



**Radio Telemetry  
Wireline Extensometer System**

**Software User's Guide**

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Ritter, Richard L., 2004, *Radio Telemetry Wireline Extensometer System, Software User's Guide*, Tucson, Arizona: Call & Nicholas, Inc.

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## SlideMinder® System

### Chapter 1. Introduction

Ground movement in and around open pit mines, large construction sites, or highways can damage or destroy expensive equipment and cause injury or death to workers and bystanders. The SlideMinder system addresses this problem by providing real-time monitoring of ground movement. When a dangerous rate of ground movement is detected, the SlideMinder system issues a hazard warning to all affected personnel.

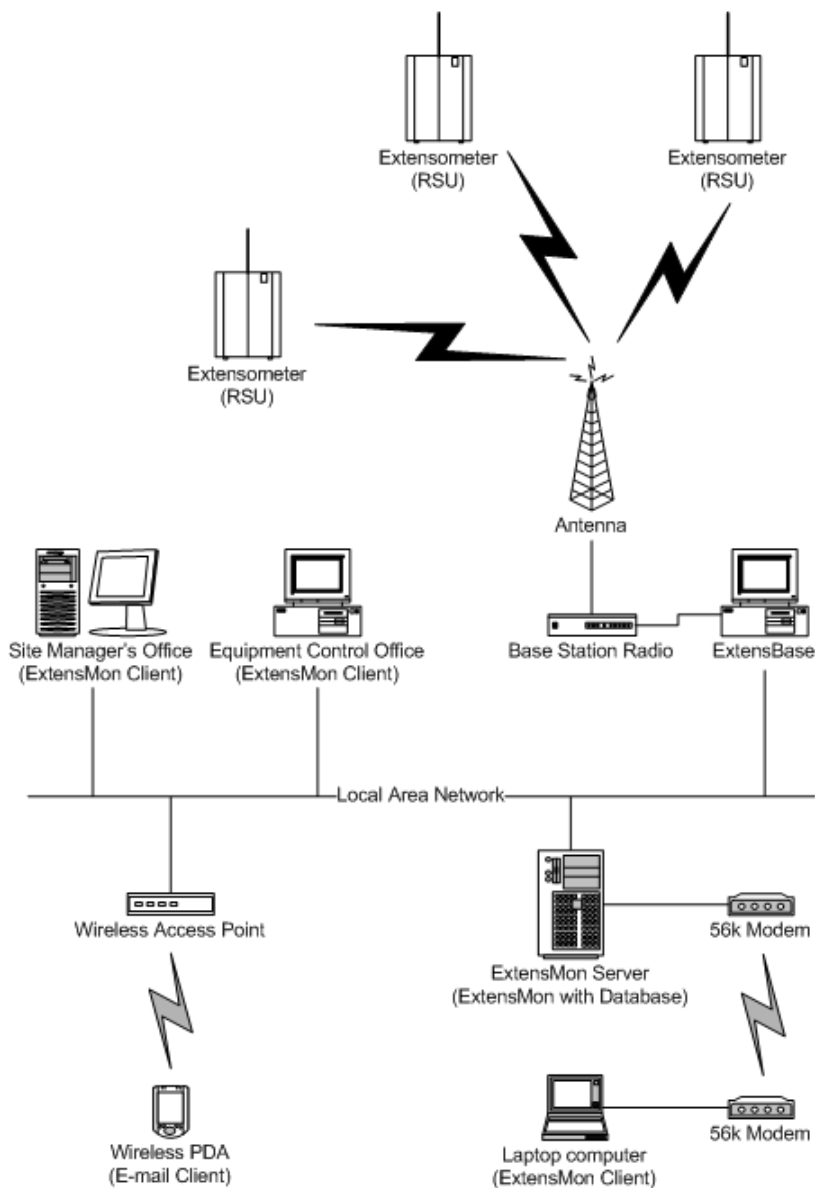


Figure 1-1. System Overview

The SlideMinder system consists of a number of hardware and software components. Hardware components include one or more extensometers, a base station radio, and base station computers. The remote extensometer and other hardware components are covered in the <sup>1</sup>*Hardware Installation Manual*. Software components, described in this manual, include the ExtensBase communication program and the ExtensMon program. ExtensMon is used for storing movement data in a central database and for viewing the movement data.

Throughout this manual, the term ExtensMon *server* is used to refer to the segment of the ExtensMon program that maintains the central database and communicates with the ExtensBase program. There is only one server per SlideMinder system. The term ExtensMon *client* is used to refer to segments of the ExtensMon program running on computers other than that running the ExtensMon server. ExtensMon clients are used for viewing the data stored in the central database by the ExtensMon server and for receiving warning messages.

The extensometer is a solar-powered remote sensing device that detects ground movement and uses a radio link to report ground movement to the base station. All of the extensometers installed around the worksite communicate with the ExtensBase and ExtensMon server components through the base station radio. If communication with the base station is interrupted, the extensometer can store movement data until the link is restored.

The base station radio is connected by a serial cable to the computer where the ExtensBase program is located. The ExtensBase program uses the base station radio to collect ground movement data from the extensometers and send commands to set extensometer parameters such as the data reporting interval. The ExtensBase program sends the ground movement data it collects to the ExtensMon server.

If communication with the ExtensMon server is interrupted, ExtensBase will store the movement data until communication with the central database is restored. The amount of movement data, or the corresponding length of time that the data can be stored in this manner, is a function of the size of the hard drive on the computer where ExtensBase is installed. If the storage capacity is exceeded, some data may be lost.

---

<sup>1</sup> Crouse, Ronald L., P.E., and Lowe, D. J., 2003, *Radio Telemetry Wireline Extensometer System, Hardware Installation Manual*, Tucson, Arizona: Call & Nicholas, Inc.

The ExtensMon server stores the ground movement data, received from the extensometers by ExtensBase, in a database. The ExtensMon server also presents the data in an intuitive graphical format and issues warnings when ground movement exceeds preset limits. ExtensBase and the ExtensMon server can coexist on the same computer, or they may be located on separate computers on the same LAN network.

The ExtensMon server compares the ground movement rate to warning criteria based on a preset warning notification protocol. Numerous warning protocol settings are possible, allowing different procedures to be implemented based on different incremental movement rates. When ground movement exceeds a preset threshold, the ExtensMon server sends warning messages via pager, modem, or LAN to the equipment control office, designated engineer, and other affected personnel.

ExtensBase can activate warning devices, such as strobe lights and sirens, at the affected extensometers. All personnel should be trained to stop work immediately and leave the area being monitored when the warning devices are activated. The equipment control office can also notify equipment operators of the hazard by radio, as a backup procedure.

After receiving the warning message, the designated engineer can use an ExtensMon client to access the central database and review ground movement data while connected to the network or at home over the Internet. The designated engineer may then elect to call the equipment control office to review the situation and set interim operational procedures to be followed pending a more permanent solution.

## **SlideMinder® System**

### **Chapter 2. Installation**

#### **2-1. SOFTWARE PACKAGE CONTENTS**

The **SlideMinder®** base station software package contains the following items:

- SlideMinder Software Installation CD
- SlideMinder Software User's Guide (this book)

Please contact the technical support team if any of these items are missing or damaged. Consult the SlideMinder *Hardware Installation Manual* for base station hardware package contents and hardware installation instructions.

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#### **2-2. REQUIREMENTS**

Before proceeding with installation of SlideMinder software, take a moment to ensure that the target system meets the following minimum requirements. If ExtensBase and ExtensMon are to be installed on the same computer, use the requirements listed for 'ExtensBase with ExtensMon'.

Processor:	Pentium
Processor Speed:	500 MHz
Physical Memory:	256 MB RAM
Operating System:	Microsoft® Windows 2000 or XP
Free Disk Space:	
ExtensBase/ExtensMon only:	500 MB
ExtensBase with ExtensMon:	1 GB
Serial Ports:	
ExtensBase with GPS:	two 9-pin RS-232 ports
ExtensBase w/o GPS:	one 9-pin RS-232 port
External Modem:	Additional 9-pin RS-232 port

Networking:

ExtensBase/ExtensMon only:      TCP/IP-capable network connections must exist between ExtensBase, the ExtensMon server, and the ExtensMon central database. The network may take the form of a Local Area Network (LAN).

ExtensBase with ExtensMon:      No network hardware is required if ExtensBase and ExtensMon will both be installed on the same computer. However, the TCP/IP protocol stack (part of the Windows operating system) must be installed for the two programs to communicate with each other.

Also, warnings cannot be issued nor can the database be accessed from an external computer without a network.

ExtensBase without GPS:      To properly operate the SlideMinder system, the computer running the ExtensBase program must maintain accurate system time. ExtensBase installations lacking the optional GPS receiver must be connected to the Internet or to a LAN where accurate system time can be obtained.

**2-3.    INSTALLING THE SOFTWARE**



**For best results, complete all hardware installation before installing the SlideMinder software.**



**ExtensBase must be installed before ExtensMon. If ExtensMon is already installed, exit the program before installing ExtensBase.**

To install ExtensBase or ExtensMon, insert the SlideMinder software installation CD into the CD-ROM drive of the target system. If the installation process does not start automatically, double click on “My Computer” then navigate to the CD-ROM drive and double click on the “Install.exe” file. Alternately, click on the Start menu, select Run and enter “d:\install” at the prompt, where “d” is the letter of the CD-ROM drive.

Once the installation program starts, choose the software package to install (ExtensBase or ExtensMon) and follow the instructions that appear on the screen. If Setup finds files on your computer that are more current than those on the CD, it will ask to keep or replace the existing file. Always click “Yes” to keep the existing file. If a “UDPPort License” window appears at any time during installation or operation, click “OK” to dismiss the window. (The license agreement is not a necessary part of this installation.)

When the installation of the first software package is complete, the other software package may be installed. Be sure to check the root directory of the installation CD for the “Readme.txt” file. The readme file may contain information on known installation issues or last-minute software modifications and should be reviewed before starting either ExtensBase or ExtensMon.

## **2-4. SOFTWARE CONFIGURATION**

A few additional configuration steps must be taken before the SlideMinder software components can be put into operation:

- The ExtensBase program must be configured with the correct COM port settings if the base station radio was not installed on the default radio port (COM 1) or the optional GPS receiver was not installed on the default GPS port (COM 2). See Chapter 3, Section 3-2.2 of this user's guide for instructions regarding COM port settings.
- The IP addresses or the machine names (DHCP protocol) of the computers running ExtensBase and the ExtensMon server must be known before SlideMinder software installation can be completed. Contact the technical support team if IP addresses or DHCP status are unknown. Refer to Chapter 3, Section 3-2.3 for details on how to set the ExtensBase IP address and Chapter 4, Section 4-2.1.1 for ExtensMon IP address instructions.
- When the ExtensMon server is installed, a central database file must be created for storage of ground movement data. See Chapter 4, Section 4-3.1 for further details. If an ExtensMon client is being installed, the program must be given the location of the central database file. See Chapter 4, Section 4-2.1.1 for details regarding ExtensMon client configuration.

## **SlideMinder® System**

### **Chapter 3. ExtensBase**

#### **3-1. RUNNING EXTENSBASE**

Double-click on the ExtensBase icon or select ExtensBase from the Windows “Start” menu to start the program. A splash screen will be briefly displayed, followed by the main ExtensBase window.

##### **3-1.1 Splash Screen**

The splash screen is displayed on system startup while ExtensBase initializes the base station radio and establishes communication with ExtensMon. This process may take several seconds.



*Figure 3-1. ExtensBase Splash Screen*

If any error messages appear during startup, please consult Chapter 5 of this manual for troubleshooting procedures.

**3-1.2 Main Window**

Once initialization is complete, the ExtensBase main window is displayed. The ExtensBase main window contains a box with current status information for each RSU in its database. Figure 3-2, below, depicts a system with two RSUs. As more RSUs are added, the ExtensBase main window will grow larger to accommodate the new units. Each RSU box on the main window includes two buttons: “Read” to query the RSU, and “Properties” to open the “RSU Properties” window.

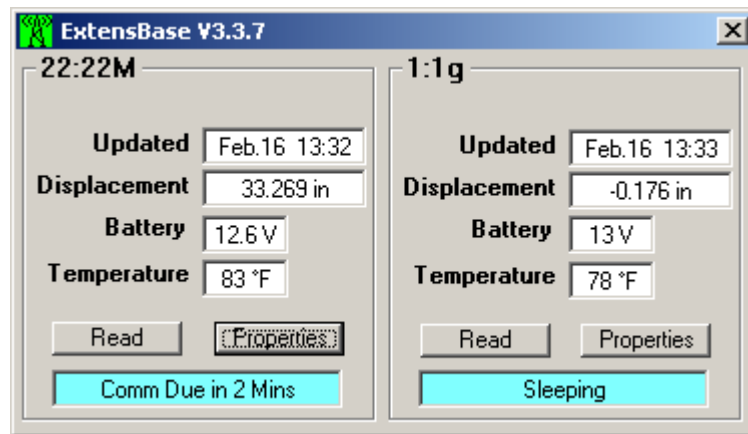


Figure 3-2. ExtensBase Main Window

The function of each data field is as follows:

- Updated** – Time and date a report was last received
- Displacement** – Total ground movement since installation
- Battery** – Current battery voltage
- Temperature** – Current temperature at the unit

The text box displays communication status, that is, it shows the length of time before an RSU is expected to “wake up.” (See Section 3-4.1.4 for more information about the RSU sleep mode).



Figure 3-3. Warning Device Indicator

The WD field appears next to the “Temperature” box if the RSU is equipped with a warning device, such as a siren or flashing light. If the warning device is activated, the WD box will change to red.

Important status messages about the RSU, such as “Encoder Error” or “Hi-Res Mode,” are displayed at the top of each RSU box. These messages will appear in large red letters. Please consult Chapter 5 (Troubleshooting) or contact the technical support team for more information regarding these RSU status messages.

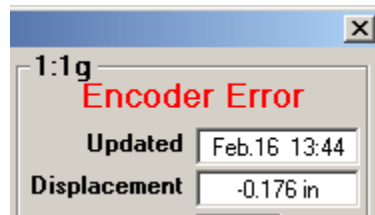


Figure 3-4.  
RSU Status Message

### 3-2. SYSTEM SETTINGS

The ExtensBase program system settings must be configured when the program is first installed. Once initialization is complete, and the ExtensBase main window is open, click on the “Properties” button in the lower right-hand corner to open the “RSU Properties” window. ExtensBase program properties and RSU parameters are configured from this window.

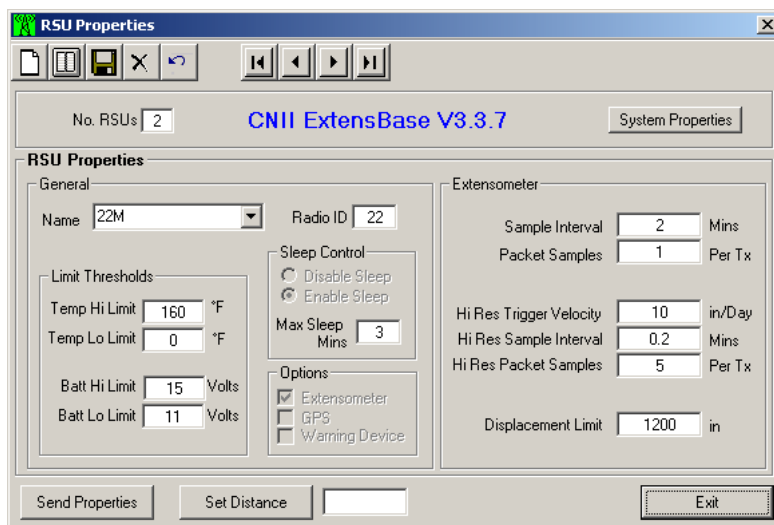


Figure 3-5. RSU Properties Main Screen

Click on the “System Properties” button in the upper right-hand corner of the “RSU Properties” window to display the system settings.

To change a setting, click on the desired option or text box and enter the new value (if required). Click the “Save Properties” button to save changes to these settings. If a mistake is made, the last settings to be saved can be restored by clicking on the “Revert to Previous” button. To go back to the “RSU Properties” display, click the “OK” button in the lower right-hand corner of the window.

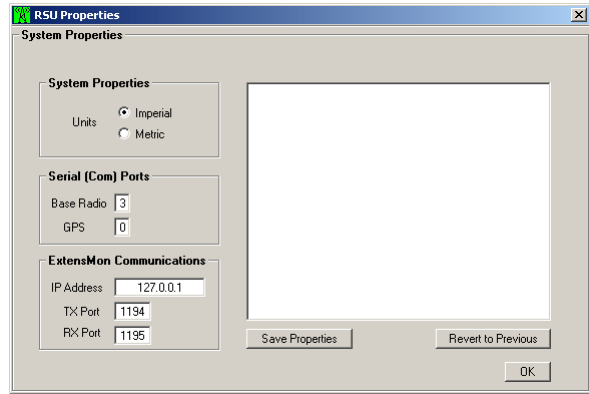


Figure 3-6. RSU System Properties Screen



**When changes are made to any of the ExtensBase system settings, the program must be restarted before the changes will take effect.**

### 3-2.1 Properties

There is only one parameter listed in the “System Properties” box. Select either “Imperial” or “Metric” to set the ExtensBase display mode. If “Imperial” is selected, then units such as inches, feet, and degrees Fahrenheit will be used for all ExtensBase displays. The units of centimeters, meters, and degrees Centigrade will be used if “Metric” is selected.

### 3-2.2 Serial Ports

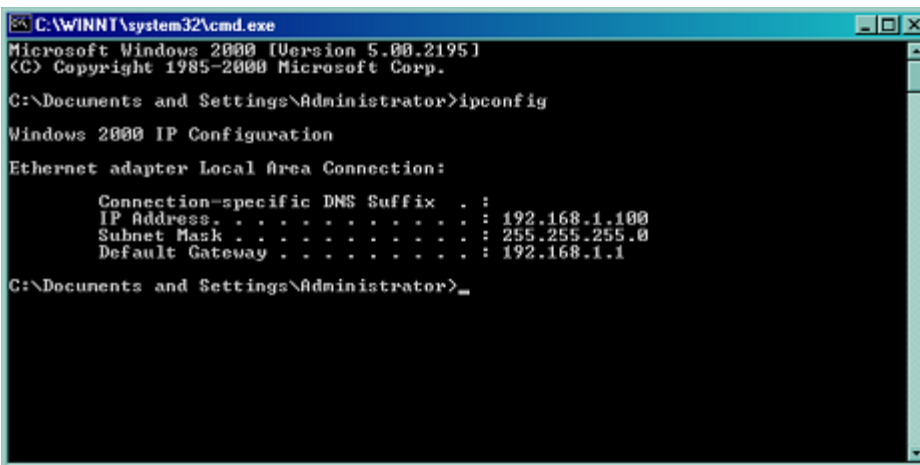
If the base station radio was not installed on the default radio port (COM 1), or the optional GPS receiver was not installed on the default GPS port (COM 2), then the ExtensBase program must be configured with the correct COM port numbers. Enter the COM port used for the base station radio in the “Base Radio” box. Enter the COM port used for the GPS receiver in the “GPS” box; enter zero (0) if there is no GPS receiver.

### 3-2.3 Communications

The ExtensBase program must be told the location of the ExtensMon server before communication between the two will take place. Enter the IP address or machine name of the computer where the ExtensMon server is located in the “IP Address” box. If both programs are located on the same machine, then the IP address of “127.0.0.1” can be used. Ensure the “TX Port” is set

to 1194 and the “RX Port” is set to 1195. Do not change these port numbers unless there is a conflict with another software program.

If the IP address of the ExtensMon server is unknown, go to the ExtensMon server and click on the Windows “Start” menu. Select the “Run...” option and type in “cmd” at the prompt. Click “OK” and the “cmd.exe” window will open. Type in “ipconfig” at the prompt and press the “Enter” key. The IP address of the computer will be displayed on a line beginning with the label “IP Address.” This is the number that should be entered in the “IP Address” box on the ExtensBase “System Properties” display.



```
C:\WINNT\system32\cmd.exe
Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\Documents and Settings\Administrator>ipconfig

Windows 2000 IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . :
    IP Address. . . . . : 192.168.1.100
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

C:\Documents and Settings\Administrator>
```

Figure 3-7. The “ipconfig” command

The IP addresses of both ExtensBase and ExtensMon can be static or use DHCP protocol. When using DHCP, enter the machine name in the IP address field, rather than the IP numbers.

### 3-3. OPERATIONS

The configuration of program settings discussed in the previous section is only performed on rare occasions, such as during installation and at the direction of the technical support team. The operations described in this chapter will be used most frequently in support of routine ExtensBase communication functions. Operations covered in this section include adding and removing RSUs, changing RSU settings, sending settings to an RSU, and viewing diagnostic displays.

### 3-3.1 Add/Modify Extensometer (RSU)

To add a new extensometer (RSU), first bring up the “RSU Properties” window by clicking on the “Properties” button of the main ExtensBase window. When the program is first run, a default RSU with the name “RSU100” will be shown. This name, as well as the radio ID, can be modified using the “Edit RSU” function. There must be at least one RSU at all times.

#### 3-3.1.1 Create or Select RSU

To create a new RSU, click on the “New RSU” button in the upper left-hand corner of the window. The parameter boxes will be filled with default values and opened for editing.

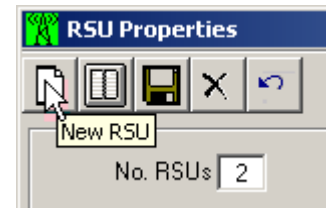


Figure 3-8.  
Create New RSU

To modify the parameters of an existing RSU, use the VCR buttons located in the top center of the “RSU Properties” window or the “Name” drop-down menu to select the desired RSU.

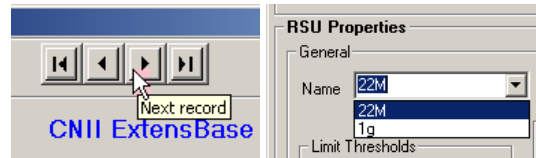


Figure 3-9. Select Existing RSU

When the name of the desired RSU appears in the “Name” box, click on the “Edit RSU” button, located immediately to the right of the “New RSU” button in the upper left-hand corner of the “RSU Properties” window. Clicking the “Edit RSU” button will open the parameter boxes for editing. All fields will turn blue when the “Edit RSU” button is selected.

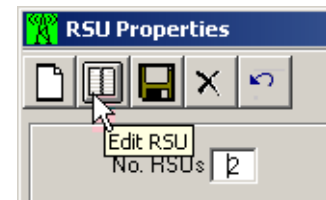


Figure 3-10. Edit RSU



**Editing mode may be exited at any time by clicking on the “Edit RSU” button. No changes will be applied.**

#### 3-3.1.2 RSU Identification

To add a new RSU, enter a unique alphanumeric designation for the new RSU in the “Name” box. Enter the radio ID for the new RSU in the “Radio ID” box. The radio ID must be unique and must match the ID number supplied with the RSU. The ExtensBase program will be unable to communicate with a new RSU if this box is left blank or filled incorrectly. Please check the RSU documentation or contact the technical support team if the radio ID is unknown.

### 3-3.1.3 Set Properties

RSU properties include:

- limit thresholds
- sleep mode control
- equipment options
- extensometer sampling interval
- extensometer displacement limit

These settings have a direct correlation with RSU operation and system performance, so they should be modified only in consultation with the technical support team. Consult Section 3-4 “RSU Properties,” for further details.

### 3-3.1.4 Save Properties

Once an RSU has been identified and its properties set, the new data must be saved before it takes effect. Click on the “Save RSU” button to save the new RSU or to save changes to an existing RSU. The “Save RSU” button is located immediately to the right of the “Edit RSU” button in the upper left-hand corner of the “RSU Properties” window.

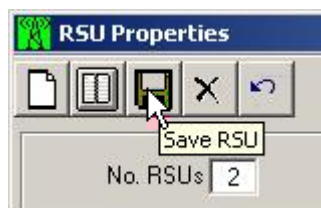


Figure 3-11. Save RSU

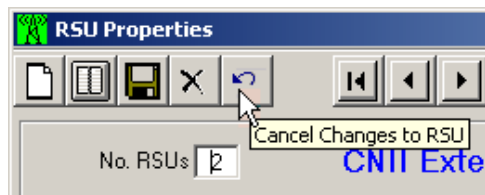


Figure 3-12. Cancel Changes

When the confirmation window appears, click “OK” to save the selected RSU properties, or “Cancel” to abort the operation.

If a mistake is made, click on the “Cancel Changes to RSU” button to reverse all changes made to the selected RSU since the last time “Save RSU” was clicked. Clicking the “Edit RSU” button will cancel all changes and exit the editing mode.

### 3-3.1.5 Send Properties

Clicking the “Save RSU” button will automatically transmit the changes to the RSU. Alternatively, click the “Send Properties” button in the lower left-hand corner of the “RSU Properties” window to send operational parameters to the selected RSU.

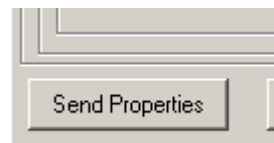


Figure 3-13. Send Properties

When the confirmation window opens, click “OK” to send properties to the selected RSU, or “Cancel” to abort the operation. The ExtensBase program will usually respond with a message stating that the selected RSU is currently in “Sleep Mode.” (See Section 3-4.1.4 for details regarding RSU “Sleep Mode.”)

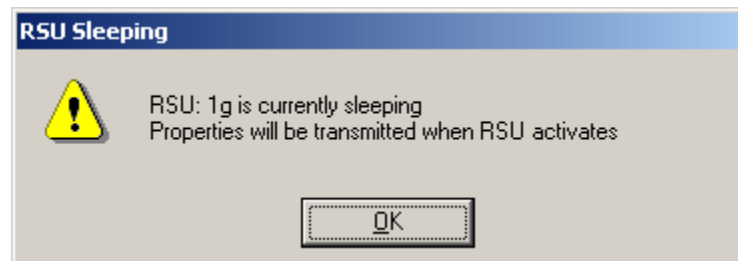


Figure 3-14. RSU Sleeping

The ExtensBase program cannot send the messages to set the RSU properties until the RSU awakens from “Sleep Mode” and activates its radio. ExtensBase therefore stores the messages so they can be sent the next time the selected RSU wakes up. Click the “OK” button to dismiss this message.

Fields that have been modified will appear with a yellow background and their current values until the new changes have been sent to the RSU. Click the “Show Pending” button to see the changes to be sent. Click the “Show Current” button to see the current settings.

### 3-3.2 Remove an RSU

To remove an RSU, first select the RSU to be removed. When the name of the desired RSU is displayed in the “Name” box, click on the “Delete RSU” button located immediately to the right of the “Save RSU” button in the upper left-hand corner of the “RSU Properties” window.

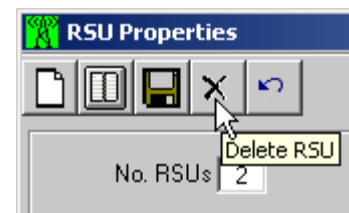


Figure 3-15. Delete RSU

When the confirmation window appears, click “OK” to delete the selected RSU, or “Cancel” to abort the operation. There must always be at least one RSU in the list.

### 3-3.3 Set Distance

When an RSU is inadvertently reset (the displacement suddenly reads zero) the extensometer can be reprogrammed with the correct displacement. Select the desired RSU, then enter the desired displacement in the box immediately to the right of the “Set Distance” button near the center of the lower edge of the “RSU Properties” window. If the ExtensBase program is set to use

imperial units, then the displacement is measured in inches. If metric units are in use, then the displacement must be expressed in centimeters.



Figure 3-16. Displacement Distance

Click “Set Distance” to send the new displacement to the selected RSU. When the confirmation window appears, click “OK” to set the displacement for the selected RSU, or “Cancel” to abort the operation. The last recorded displacement value can be obtained through ExtensMon, using the Tables option under the View menu.

### 3-4. RSU PROPERTIES

All of the subsections in this section refer to the following illustration.

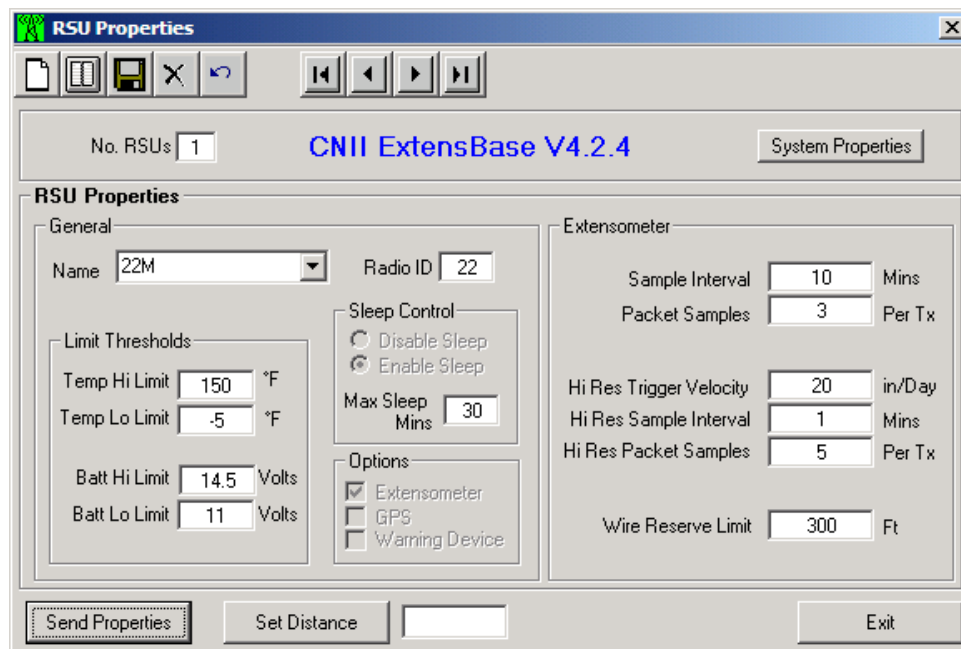


Figure 3-20. RSU Properties Window

The RSU (Extensometer) properties are covered in detail in this section. For information regarding ExtensBase program settings such as COM ports, IP address, and units of measurement, see Section 3-2. When a new RSU is created, default values for each parameter are shown.

### **3-4.1 General RSU Properties**

The “General” box of the “RSU Properties” window contains a number of RSU parameters. The RSU name and radio ID, limit thresholds, sleep control, hardware options, and extensometer configuration parameters are all located in this box.

#### **3-4.1.1 Identification**

The “Name” property is the alphanumeric designation for the selected RSU. This is the same “Name” the ExtensMon program will associate with data from this unit in its graphical displays. A meaningful name is suggested, but not required.

The “Radio ID” property refers to the ID number of the data radio inside the RSU. When ExtensBase has a message for the selected RSU, this number is used to address the message to the correct unit. Valid radio ID numbers range from 1 to 255. Consult the documentation provided with the RSU or call the technical support team to determine the correct radio ID.

#### **3-4.1.2 Temperature Limits**

The “Limit Thresholds” box contains fields for “Temp Hi Limit” and “Temp Lo Limit.” Each of these properties may range from -15 degrees to 160 F degrees. If the temperature falls below the lower threshold, the window (on the ExtensBase Main screen) will turn blue. If it goes above the upper threshold, the window will turn red. A message is sent to ExtensMon when the temperature at the RSU exceeds these limits or returns to normal from a temperature exception condition. The ExtensMon program then notifies all designated parties, provided a temperature alarm has been set up (Ch. 4, Sec. 4-6).

#### **3-4.1.3 Battery Limits**

The “Limit Thresholds” box also contains fields for “Batt Hi Limit” and “Batt Lo Limit.” Each of these properties may range from 10 volts to 15 volts. If the voltage falls below the lower threshold, the window will turn blue. If it goes above the upper threshold, the window will turn red. A message is sent to ExtensMon when the battery voltage at the RSU exceeds these limits or returns to normal from a battery voltage exception condition. The ExtensMon program then notifies all designated parties, provided a battery voltage alarm has been set up (Ch. 4, Sec. 4-6).

#### **3-4.1.4 Sleep Control**

The “Sleep Mode” feature is used to shut down the radio in the RSU to conserve power. Monitoring of ground movement continues in sleep mode, and the RSU will automatically wake up if excessive ground movements are measured (i.e., if “Hi-Res” mode is entered).

The “Sleep Mode” may be either enabled or disabled. The radio is left on all the time when “Sleep Mode” is disabled, so use this mode only for bench testing and system diagnostics. The “Sleep Mode” should always be enabled for normal operation to avoid draining the battery.

When “Sleep Mode” is enabled, the RSU is programmed to automatically wake up (turn on its radio) at a given interval from its last communication and send a message to ExtensBase. This enables messages that are waiting to be sent to the RSU to be processed.

The maximum length of time that the selected RSU may remain asleep is expressed in minutes and is found in the “Max Sleep Mins” box. Sleep time may be set anywhere from 1 to 255 minutes. Sleep time should be equal to the sample interval multiplied by the packet samples (Sec. 3-4.2.1).

#### **3-4.1.5 Hardware Options**

The checkboxes in the “Options” box should be checked if the given device is included among the hardware components of the selected RSU. The extensometer is the actual device used for measuring ground movement. If this box is unchecked, ExtensBase will not look for ground movement data from the selected RSU.

The RSU may also contain a GPS receiver in some applications. If a GPS receiver is contained within the RSU enclosure, the “GPS” box should be checked. If the RSU is equipped with a warning device, such as a siren and/or flashing light, the “Warning Device” box should be checked.

Once these checkboxes have been correctly configured, they should not be altered except at the direction of the technical support team.

#### **3-4.2 Extensometer Properties**

The remaining RSU properties listed in the “Extensometer” box of the “RSU Properties” window pertain to sampling intervals, Hi-Res trigger, and the wire reserve limit. Sampling parameters affect the resolution of the data and the performance of the system. The Hi-Res trigger is used by the RSU to determine when the high-resolution reporting mode is called for. The wire

reserve limit is the estimated length of wire remaining on the supply spool. A warning can be set up to advise when the spool is close to empty and should be replaced.

#### **3-4.2.1 Routine Sampling**

There are two routine sampling parameters located in the “Extensometer” box. The “Sample Interval” specifies the length of time in minutes between routine displacement reports. The value of this parameter will vary depending on the application. The “Sample Interval” may range from 1 minute to 300 minutes.

The “Packet Samples” parameter indicates the number of displacement measurements the RSU should store before it transmits to ExtensBase. Valid entries range from 1 sample to 64 samples per packet (transmission). This setting affects the transmission frequency from the RSU and hence the performance of the system. The smaller the number, the more often the unit will transmit. However, there is a risk of draining the battery if the unit transmits too frequently, using power more quickly than the solar panel recharges it. If the battery voltage drops to 9.5, the unit will shut down.

If the “Sample Interval” is set to ten minutes and the “Packet Samples” parameter is set to three per transmission (3 per TX), then the RSU will send out one packet containing three ground displacement measurements every thirty minutes.

Sending multiple readings in each packet this way conserves RSU power and improves overall RF system throughput, but has the disadvantage of fewer real-time updates. The data settings displayed by the example on Figure 3-20 generate data up to 30 minutes old.

#### **3-4.2.2 Hi-Res Mode**

The RSU offers two reporting modes, standard and high-resolution. The standard mode is used when the ground is moving very slowly. When ground movement exceeds a preset trigger value (the “Hi-Res Trigger Velocity”) the RSU goes into high-resolution reporting mode and will send displacement measurements at an accelerated rate. Valid trigger velocities range from 0.5 to 500 units per day.

A separate pair of sampling parameters (“Hi-Res Sample Interval” and “Hi-Res Packet Samples”) is provided to enable better sample resolution and near real-time display during periods of rapid ground movement. The “Sample Interval” may range from 1 minute to 300 minutes. Valid entries

range from 1 sample to 64 samples per packet (transmission). The RSU returns to its standard sampling settings once the movement rate falls below the high-resolution trigger value.

The RSU monitors ground displacement every six seconds. In order to enter Hi-Res mode, there must be ten consecutive observations above the Hi-Res trigger velocity. In order to exit Hi-Res mode, there must be ten consecutive observations below the Hi-Res trigger velocity. This reduces the chance of switching into Hi-Res mode as a result of wind noise or other external factors.

### **3-4.2.3 Wire Reserve Limit**

The “Wire Reserve Limit” contains a field for the estimated amount of wire contained on the supply spool, in feet or meters. A message is sent to ExtensMon when the wire reserve limit value is exceeded. If a reserve limit warning has been set up (Ch. 4, Sec. 4-6), the ExtensMon program will notify all parties specified. When the reserve limit is exceeded, there is very little wire remaining on the supply spool, and it should be replaced with a new spool of wire.

## **SlideMinder® System**

### **Chapter 4. ExtensMon**

#### **4-1. RUNNING EXTENSMON**

To start the ExtensMon program, double-click on the ExtensMon icon or select ExtensMon from the Windows Start menu. A splash screen will be displayed briefly, followed by the main program window. If ExtensMon is located in the Startup directory, the program will start automatically every time the system is rebooted.

##### **4-1.1 Splash Screen**

The ExtensMon splash screen is displayed on program startup and contains important point-of-contact information for the technical support team.

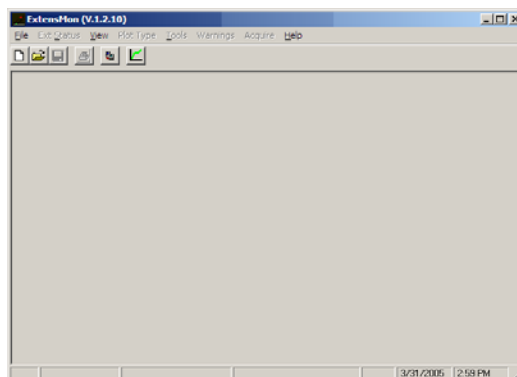


*Figure 4-1. ExtensMon Splash Screen*

To display the splash screen and view technical support contact information at any time, select the “About” option from the ExtensMon Help menu.

##### **4-1.2 Main Window**

The ExtensMon main window provides menu options to access all program functionality, a toolbar with shortcuts to commonly used functions, a display area for graphs of extensometer data, and a status bar with time, date, connection status, and warning monitoring status.



*Figure 4-2. ExtensMon Main Window*

For details regarding ExtensMon program configuration, consult Section 4-2 below. Instructions relating to routine ExtensMon operations, such as database creation, printing, and connecting to ExtensBase may be found in Section 4-3. Section 4-4 describes common extensometer data maintenance tasks, and Section 4-5 describes the ExtensMon data analysis features. Section 4-6 details the ExtensMon warning features.

## 4-2. PROGRAM SETTINGS

The ExtensMon program must be configured for proper operation the first time the program is activated. Program settings for ExtensMon communications are found on the “Program Settings” window and are covered in Section 4-2.1. Program settings relating to ExtensMon program appearance are described in Section 4-2.2.

### 4-2.1 Settings Window

To access the ExtensMon settings for program communications, click on the “Program Settings” option of the main window’s File menu.

The “Program Settings” window should appear. If the “Program Settings” option is grayed out (disabled), an ExtensMon database is open and must be closed before program settings can be modified. Consult Section 4-3.2 for instructions on closing the open database.

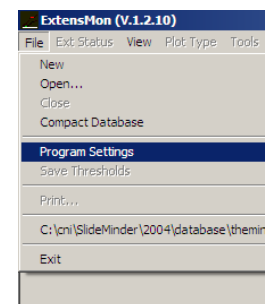


Figure 4-3. File Menu  
Program Settings

#### 4-2.1.1 General Settings Tab

The ExtensMon server must be told the location of the ExtensBase program in order to enable data communication. The “General Settings” tab contains these settings as well as settings for warning message communication.

Enter the IP address, or machine name, of the computer running the ExtensBase program in the “IP Address” box. (See Chapter 3, Section 3-2.3 for obtaining a computer’s IP address.)

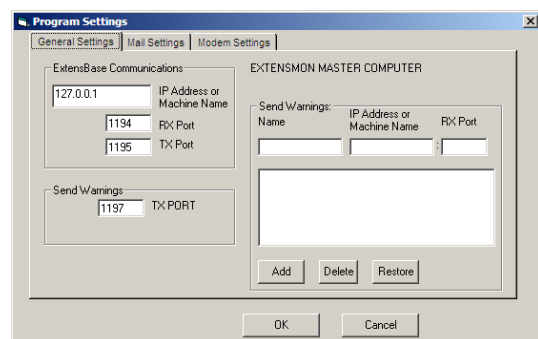


Figure 4-4. General Settings Tab

If no IP address is entered, the program assumes that the computer is a client server and does not allow it to communicate with the ExtensBase program or issue warnings. An “Update Interval” box at the lower left is visible while the IP address field is blank. A number entered in “Update Interval” field configures the time in minutes (from 1 to 20) that the client will check the database for updates and refresh the display. If a “0” is entered, the screen must be refreshed manually using either the “Refresh” button or choosing “Refresh” from the Plot Type menu.

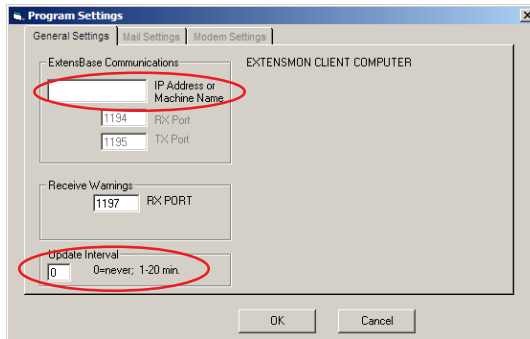


Figure 4-5. General Settings Tab

Communications between the ExtensBase program and the ExtensMon master program, and also between the ExtensMon master computer and its client

**Recommended Port Setting Values**

Port Name	Port Value
ExtensBase TX port	1194
ExtensBase RX port	1195
ExtensMon Listen (RX) port	1194
ExtensMon Send (TX) port	1195
ExtensMon Warnings port	1197

computers, requires that specific port setting values be used, in addition to IP addresses or machine names. By default, the programs are assigned certain port values that will function properly. However, if another program on your computer is using one of the assigned values, these port settings may need to be modified.

The TX and RX ports are used only between the ExtensBase program and the ExtensMon main program. The ExtensMon Warnings port is used by the ExtensMon main program to issue popup warnings to any ExtensMon client computer on the same LAN network. ExtensBase port settings are discussed in further detail in Chapter 3, Section 3-2.3.

**4-2.1.2 Mail Settings Tab**

A sender’s name, e-mail address, and e-mail server address (SMTP) must be specified for outgoing e-mail alerts. The source name and e-mail address will appear in the “From” field on all e-mail alert messages generated by ExtensMon.

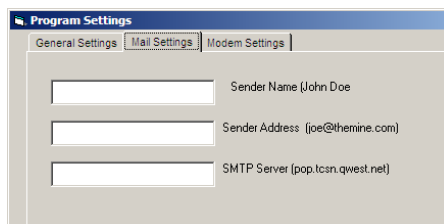


Figure 4-6. Mail Settings Tab

In the “Sender Name” box, enter the name that will appear in alert messages. Enter the e-mail address in the “Sender Address” box. This address will be used if the recipient of an alert message clicks “Reply.” Finally, enter the URL for the outgoing (SMTP) e-mail server. (The URL may be obtained either from the ISP or your company IT personnel.)

#### 4-2.1.3 Modem Settings Tab

Any standard AT-compatible modem may be installed to enable ExtensMon to send warnings using a pager. If a modem is installed, select the “Modem Settings” tab on the “Program Settings” window to configure ExtensMon for modem communications.

Enter the number of the COM port used by the modem in the “Modem Comm Port” box, or zero (0) if no modem is installed. If using an internal modem, select the “Phone and Modem Options” (or similar) applet from the Windows Control Panel and click on the “Modems” tab. The modem COM port will be listed in the table under the “Attached To” heading.

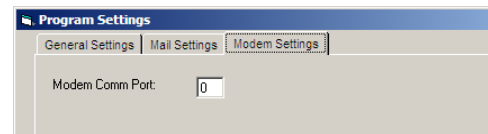


Figure 4-7. Modem Settings Tab

### 4-2.2 Program Appearance

The ExtensMon window may be maximized or resized as needed. If more viewing area is needed in the ExtensMon main window, the toolbar and status bar may both be hidden using the View menu. Other appearance settings relating to graph colors and other ExtensMon data display features may be found on the “Options” window. See Section 4-5.1 for further details.

#### 4-2.2.1 Toolbar and Status Bar

The ExtensMon main window toolbar and status bar can be turned on and off using the “Toolbar” and/or “Status Bar” options in the ExtensMon main window View menu. These bars are visible when a checkmark appears next to their names in the View menu. Clicking on the name in the menu toggles the bar on or off.

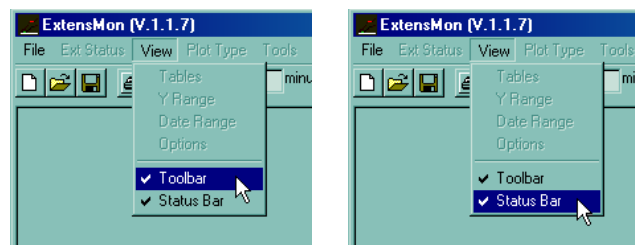


Figure 4-8. Show/Hide Toolbar and Status Bar

## 4-3. FUNDAMENTALS

Routine ExtensMon operations include creating and opening the central database, printing the current display, connecting to the ExtensBase program, and using the help menu.

### 4-3.1 Create/Select Database

A new database must be created, or an existing database opened before any ExtensMon data analysis operations can be performed. If the ExtensMon program is installed as the SlideMinder system data server, then a *new* central database must be created before the SlideMinder system can store SlideMinder system data.

#### 4-3.1.1 Create a New Database

Before any data may be collected by the ExtensMon server or analyzed using ExtensMon client, a central database of extensometers and ground movement data must be created. To create a new database, select the “New” in the File menu of the ExtensMon main window.

A standard Windows file dialog will open. To create the new database, enter a name for the database in the “File name:” box and click on “Open.”

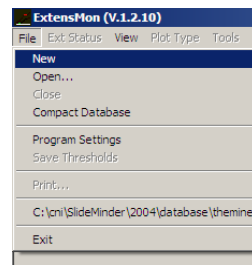


Figure 4-9. Select New

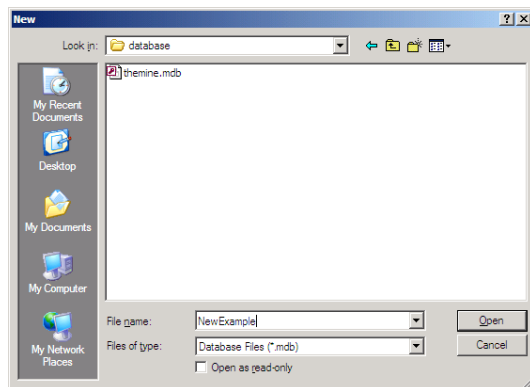


Figure 4-10. Name New Database

The units of measurement in use by the SlideMinder system must be specified when creating a new database. Select Metric or Imperial units when prompted.

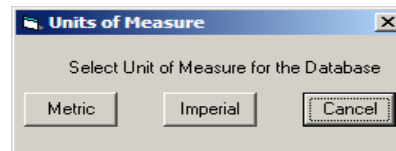


Figure 4-11. Specify Units of Measurement

Once the central database has been created, the ExtensMon server must be connected to ExtensBase (Sec. 4-3.4) and must be left running at all times to process and store the data transmitted by ExtensBase. The central database will not start collecting SlideMinder system data until the extensometers have been added. New extensometers are automatically added when detected in the data coming from ExtensBase.

### 4-3.1.2 Open an Existing Database

The central database file must be opened before ExtensMon can be used as a SlideMinder system client. It may also be necessary to open a database file to analyze archived data or data from other SlideMinder installations.

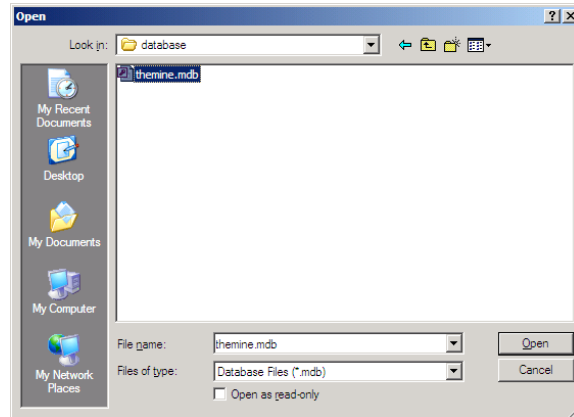


Figure 4-12. Opening an Existing Database

Select the “Open” option from the ExtensMon main window File menu. A standard Windows file dialog will appear. Navigate to the appropriate folder and select the desired database file. The database file must have an “.mdb” extension.

Click the “Open” button to open the selected database file. When the database file is opened, the ExtensMon main window will show a displacement graph of all extensometers in the database as its default display.

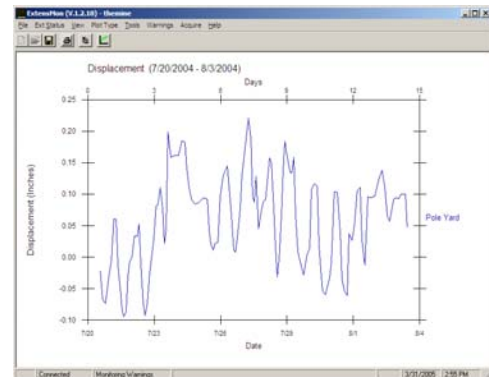


Figure 4-13. Main Window, Open Database

### 4-3.2 Close Current Database

Only one ExtensMon database may be open at a time. To view data from a database other than the current database, the current database must first be closed. It is also necessary to close the current database before the program settings can be modified (Sec. 4-2).

To close the current database, select the “Close” option from the ExtensMon main window File menu.

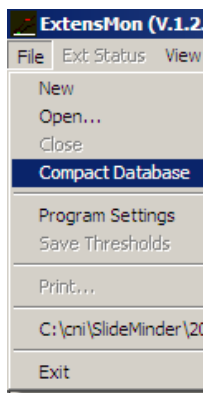


Figure 4-14. Compact Database

### 4-3.3 Compact Database

Occasionally the Microsoft Access database the program generates may become corrupted for various reasons. With no database opened, choose the “Compact Database” option on the File menu. Select the corrupted database to repair the file. Then reopen the database.

### 4-3.4 Print Current Display

To print the current display, select the “Print” option from the ExtensMon main window File menu. When this option is selected, the current graph will be sent to the default printer.

### 4-3.5 Most Recently Used File List

Once a database has been opened, a shortcut will appear on the File menu. Click on the name of the database instead of searching for it on the hard drive. The four most recently used databases are shown.

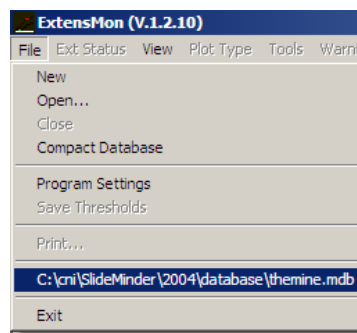


Figure 4-15. Recent File List

### 4-3.6 Connect to ExtensBase

A live connection between the ExtensMon server and the ExtensBase is required for transfer of extensometer data from the remote units to the central database. If the ExtensMon program has been installed as the central server and the main window status bar says “Not Connected,” connection to the ExtensBase program

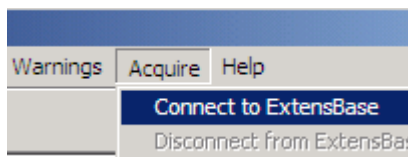


Figure 4-16. The Acquire Menu

must be established. Select the “Connect to ExtensBase” option from the Acquire menu or use the “Connect to Base” toolbar button to establish the connection.



Figure 4-17. “Connected” Status Bar Display

When ExtensMon is connected to ExtensBase, the word “Connected” will appear in the main window status bar.



**Only the ExtensMon server is required to have a live connection to ExtensBase; ExtensMon clients should remain disconnected from ExtensBase.**

Consult Chapter 5, “Troubleshooting,” regarding any connectivity problems.

### 4-3.7 The ExtensMon Help Menu

The ExtensMon Help menu may be used to access this user’s guide through the “Contents” and “Search For Help On...” options. Select the “About” option to bring up the splash screen with point-of-contact information for the technical support team.

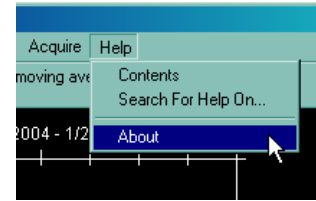


Figure 4-18. The Help Menu

### 4-3.8 The Toolbar and Status Bar

The ExtensMon program toolbar offers shortcuts to some frequently used program features. Toolbar shortcuts are only active when a database is open.

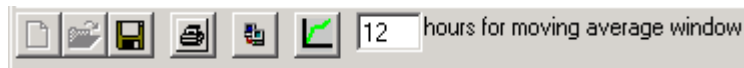


Figure 4-19. The ExtensMon Toolbar

The toolbar shortcuts functions are (from left to right):

- Create new database
- Open existing database
- Closes existing database
- Print current display
- Connect to base
- Refresh current display
- Hours for moving average

The “hours for moving average” box is used to enter the number of hours over which velocity data should be averaged. See Section 4-5.1.3 for more information on this setting. The toolbar is the only location for the “Refresh” button, so the toolbar must be visible to force the display to refresh.

The ExtensMon program also features a status bar at the bottom edge of the main window. The status bar is used to display the status of the connection to ExtensBase, the warning monitoring status, and current date and time.

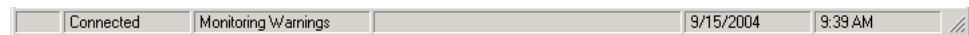


Figure 4-20. The ExtensMon Status Bar

The ExtensMon server should always show “Connected” and “Monitoring Warnings” messages in the status bar. Consult Chapter 5, “Troubleshooting,” if the ExtensMon server status bar reads “Not Connected” or “Not Monitoring Warnings.”

The ExtensMon server is typically left running at all times, and is the only ExtensMon that should be monitoring warnings.



**Only the ExtensMon server that maintains the central database of extensometers and movement data should be Connected to ExtensBase.**

## 4-4. EXTENSOMETERS

The ExtensMon program depends on the extensometer data in the central database for correct operation. The central database must be kept up-to-date with relevant information regarding all installed extensometers, including warning devices, radio ID, and geographical location. Procedures for maintaining extensometer data, as described in the following subsections, require a database to be open.

### 4-4.1 Extensometer Table

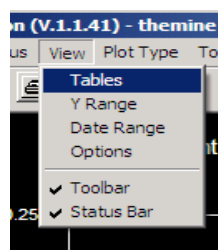


Figure 4-21.  
Select View/Tables

A list of all extensometers in the current database may be obtained by selecting the “Tables” option from the View menu. The “View Tables – Extensometers” window, containing a detailed listing of every extensometer in the current database, will open.

ID	RadioID	LocationID	StationName	DefaultColor	AlarmState	hasEncoder	hasWarning
1	14	1	Pole Yard	65280	0	-1	0

Figure 4-22. Detailed Listing of Extensometers

By default the extensometers list is presented. Extensometer parameters shown in this table include station ID, radio ID, location ID, station name, display color, warning status, encoder presence, warning devices, and a “station active” indicator.

Other tables may be viewed by selecting the various tabs. Extensometer Data shows the date and time, displacement, voltage, and temperature values. Individual lines may be deleted by checking “Allow Deleting Rows,” highlighting the row with the pointer, and pressing the “Delete” key on the keyboard. Historical data may be viewed for locations, limit settings, and deactivated units. Switch between extensometers by selecting from the list on the right side of the window.

#### 4-4.2 Extensometer Tools

The Tools menu of an ExtensMon Open Database main window lists options to select, modify, reactivate, or delete Extensometers.

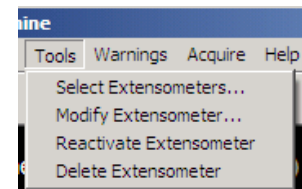


Figure 4-23. Tools Menu

##### 4-4.2.1 Select Extensometer

The “Select Extensometer” window is used for a number of ExtensMon features, such as reactivating or deleting extensometers. The data displayed on the ExtensMon graphical display is determined by the selected extensometers. Only data collected by the extensometers that have been selected for display will be shown on the graph.

On the Tools menu, click on “Select Extensometer” to display the list of extensometers. By default the list displays only active extensometers. To include inactive extensometers, check the “Show Deactivated Stations” box on the bottom left.

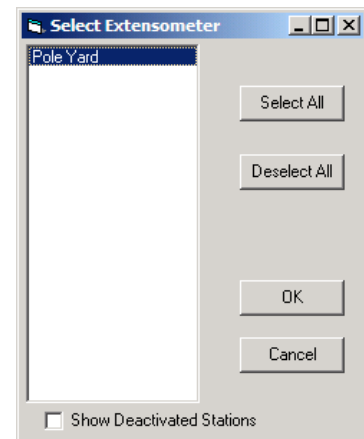


Figure 4-24. Select Extensometer

Click on the name of the extensometer to select it. To select more than one extensometer, hold down the control (“Ctrl”) key on the keyboard while clicking, or click an extensometer then hold down the shift key and click another extensometer to select all extensometers between the two. The “Select All” button can also be used to select all the extensometers listed. The “Deselect All” button is used to clear the current selection. When all desired extensometers have been selected, click “OK” to accept the selection. Click “Cancel” to abort the selection process and close the “Select Extensometer” window.

##### 4-4.2.2 Modify Extensometer

When it becomes necessary to change the operational parameters for an extensometer, select the “Modify Extensometer” option from the Tools menu. The “Update Extensometer” window will open.

From the “Name” drop-down menu, select the extensometer to be modified. The current settings for

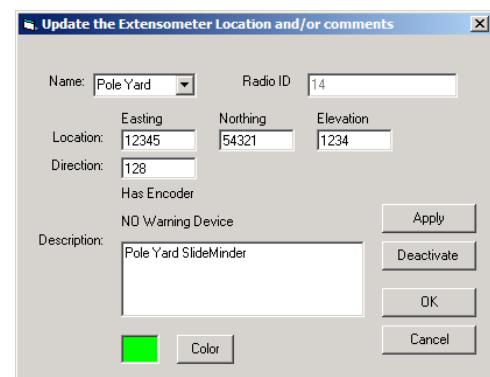


Figure 4-25. Update Extensometer

the selected extensometer will be displayed. Update the extensometer location, equipment, comments, and color parameters as necessary. Click “Apply” to accept the changes without closing the window, “OK” to accept the changes and close the window, or “Cancel” to close the window without accepting the changes.

The location and direction parameters are required for the vector plots. The “Location” refers to the northing, easting, and elevation of the extensometer; the “Direction” parameter should be the approximate azimuth, in degrees, of the wireline in the field, from the extensometer to the anchor pin. These parameters are required by ExtensMon for correct display of displacement vector and velocity vector plots. If these parameters are omitted, the vector plots will not be accurate.

To deactivate the extensometer, click the “Deactivate” button. The deactivated unit will no longer appear by default. The data will be retained in the database and can be viewed by checking the “Show Deactivated Stations” box in the Select Extensometer window.

For ExtensMon client programs, it is possible to modify extensometer colors. From the Tools menu, choose “Modify Extensometer.” A new window titled “Override Colors” will open. The color of the extensometer as it appears on the master computer will be shown. In order to change to a new color, the “Use New Colors”

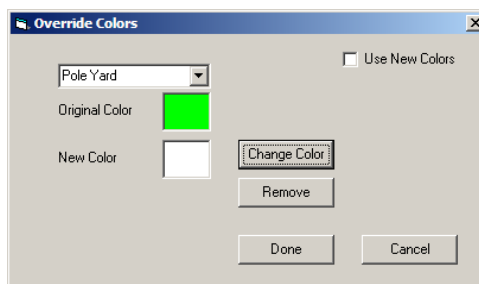


Figure 4-26. Override Colors

box must be checked. Click the “Change Color” button to open a color palette and select a new color. Once a color is selected, click “Done.” To deselect the new color, click on “Remove,” or to toggle between the new and original color, check or uncheck the “Use New Colors” box. To switch to a different Extensometer, use the drop-down menu and select the desired unit.

#### 4-4.2.3 Reactivate Extensometer

To reactivate an extensometer that has been deactivated, select “Reactivate Extensometer” from the Tools menu. The Reactivate feature uses the “Select Extensometer” window (Sec. 4-4.2.1). By default, a list of all inactive extensometers will be displayed. Select the extensometers to be reactivated and click “OK.” Click “Cancel” to abort the reactivation.

#### 4-4.2.4 Delete Extensometer

To delete extensometers, select the “Delete Extensometer” option from the Tools menu. A list of all extensometers will be displayed. Select the extensometers to delete (Sec. 4-4.2.1) and click “OK” to delete the selected extensometers or “Cancel” to abort the deletion. All data associated with the deleted unit will also be deleted.



**Under normal operations, it is preferable to deactivate an extensometer, rather than delete it. Deletions should only be used for testing purposes.**

#### 4-4.3 Extensometer Status

To view the current status of all extensometers in the database, select the “Ext Status” option from the main menu. The “Extensometer Status” window will open. The box in the left half of the window contains a tree view that lists all extensometers stored in the current database.

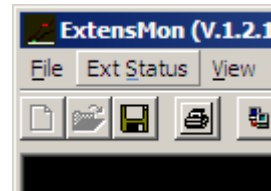


Figure 4-27. Ext Status

Branches of the tree view may be collapsed/expanded as necessary for more convenient viewing. For each extensometer in the currently open database, the status is displayed for:

- name
- location
- last known direction of movement
- displacement
- velocity
- battery voltage

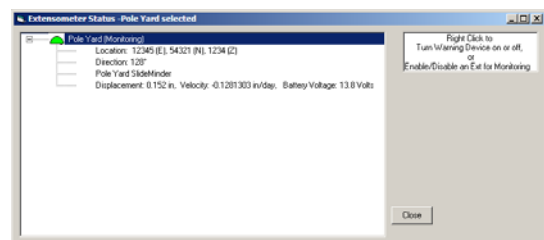


Figure 4-28. Extensometer Status Window

The warning indicator beside the name of the unit is normally green. If the unit contains a warning device, and the device is active, the warning indicator will be red.

To enable or disable an extensometer, or to turn extensometer warning devices on or off, select an extensometer in the tree view on the left, then right click on the label. A new menu will open. Select the desired action.

NOTE: To use this feature, ExtensMon must be connected to ExtensBase.



**Disabling an active warning device may not take effect immediately, depending on the sleep settings of the particular unit. The warning device will not be deactivated until the unit checks in with the base station.**

## 4-5. DATA ANALYSIS

The primary function of the ExtensMon program is the analysis of ground movement data. The ExtensMon program offers two types of data display: vector plots in plan view and graphs of change over time. Analysis operations include setting data display options, selecting ranges, selecting display type, and working with the display.

### 4-5.1 Set Display Options

All graph and plot display options are set using the “Options” window. In the ExtensMon open database main window, select “Options” from the View menu to open the “Options” window. This window has three tabs: “General Options,” “Displacement,” and “Velocity.”

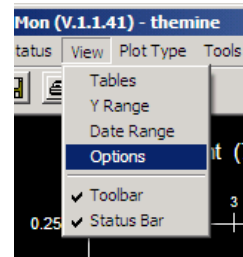


Figure 4-29. Options

#### 4-5.1.1 General Options

The “General Options” tab is used to set foreground and background colors for plots and graphs, turn gridlines on and off, and select data reduction settings.

Click the “Modify” button next to “Main Plot Background” to change the background color. A standard windows color palette will open. Use the palette to select the background color, then click the “OK” button on the palette

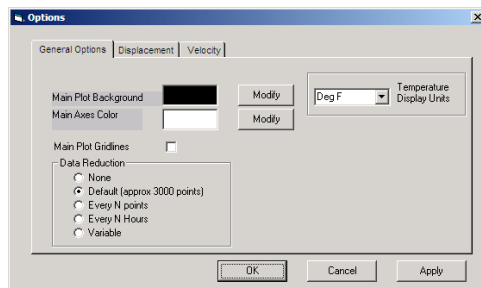


Figure 4-30. General Options Tab

to change the color, or click “Cancel” to keep the current color. The new background color will be displayed in the box beside “Main Plot Background.” Use the same procedure to select the color for the axes and lettering. (Click on “Modify” beside “Main Axes Color.”)

A check mark in the checkbox to the left of “Main Plot Gridlines” indicates plot/graph gridlines are on. Uncheck this box to turn gridlines off. The “Temperature Display Units,” on the right side of the screen, can be selected using the drop-down menu.

The “General Options” tab also contains options for data point reduction to reduce plotting time. It may also make it easier to spot general trends in the data if the number of data points is reduced. To turn off data point reduction and see all of the data points, select the “None” option in the “Data Reduction” box. To improve the time it takes to display the graph, the “Default” option may be selected to display a maximum 3,000 data points in the date range.

To fine tune the number of database data points between data points on the graph, select either “Every N points” or “Every N Hours” and enter the number of database points or the number of hours between display points in the text box.

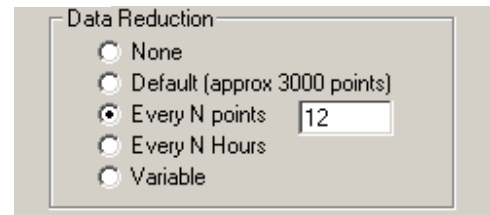


Figure 4-31. Data Reduction by Points

Under the “Variable” option, three separate time periods can be specified and the data reduced, chronologically, by different variables:

1. Every data point for the most recent data
2. One data point every two hours (12 points/day) for the period preceding the most recent
3. One point per day for the period preceding that (the oldest data).

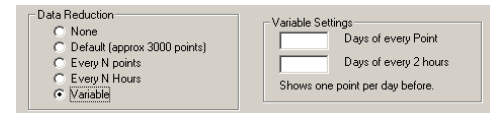


Figure 4-32. Variable Data Reduction

#### 4-5.1.2 Displacement Options

The “Displacement” tab of the “Options” window is used to define parameters for vector plots of displacement data. The relative length of the displacement vectors may be changed by multiplying the actual movement by a constant (the “Displacement Multiplier”). The units of the displacement vectors may be specified using the “Display Units” drop-down menu.

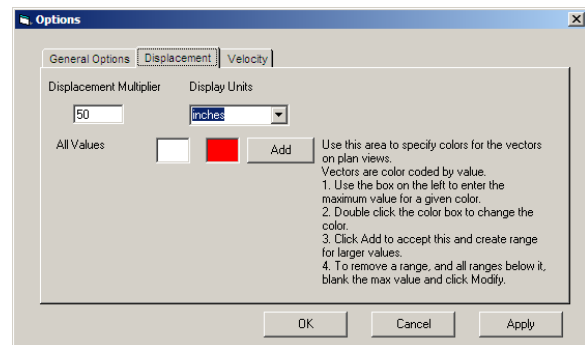


Figure 4-33. Displacement Tab

The displacement vectors may be color-coded by magnitude to make it easier to determine which extensometers have detected excessive ground movement. For example, green could be used to designate ground that has barely moved, yellow for ground that has moved but not so far that it has become a hazard, and red for ground that has moved far enough to be designated a hazard.

To set a color for a range of ground displacement, use the text box on the left to enter the maximum displacement value for a given color, then double click on the box to the right to select the color. A standard Windows color palette will open. Choose the desired color and click the “OK” button on the palette window.

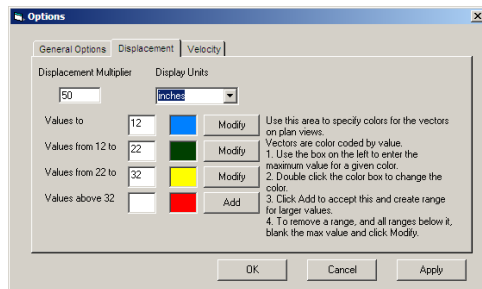


Figure 4-34. Add and Modify Colors

To accept the color for that displacement range and create a new range for larger values, click the “Add” button. To remove a range and all ranges below it, delete the number in the text box on the left and click the “Modify” button.

### 4-5.1.3 Velocity Options

The “Velocity” tab of the “Options” window is used to define parameters for vector plots of velocity data. The relative length of the velocity vectors may be changed by multiplying the actual rate of movement by a constant (the “Velocity Multiplier”). The units of the velocity vectors may be specified using the “Display Units” drop-down menu.

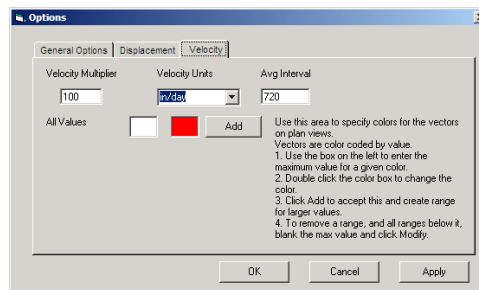


Figure 4-35. Velocity Tab

The velocity vectors may also be color-coded to make it easier to determine which extensometers have detected an excessive rate of ground movement. Follow the procedure outlined in the previous section to set color ranges.

## 4-5.2 Set Ranges

The options for setting the x and y ranges for graphs of change versus time are located under the view menu in the ExtensMon open database main window. The range for the y axis (the vertical axis) is set using the “Y Range” option. The range for the x axis (the horizontal axis) is set using the “Date Range” option.

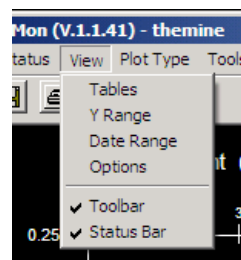


Figure 4-36. Range Options

#### 4-5.2.1 Y Range

Select the “Y Range” option on the View menu to open the “Set Y Range” window. Enter the minimum and maximum values for the vertical (y) axis in the “Minimum” and “Maximum” boxes. The units of measurement for the y axis limits are specified in the “Options” window for the given graph type. To maximize the Y Range, check the “Use Full Range” check box.

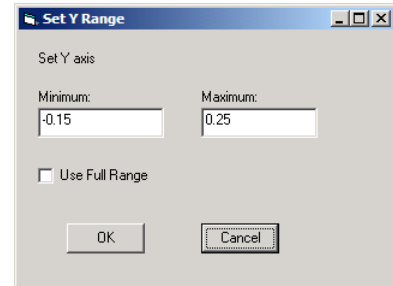


Figure 4-37. Set Y Range

#### 4-5.2.2 Date Range

Select the “Date Range” option on the View menu to open the “Set Date Range” window. Click the “Maximum Extents” button to select all available data from the database for the given extensometer and current graph type.

The date range displayed on the x axis may be narrowed by manually setting the start and end date and time using the “Minimum” and “Maximum” boxes. Click the down arrow on the date box to bring up a calendar to select a date, and use the up/down control on the time box to set the display time limit.

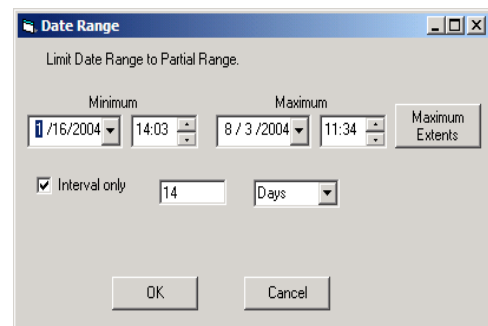


Figure 4-38. Set Date Range

Check the “Interval Only” box to view the graphs in a moving window. Set the interval in days or months using the drop-down menu. As new data are added, the graph automatically shifts left and shows only the desired interval of the most current data. Checking the “Interval Only” check box overrides any minimum and maximum dates already set. Uncheck the box to use a specific date range.

### 4-5.3 Select Display Type

The ExtensMon program offers two types of data display:

1. Vector plots in plan view:
  - Displacement
  - Velocity
2. Graphs of change over time:
  - Displacement
  - Velocity
  - Temperature
  - Voltage

Vector plots show movement as vectors, with the origin of the vector placed at the map coordinates of the extensometer. The relative length of the vectors can be changed by a vector multiplier (Secs. 4-5.1.2 and 4-5.1.3).

NOTE: Vector and azimuth plots will not display correctly unless the correct northing and easting of the extensometer have been entered using the “Modify Extensometer” windows (Sec. 4-4.2.2).

When the mouse pointer is positioned over a vector on a vector plot, a text box will pop up showing the extensometer label, coordinates, and present velocity associated with the indicated vector. Plots and graphs can display data collected from one extensometer or multiple extensometers, depending on the list of selected extensometers (Sec. 4-4.2.1).

Plots and graphs are accessed under the Plot Type menu in the ExtensMon main window with an open database.

Screens may be updated or refreshed at any time using the “Refresh” button on the toolbar or by selecting “Refresh” from the Plot Type menu.

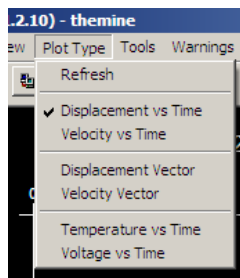


Figure 4-39.  
Plot Type Menu

### 4-5.3.1 Displacement vs. Time

To view the ground displacement data collected from the extensometer, select the “Displacement vs. Time” option from the Plot Type menu. A typical

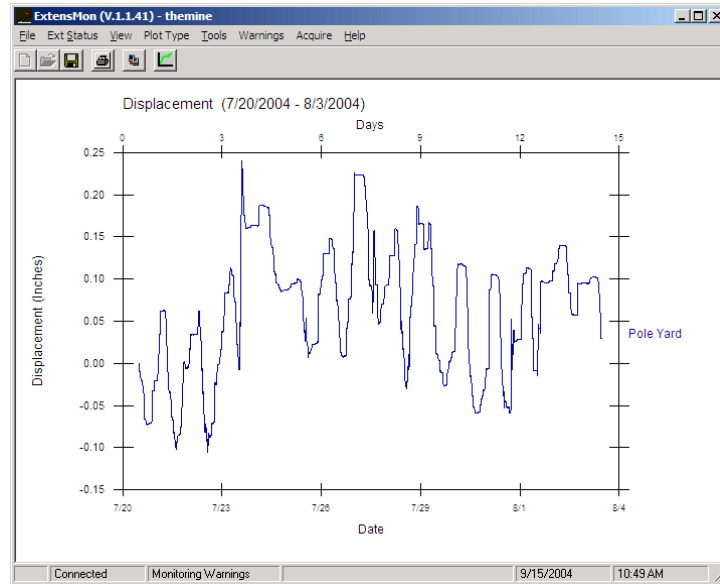


Figure 4-40. Displacement vs. Time

displacement graph should show a continuously increasing curve as the ground slowly moves away from the extensometer.

Data spikes can occur when there is a temporary extension of the wireline. A false warning condition may also be produced. In most cases, the movement graph will return to the movement level prior to the spike. The data spikes may be caused by a high velocity wind gust or a person walking into the wireline.

### 4-5.3.2 Velocity vs. Time

To view the incremental velocity measured by the extensometer, select the “Velocity vs. Time” option from the Plot Type menu.

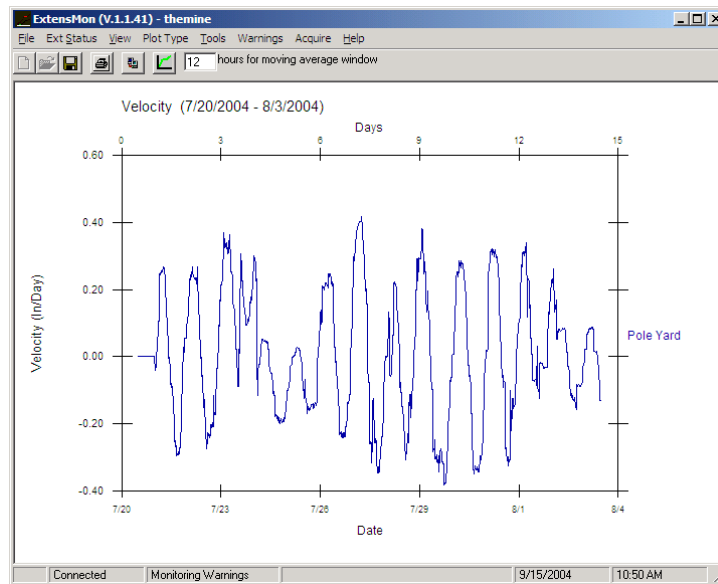


Figure 4-41. Velocity vs. Time

A typical velocity graph will usually appear as a line centered on a velocity of zero with spikes occurring when movement is detected. A value can be entered on the “hours for moving average” field located on the toolbar to filter the data noise. This calculates the velocity over a moving time period of the specified number of hours. Decimal values may be used (e.g., 0.1, 4.5, etc.).

### 4-5.3.3 Displacement Vector

To view ground displacement vectors derived from extensometer data, select the “Displacement Vector” option from the Plot Type menu. A vector plot will be displayed showing the relative displacement measured by all selected extensometers.

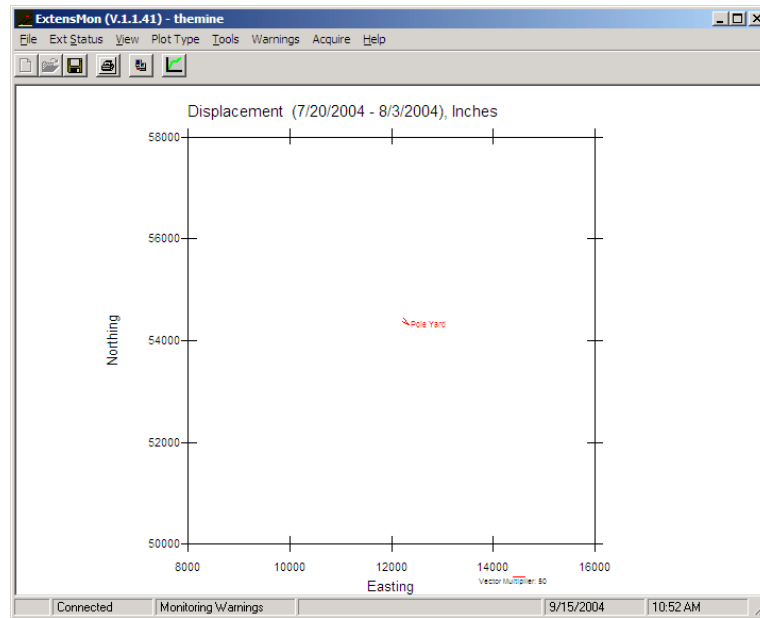


Figure 4-42. Displacement Vector

#### 4-5.3.4 Velocity Vector

To view ground movement velocity vectors derived from extensometer data, click on the Plot Type menu and select the “Velocity Vector” option. A vector plot will be displayed, showing the relative rate of displacement measured by all selected extensometers.

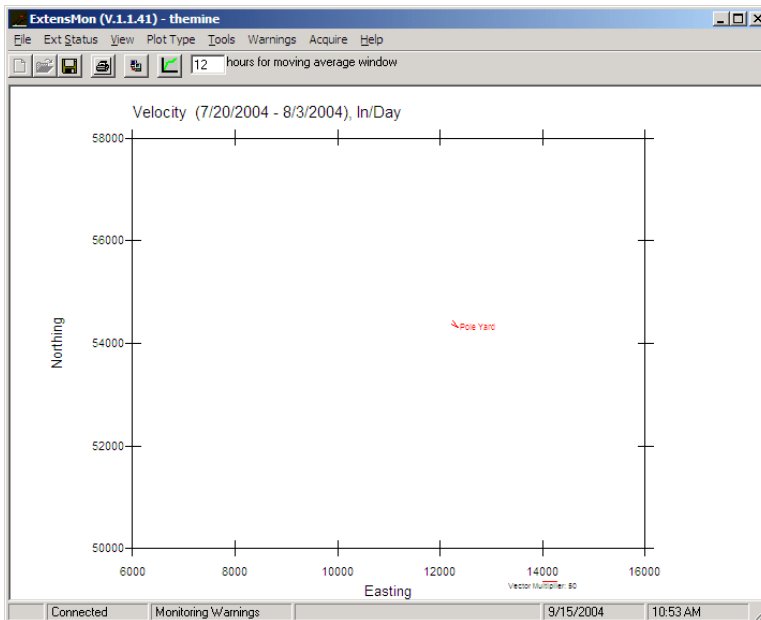


Figure 4-43. Velocity Vector

#### 4-5.3.5 Temperature vs. Time

A temperature sensor located inside the extensometer enclosure collects temperature data. To view the data, select the “Temperature vs. Time” option from the Plot Type menu.

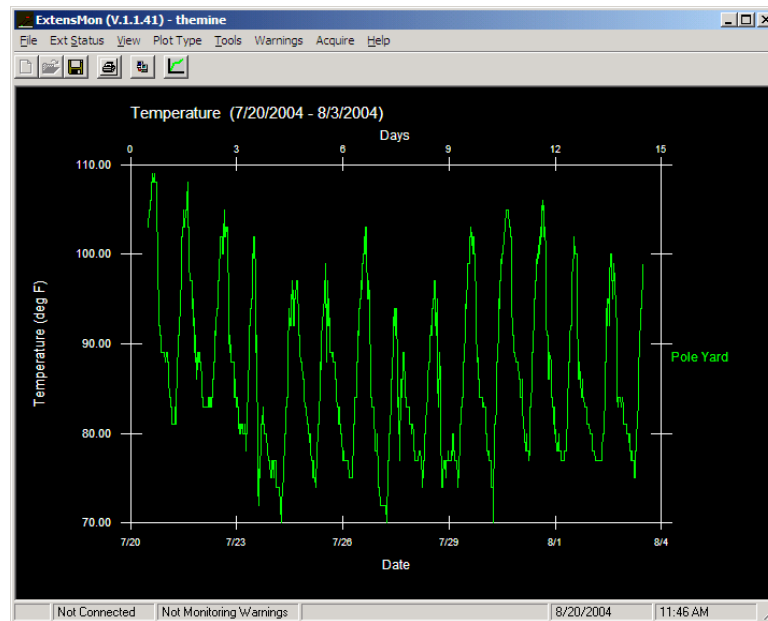


Figure 4-44. Temperature vs. Time

The graph of temperature versus time should have a daily cycle, with extremes determined by time of day and weather patterns. Temperature graphs should be viewed periodically to monitor the physical condition of the extensometer. Extremely cold or hot conditions may cause failure of certain components.

#### 4-5.3.6 Voltage vs. Time

The extensometer also reports its battery voltage. To view the extensometer battery voltage data, from the Plot Type menu, select “Voltage vs. Time.”

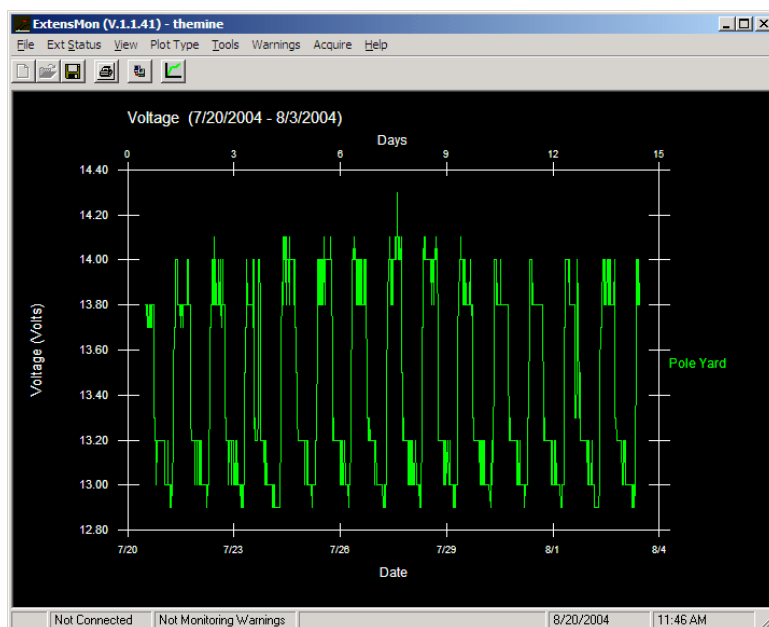


Figure 4-45. Voltage vs. Time

The graph of voltage versus time should mimic the temperature graph, with the voltages varying between 12.5 volts and 13.5 volts. The voltage will increase during daylight hours when the solar panel is providing power for the extensometer and charging the battery and will decrease during non-daylight hours as the battery is slowly drained by the extensometer.

If the voltage graph shows a downward trend, a longer sleep interval may be required, or the battery may be in need of replacement. If the voltage goes below 10.5 volts, the extensometer will shut down and will require manual startup to resume operation. If the battery voltage goes below 10.5 volts, the charging system should be inspected. The solar panel may need attention, or the battery may need to be recharged or replaced.

#### 4-5.4 View the Graph/Plot

When viewing a vector plot or graph, display options include zoom in or out, refresh, and print.

##### 4-5.4.1 Zoom In/Out

To zoom in on a portion of the display, click and hold the left mouse button while dragging the mouse pointer diagonally to draw a box around the desired area. Right click inside this box and select the “Zoom In” option from the popup menu.

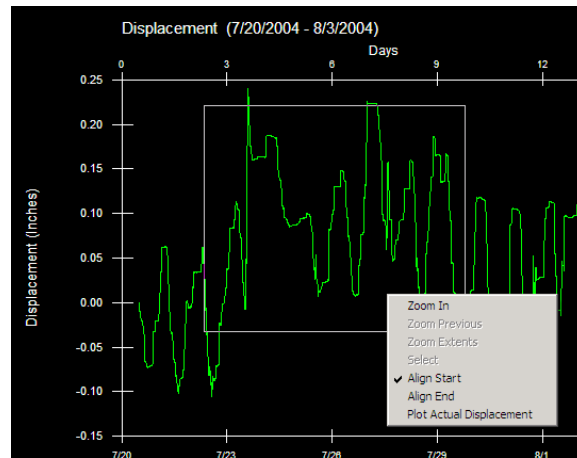


Figure 4-46. Zoom In

The x and y axis limits (Sec. 4-5.2) will be automatically adjusted for the desired zoom area and the current graph will be redrawn accordingly.

To zoom back out, right click anywhere on the display and select either “Zoom Previous” or “Zoom Extents” from the popup menu. “Zoom Previous” will redraw the graph to the

previous x and y ranges. “Zoom Extents” will redraw the graph to display all available data for the current selected extensometer(s) and graph type.

By default, ExtensMon shifts all extensometer data to zero displacement at the start date. This can be changed using the popup menu; right click anywhere on the display. “Align End” can be used to normalize the data to the end date. “Plot Actual Displacement” will plot each extensometer using the actual values received from the encoders. Select “Align Start” to set zero displacement at the start date.

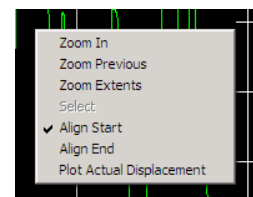


Figure 4-47.  
Zoom Popup Menu

##### 4-5.4.2 Refresh

To update, or refresh, the current display to include the most recent data, click the “Refresh” button on the toolbar or select “Refresh” from the Plot Type menu. The current display will be updated to reflect any new data collected since the graph or plot was last drawn.

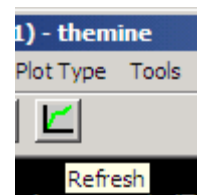


Figure 4-48.  
Refresh Button

### 4-5.4.3 Print

To print the current display, select the “Print...” option from the ExtensMon main window File menu.

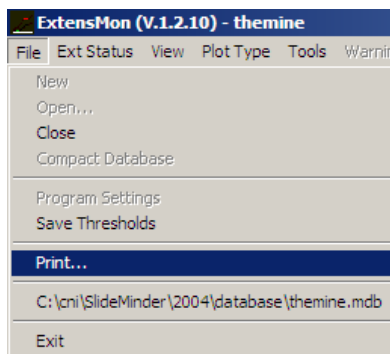


Figure 4-49. File Menu Print Option

A standard Windows “Print” dialog will open. Use this window to select a printer and specify printing options, then click the “Print” button to send the graph to the selected printer. Click “Cancel” to abort the print operation.

NOTE: The “Print” button on the toolbar will send the current display to print using the default printer and the last known printer settings. Use the “Print” option under the File menu, if you need to verify printer or print settings.

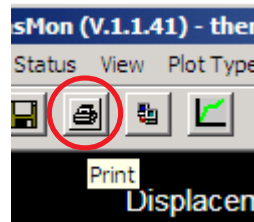


Figure 4-50.  
Print Button

## 4-6. WARNINGS

The ExtensMon program can be configured for an endless variety of warning protocols. Warnings can be issued for excessive ground displacement or velocity, and for battery voltage or temperature above or below preset limits. Warning messages can be set to display in a message box on another computer, or they may be sent via e-mail or pager. If an RSU (extensometer) is equipped with a warning device such as a flashing light or siren, that device can be automatically activated as part of the warning protocol.

### 4-6.1 View Warnings

To avoid confusion, the ExtensMon server that maintains the central extensometer database is the only ExtensMon that should be configured with warning protocols to issue warnings. The ExtensMon clients should not implement the warnings unless they are running at all times. Even then, an ExtensMon client will be unable to activate extensometer warning devices, or issue “Limit” warnings, because it does not communicate directly with the ExtensBase program.

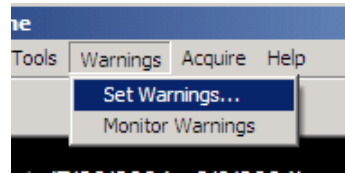


Figure 4-51. Set Warnings

The column on the left, “Enabled,” displays an “E” if the warning is enabled, or a blank space if the warning is disabled. The “Description” column shows the alphanumeric name for the warning; the “Type” column shows whether a warning is a displacement, velocity, or limit warning. The final column indicates the value beyond which a warning will be issued.

To configure ExtensMon warning protocols, in the Main Window, click on the Warnings menu, then select “Set Warning.”

A window with a list of all warnings will be displayed. This “Warnings” window is the interface used to define, edit, copy, enable, and disable ExtensMon warnings.

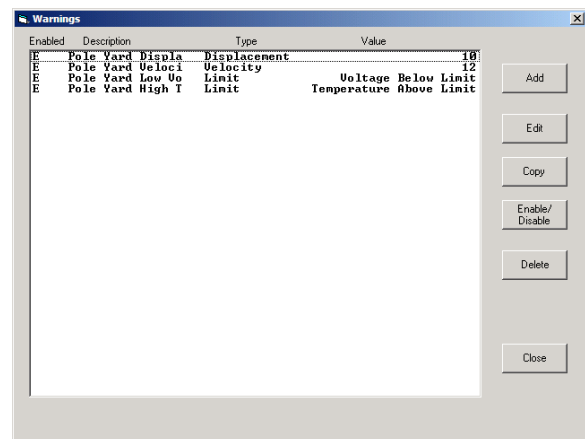


Figure 4-52. The Warnings Window

## 4-6.2 Add Warning

To add a new warning, click the “Add” button on the “Warnings” window. The “Set Warning Thresholds” window will open.

Adding a warning is accomplished in six steps:

1. Name the warning
2. Select type
3. Specify threshold
4. Select extensometer
5. Select delivery method
6. Specify warning message

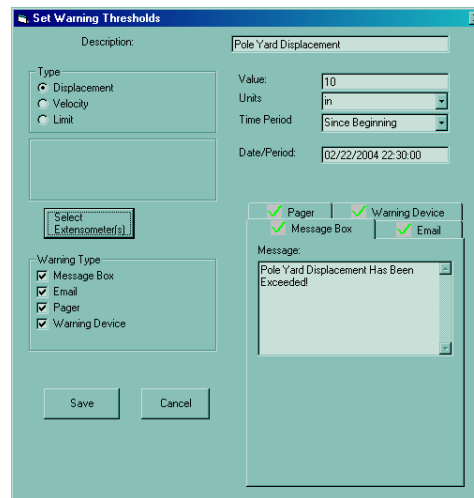


Figure 4-53. Set Warning Threshold

### 4-6.2.1 Name the Warning

Enter an alphanumeric designation for the warning in the “Description” box. This is the name that will appear in the list on the “Warnings” window.

### 4-6.2.2 Select Warning Type

Select the type of warning.

- A “Displacement” warning will be issued when total ground movement exceeds a preset limit.
- A “Velocity” warning will be issued when the rate of movement exceeds a preset limit.
- A “Limit” warning is based on temperature, battery voltage, or wireline pay out.

### Displacement Warning

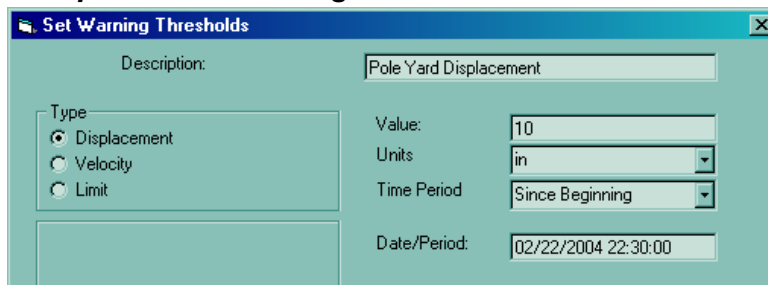


Figure 4-54. Set Warning Threshold - Displacement

To set a displacement warning, click the “Displacement” option under “Type.” Enter a numeric value in the “Value” box and select the unit of measurement for that value from the “Units” drop-down menu. (Fig. 4-51 shows a value of ten inches.)

Select one of the three time periods from the “Time Period” drop-down menu. Enter the required start date and time in the “Date/Period” box if the “Since Date” time period was selected, or enter the number of hours if the “Last Hours” time period was selected. If the “Last Hours” period is selected, ExtensMon will only look at the accumulated displacement over the preceding number of hours specified in the “Date/Period” box.

### Velocity Warning

The screenshot shows a dialog box titled "Set Warning Thresholds". The "Description" field contains "Pole Yard Velocity". Under the "Type" section, there are three radio buttons: "Displacement", "Velocity" (which is selected), and "Limit". To the right of the "Type" section, there are three input fields: "Value" with the number "12", "Units" with a dropdown menu set to "In/day", and "Average Time(hr)" with the number "6".

Figure 4-55. Set Warning Threshold - Velocity

To set a velocity warning, click the “Velocity” option under “Type.” Enter a numeric rate in the “Value” box, and select the units for that rate from the “Units” drop-down menu. (Fig. 4-52 shows a warning threshold value of twelve inches per day.)

Enter the number of hours over which to average the velocity readings in the “Average Time” box. The velocity that is compared by ExtensMon to the threshold value is the calculated velocity from the current reading to the reading at the beginning of the “Average Time” period. This “moving average” is necessary to smooth out the data spikes that occur in the data.

### Limit Warning

The screenshot shows a dialog box titled "Set Warning Thresholds". The "Description" field contains "Pole Yard Low Voltage". Under the "Type" section, there are three radio buttons: "Displacement", "Velocity", and "Limit" (which is selected). Below the "Type" section, there is another section with three radio buttons: "Voltage" (which is selected), "Temperature", and "Wireline Limit". To the right of the "Type" section, there is a dropdown menu set to "Below Limit".

Figure 4-56. Set Warning Threshold - Limit

A “Limit” warning is issued when battery voltage, temperature, or wireline exceeds a given limit or returns to normal from an exception condition. To set a limit warning, click the “Limit” option under “Type,” then select “Voltage,”

“Temperature,” or “Wireline Limit” from the options that appear in the box below the Type box.

Select a warning type from the “Type” drop-down menu. The “Above” warning is issued when the monitored parameter exceeds the “Max” value specified in the ExtensBase “RSU Properties” window. The “Below” warning is issued when the monitored parameter exceeds the “Min” value specified in the ExtensBase “RSU Properties” window. A “Return to Normal” warning is issued when the parameter returns to normal after being above the maximum or below the minimum.

The temperature and battery limits must be programmed into the RSU (extensometer) using the ExtensBase program before any ExtensMon “Limit” warnings can be issued. For further details regarding temperature and battery limits, see Chapter 3, Sections 3-4.1.2 and 3-4.1.3, respectively. The wireline limit (also called the “wireline reserve limit”) is described in Chapter 3, Section 3-4.2.3.

#### 4-6.2.3 Select Extensometers

Select the extensometers to which the warning will apply. Click the “Select Extensometer(s)” button to open a new window. Select the desired units for the warning being created. Multiple units can be selected by holding down the “ctrl” key and clicking the additional extensometers, or all units can be selected using the “Select All” button.

#### 4-6.2.4 Select Delivery Method

The delivery methods must be specified for the warning. Use the check boxes under “Warning Type” to select warning delivery methods. The warning may be sent by message box, e-mail, and pager. The warning devices on the extensometer can also be activated. The delivery methods are not mutually exclusive; all delivery methods may be selected for a given warning.



Figure 4-57. Warning Types

### Send Warning by Message Box

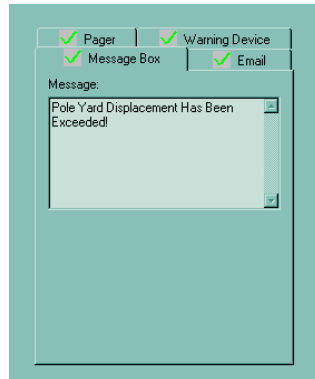


Figure 4-58. Message Box Tab

To send alert messages by message box, check the “Message Box” check box under “Warning Type.” In the lower right-hand corner of the “Set Warning” window, select the “Message Box” tab. Enter the text of the warning message in the “Message” text box. When the warning is activated, a message box containing this text will appear on the monitor of any computer listed in the “Warnings To” box under the “General Settings” tab of the “Program Settings” window (Sec. 4-2.1.1).

### Send Warning by E-Mail

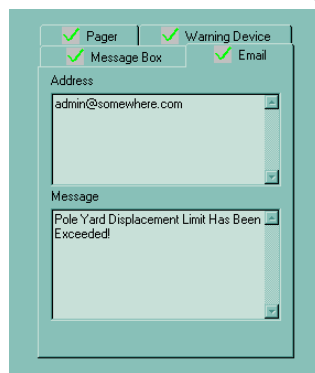


Figure 4-59. E-mail Tab

To send alert messages by e-mail, check the “Email” check box under “Warning Type.” In the lower right-hand corner of the “Set Warning” window, select the “Email” tab. Enter the address of the warning recipient in the “Address” text box and the text of the warning message in the “Message” text box. When the warning is activated, an e-mail containing the specified text will be sent to all of the listed addressees. The sender’s name and return address will appear as specified under the “Mail Settings” tab of the “Program Settings” window (Sec. 4-2.1.2).

### Send Warning by Pager

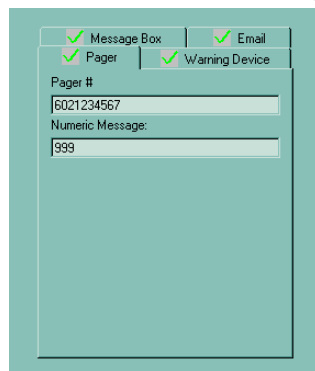


Figure 4-60. Pager Tab

To send alert messages by pager, check the “Pager” check box under “Warning Type.” In the lower right-hand corner of the “Set Warning” window, select the “Pager” tab. Enter the phone number of the pager in the “Pager #” text box and the numeric warning message in the “Numeric Message” text box. When the warning is activated, the pager at the given phone number will be dialed and the numeric warning message will be transmitted. Only one pager number may be specified per warning.

### Activate Remote Warning Devices

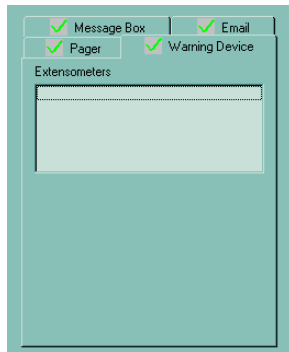


Figure 4-61.

Warning Device Tab

To have the warning activate remote warning devices such as a siren or flashing lights, check the “Warning Device” check box under “Warning Type.” In the lower right-hand corner of the “Set Warning” window, select the “Warning Device” tab. Select the desired extensometers from the list box. When the warning is activated, a command to activate warning devices will be transmitted to each selected unit. To deselect a warning device, hold down the “Ctrl” button and click on the device name.

NOTE: Only those units that are equipped with warning devices will appear in the list box under the “Warning Device” tab. Units that are equipped with warning devices must be specified in the ExtensBase program (Ch. 3, Sec. 3-4.1.5). A direct connection to the ExtensBase program is required to activate remote warning devices; ExtensMon clients cannot be configured to use this feature.

#### 4-6.2.5 Save the Warning

When configuration of the new warning is complete, click the “Save” button to save changes or “Cancel” to discard the changes and close the window.

Once changes are saved, write the new warning thresholds to the database. In the ExtensMon main window, select “Save Thresholds” under the File menu. The new warning thresholds and all associated warning parameters will be permanently written to the database.

NOTE: No confirmation dialog is displayed; be sure the thresholds are set correctly before selecting the “Save Thresholds” option.

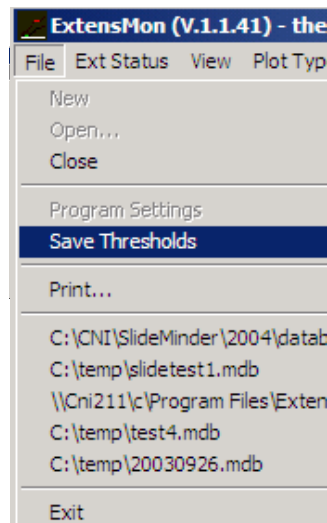


Figure 4-62. Save Thresholds

### 4-6.3 Modify Warning

Once warnings have been added to the database, they may be edited, activated, deactivated, or deleted. To change warning parameters, open the ExtensMon main window. Click on the Warnings menu and select “Set Warnings” to bring up the “Warnings” window. (Fig. 4-49)

#### 4-6.3.1 *Edit Warning*

To modify a warning, select the desired warning from the list in the “Warnings” window and click the “Edit” button. The “Set Warning” window will open with all the details relating to the selected warning. All warning parameters and delivery methods may be modified except the warning type (displacement, velocity, or limit).

When editing is complete, click the “Save” button to save changes or “Cancel” to discard the changes and close the window. After completing and saving edits, write the changes to the database. Select “Save Thresholds” under the File menu (Sec. 4-6.2.5).

#### 4-6.3.2 *Copy Warning*

New warnings can be created by copying from an existing warning and editing as necessary. In the “Warnings” window, select the warning to be copied and click the “Copy” button. A copy will be created and appear in the list. Select this new warning and make the desired edits.

#### 4-6.3.3 *Enable/Disable Warning*

The Enable/Disable button is a toggle switch. If a warning is enabled, clicking on this button will disable it, and vice versa. Warnings that are enabled will be indicated by an “E” in the far left-hand column of the “Warnings” window. Warnings that are disabled will have a blank space in that column. To toggle a warning on or off, select the desired warning from the table and click the “Enable/Disable” button.

#### 4-6.3.4 *Delete Warning*

To delete a warning, select the desired warning from the table and click the “Delete” button. NOTE: This is a one-click process; no confirmation dialog will be displayed. Be certain that the selected warning is the correct one.

### 4-6.4 Monitor Warnings

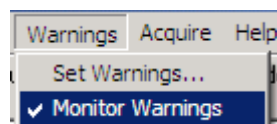
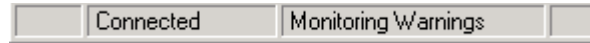


Figure 4-63.  
Monitor Warnings

The ExtensMon server will send warning messages only when warning monitoring is turned on. Warning monitoring can only be turned on at the ExtensMon server. In the ExtensMon server, click on “Warnings.” A check next to “Monitor Warnings” indicates that ExtensMon is monitoring incoming data for exception conditions and will send out the specified warning if activated. The absence of a check next to the “Monitor Warnings” option indicates that ExtensMon is not checking for warning conditions.

The status bar will read “Monitoring Warnings” in the panel immediately to the right of the “Connected” panel when warnings are being monitored. If warnings are not being monitored, the warning monitoring status bar panel will read “Not Monitoring Warnings.”



*Figure 4-64. Monitoring Warnings Status*

Warnings that activate a remote warning device and are no longer needed can be turned off using the “Ext Status” function of the ExtensMon server’s main menu. (See Section 4-4.3 for more information on the “Extensometer Status” feature.) Alternatively, when displacement rates fall below the trigger threshold, the warning device will turn off automatically.

## SlideMinder® System

### Chapter 5. Troubleshooting

#### 5-1. EXTENSBASE

The ExtensBase program controls communications with the Remote Station Units (RSUs), otherwise known as extensometers. If a GPS module is installed at the base station, ExtensBase also maintains accurate system time using the GPS receiver. The ExtensBase program also relays all RSU ground movement data to the ExtensMon server program for storage in the central database. Consult the following sections if problems are encountered with any of these subsystems.

##### 5-1.1 No Base Radio

The following message box will be displayed when ExtensBase is started if the base station radio is disconnected.



Figure 5-1. Base Radio Error

The base station radio must be initialized when ExtensBase is started. If this message is displayed, click “Abort” to cancel ExtensBase startup, or follow the troubleshooting procedures, then click “Retry.”

The base station radio may also become inoperative after ExtensBase has been started, in which case a “NO BASE RADIO” message will appear in the main ExtensBase window.

If the “Base Radio Error” message box opens, or if the “NO BASE RADIO” message is present, proceed with the following steps to ensure that the base station radio is connected and properly functional.



Figure 5-2.  
No Base Radio

- Ensure that the base station radio power supply is plugged into an outlet and properly connected to the base station radio (see the SlideMinder hardware manual for details).
- Check the serial cable from the base station radio to the computer where the ExtensBase program has been installed. Inspect the cable for damage and proper connection on both ends. If the serial cable is damaged, order a new one from the technical support team.

- Remove the small plastic door on the right front of the base station radio to view the base station radio status LEDs (Light Emitting Diodes). At least one of the LEDs should be illuminated. If no LEDs are illuminated, the base station radio may have to be replaced.
- If the power supply is properly connected and the LEDs are not illuminated, check the circuit breaker or fuse for the outlet where the base station radio is plugged in. Proper outlet functionality may also be verified by plugging in a known good device, such as a lamp.
- If the power outlet is functional, but the base station radio LEDs are not illuminated, then the problem is most likely a bad power supply. Order a new power supply from the technical support team.
- Ensure that the base station radio antenna feed line is undamaged and properly connected to the back of the base station radio (see the SlideMinder hardware manual for details).

**NOTE:** Be sure the antenna is connected before the base station radio is powered up.

- Check the COM port number on the back of the computer where the serial cable is connected. The COM port number on the back of the computer must match the COM port number specified in the ExtensBase “RSU Properties – System Properties” window in the “Base Radio” box. (Ch. 3, Sec. 3-2.2)

If all of these steps have been followed and the base station radio remains non-functional, it may have to be replaced. Please contact the technical support team for further guidance.

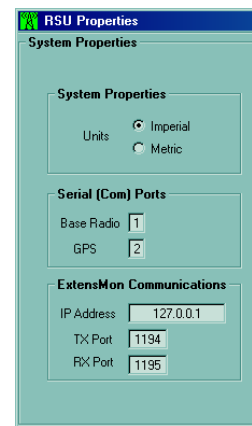


Figure 5-4.  
RSU Properties

### 5-1.2 GPS Not Found

Proper SlideMinder system functionality depends on accurate system time. A system without access to a network having correct time-of-day will have a GPS module installed. Follow the procedures in this section only if there is a GPS module installed and system time is inaccurate.

If no GPS module is installed, the entry in the “GPS” box of the “RSU Properties – System Properties” window (Ch. 3, Sec.3-2.2) must be set to zero (0). If a GPS module is installed and all other SlideMinder subsystems

are functional and connected, but no data is being collected, then the problem may be with the GPS module.

If there is a problem with the GPS module, the “ExtensBase Diagnostics” window may have a “GPS PORT:*n* FAILED” message (where *n* is the COM port number of the GPS module) similar to the following illustration. (Fig. 5-5) Contact technical support for information regarding accessing the ExtensBase Diagnostics window.

If ExtensBase has been active for more than a few minutes, the “GPS PORT:*n* FAILED” message may have already scrolled off the top of the viewable list of messages. If this is the case, shut down and restart the ExtensBase program. Open the “ExtensBase Diagnostics” window immediately upon startup and look for the “GPS PORT:*n* FAILED” message near the top of the display.

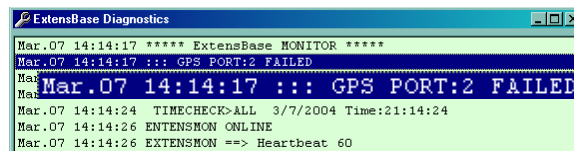


Figure 5-5. Diagnostics - Bad GPS Port

The “GPS PORT:*n* FAILED” message indicates that the COM port number supplied in the “RSU Properties – System Properties” window is an invalid

COM port number and cannot be accessed. The technical support team can help determine what serial ports are available for GPS module usage.

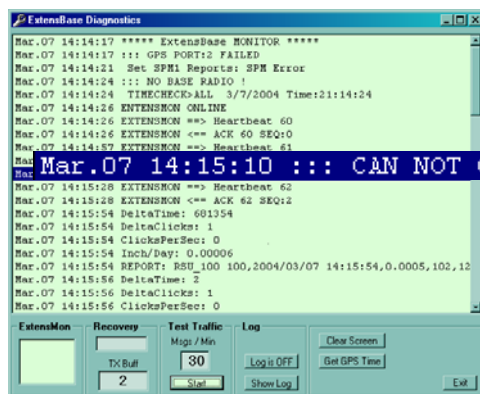


Figure 5-6. Diagnostics – Can Not Open GPS Port

A similar but different message appearing in the “ExtensBase Diagnostics” window during system startup is the “CANNOT OPEN GPS PORT:*n*” error, where *n* is the COM port number specified in the “RSU Properties – System Properties” window for the GPS module.

The “CANNOT OPEN GPS PORT:*n*” error indicates that the COM port specified for the GPS module is already in use by another device. If this is the case, remove the other device or specify a new GPS port. Contact the technical support team for further guidance if the problem persists.

If neither of the above error messages are detected, but system timing problems are still indicated, there is a problem with the GPS module itself. Proceed with these steps to ensure that the GPS module is connected and properly functional.

- Ensure that the GPS module power supply is plugged into an outlet and properly connected to the GPS module (see the SlideMinder hardware manual for details).
- Check the serial cable from the GPS module to the computer where the ExtensBase program has been installed. Inspect the cable for damage and proper connection on both ends. If the serial cable is damaged, order a new one from the technical support team.
- If the power supply is properly connected, check the circuit breaker or fuse for the outlet where the GPS module is plugged in. Proper outlet functionality may also be verified by plugging in a known good device, such as a lamp.
- If the power outlet is functional, but the GPS module is not, then the problem may be a bad power supply. Order a new power supply from the technical support team.
- Ensure that the GPS antenna feed line is undamaged and properly connected to the back of the GPS module (see the SlideMinder hardware manual for details).
- Ensure that the GPS receiver has a clear view of the sky and is not covered with debris or snow.
- Check the COM port number on the back of the computer where the serial cable is connected. The COM port number on the back of the computer must match the COM port number specified in the ExtensBase “RSU Properties” window in the “GPS” box (Ch. 3, Sec.3-2.2).

If all of these steps have been followed and the GPS module remains non-functional, the GPS module may have to be replaced. Contact the technical support team for further guidance.

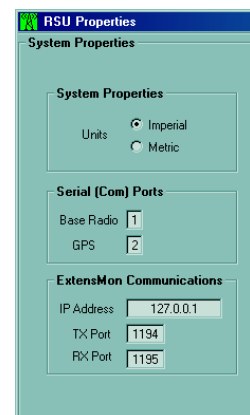


Figure 5-7.  
RSU Properties

### 5-1.3 RSU is Sleeping

When RSU (extensometer) properties are updated, the distance is set, or an attempt is made to “read” the RSU, one of the following “RSU Sleeping” message boxes may appear.

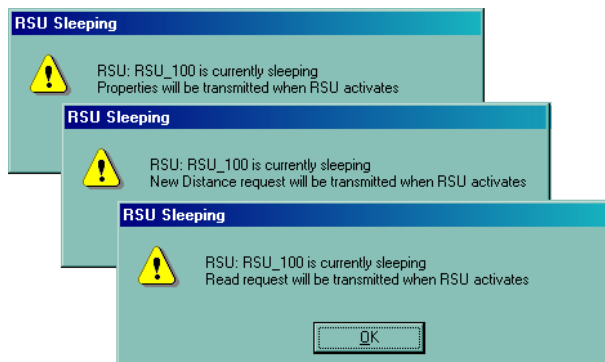


Figure 5-8. RSU Sleeping

This in itself is not necessarily a problem. When the RSU “Sleep Mode” is enabled (Ch. 3, Sec.3-4.1.4), ExtensBase will be unable to communicate with the given RSU for a period of time up to the limit specified in the “Max Sleep Mins” box under “Sleep Control” in the “RSU Properties - RSU Properties” window.

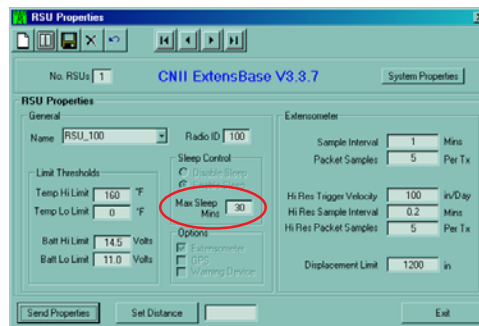


Figure 5-9. RSU Properties Window

The “RSU Sleeping” message indicates a problem only when the main ExtensBase window reads “Comm Overdue *n* Mins,” where *n*, which is the number of minutes that communication with the given RSU is overdue, is more than three minutes. It is normal for communications to be overdue for up to three minutes, but not longer. If communication with a particular RSU is overdue for more than three minutes, but the base station radio is present and functional, and communication with other RSUs is normal, a communication problem is indicated with respect to the RSU in question.



Figure 5-10. Comm Overdue

NOTE: Communications may report several minutes overdue if changes have been made to the sleep settings of an RSU. Once communications have been made, the “Comm Due” window should function properly.

A communication failure with a given RSU may also be detected in the “ExtensBase Diagnostics” window or log file. If communication with a given RSU has been interrupted, an “RSU *n*: Status = No Comm” line will appear in the “ExtensMon Diagnostics” window. Contact technical support for information regarding accessing the ExtensBase Diagnostics window.

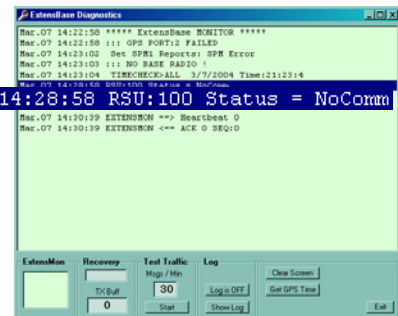


Figure 5-11. Diag. - RSU Status

Complete the following troubleshooting steps to verify communications with a single RSU.

- If the ExtensMon “Voltage vs. Time” display (Ch. 4, Sec.4-5.3.6) shows a steadily decreasing value over several days, the sleep settings may need to be lengthened, or the battery or voltage regulator in the RSU enclosure may be non-functional. Contact the technical support team for further information regarding battery and voltage regulator testing and replacement.
- Consult the documentation provided with the RSU in question to determine its “Radio ID” number. The number entered on the “RSU Properties – RSU Properties” window must be identical to the number provided for the given RSU (Ch. 3, Sec. 3-4.1.1).
- Inspect the RSU solar panel and solar panel cable leading to the RSU for damage. If either the solar panel or solar panel power cable are missing or damaged, order new components from the technical support team. Follow the instructions given by the technical support team and the SlideMinder hardware manual for proper installation of these components.
- Inspect the RSU antenna and the antenna cable leading to the RSU for damage. If either the antenna or antenna cable are missing or damaged, order new components as appropriate from the technical support team. Follow the instructions given by the technical support team and the SlideMinder hardware manual for proper installation of these components.
- Open the RSU enclosure and inspect the power and antenna cables for proper connection to the appropriate terminals within the enclosure (consult the SlideMinder hardware manual for details). If the cables appear to be improperly connected, please consult the technical support team before proceeding.

- Check the LEDs on the front of the black box labeled “VLM-2000” inside the RSU enclosure. At least one of these LEDs should be illuminated to indicate that power is available and the system is running.

If all of these steps have been followed and the RSU (extensometer) remains non-functional, the RSU may have to be replaced. Please contact the technical support team for further guidance.

#### 5-1.4 No RSU Communication

If no communication is taking place with any of the RSUs, all units in the main ExtensBase window will display a red “Comm Overdue” warning. If this is the case, verify that the base station radio is functional. (Sec. 5-1.1)

If the base station radio is present and functional, yet no communication is taking place with any of the RSUs, contact the technical support team for further guidance.

#### 5-1.5 ExtensMon Not Found

Valid communication between ExtensBase and the ExtensMon server is necessary before any RSU (extensometer) data can be stored in the central database or viewed on the ExtensMon display. A failure in communication between ExtensBase and the ExtensMon server will generally be noticed first at the ExtensMon server. (Sec. 5-2.1)

A communication failure between ExtensBase and the ExtensMon server will be indicated in the “ExtensBase Diagnostics” window (Ch. 3, Sec.3-3.4). If communication has failed between the two programs, the “ExtensMon” box in the lower left-hand corner of ExtensBase Diagnostics window will turn from green to red.

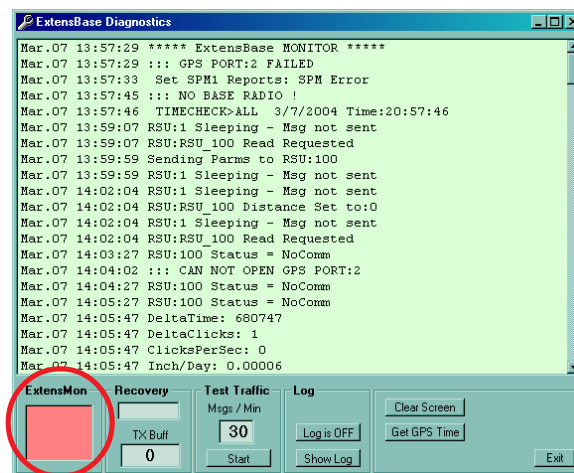
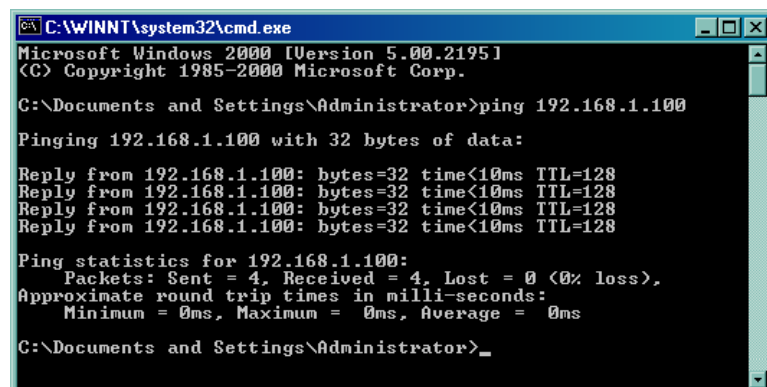


Figure 5-12. Comm Failure

If communication has been interrupted between ExtensBase and the ExtensMon server, follow these steps to troubleshoot the ExtensBase end of the communications link. (See Section 5-2.1, below, for instructions regarding the ExtensMon server end of the communications link.)

- Verify that the ExtensMon server is running. Communication cannot take place between the two programs if one or the other is not running.
- Verify that a database has been opened in the ExtensMon server program. The ExtensMon server will not attempt to communicate with ExtensBase if a database is not open. If there is no database open, the ExtensMon program window will be blank.
- Check the IP addresses and port numbers listed in the ExtensBase “RSU Properties – System Properties” window. See Section 3-2.3 for further details regarding proper ExtensBase communications setup.
- Use the “Ping” command to verify that the network connection between ExtensBase and ExtensMon is functional. To use the “Ping” command, first determine the IP address of the ExtensMon server, then click the Windows “Start” menu on the computer running ExtensBase and select the “Run...” option. At the “Open” prompt, type in “cmd.” When the cmd.exe window appears, type “ping” followed by a space followed by the IP address of the ExtensMon server. If the network connection is working, it will reply. The output should look similar to the following illustration (Fig. 5-13).



```
C:\WINNT\system32\cmd.exe
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\Documents and Settings\Administrator>ping 192.168.1.100

Pinging 192.168.1.100 with 32 bytes of data:

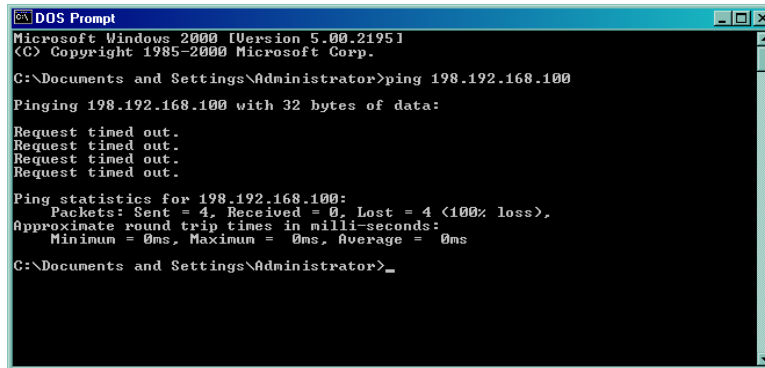
Reply from 192.168.1.100: bytes=32 time<10ms TTL=128
Reply from 192.168.1.100: bytes=32 time<10ms TTL=128
Reply from 192.168.1.100: bytes=32 time<10ms TTL=128
Reply from 192.168.1.100: bytes=32 time<10ms TTL=128

Ping statistics for 192.168.1.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\Administrator>_
```

Figure 5-13. Replying to “Ping” Command

If the network connection between ExtensBase and ExtensMon is not functional, the “Ping” command will time out. The output will look similar to the following illustration (Fig. 5-14).



```

Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\Documents and Settings\Administrator>ping 198.192.168.100

Pinging 198.192.168.100 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 198.192.168.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\Administrator>_

```

Figure 5-14. Request Timed Out

If all of these steps have been followed and ExtensBase still cannot communicate with the ExtensMon server, try the procedures outlined in the following section (5-2.1). Contact the technical support team for further guidance if this does not solve the problem.

## 5-2. EXTENSMON

The ExtensMon server program collects and displays data sent by the Remote Station Units (RSUs), also known as extensometers. The ExtensMon server is also responsible for issuing warnings when ground movement exceeds preset limits or extensometer parameters exceed preset limits. Consult the following sections if problems are encountered with any of these features.

### 5-2.1 ExtensBase Not Found

Valid communication between ExtensBase and the ExtensMon server is necessary before any RSU (extensometer) data can be stored in the central database or viewed on the ExtensMon display. A failure in communication between ExtensBase and the ExtensMon server will be indicated by the words “Not Connected” in the status bar located at the bottom of the ExtensMon main window.

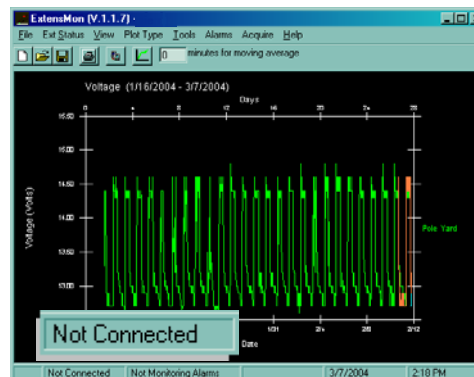


Figure 5-15. Not Connected

If the status bar reads “Not Connected,” attempt to connect to ExtensBase by selecting “Connect to ExtensBase” from the Acquire menu (Ch. 4, Sec. 4-3.4). The status bar on the ExtensMon server main window will read “Connecting” while the connection process takes place.

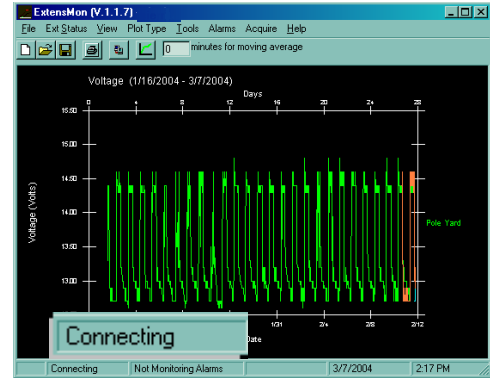


Figure 5-16. Connecting

If the connection attempt is successful, within a few seconds, the status bar will display the word “Connected.” If the ExtensMon server status bar returns to “Not Connected” after a few seconds, there is a problem with the connection between the ExtensMon server and ExtensBase.

NOTE: A database must be opened in the ExtensMon server before any communication can take place between the ExtensMon server and ExtensBase.

If a database is open in ExtensMon and there is still no connection between ExtensMon and ExtensBase at the ExtensMon server, try the following the steps. (See also Section 5-1.5 for instructions regarding the ExtensBase end of the communications link.)

- Verify that the ExtensBase program is running. Communications cannot take place between the two programs if one or the other is not running.
- Check the IP addresses and port numbers listed in the ExtensMon “Program Settings” window. See Ch.4, Sec. 4-2.1.1 for further details regarding ExtensMon communications setup.
- Use the “Ping” command, as described in Section 5-1.5, to verify that the network connection between ExtensBase and ExtensMon is functional.

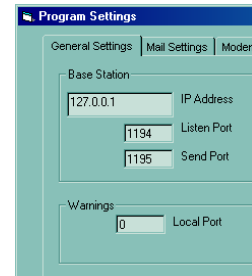


Figure 5-17.  
Program Settings

If all of these steps have been followed and the ExtensMon server still cannot communicate with ExtensBase, try the procedures outlined in Section 5-1.5. If this does not solve the problem, contact the technical support team for further guidance.

### 5-2.2 Bad Vector Graph Display

When a database is first opened, the default display is the “Displacement Vector” display (Section 4-5.3.3). The displacement vector (or velocity vector) display will look incorrect if the latitude and longitude have not been entered correctly for the extensometer (RSU) being displayed.

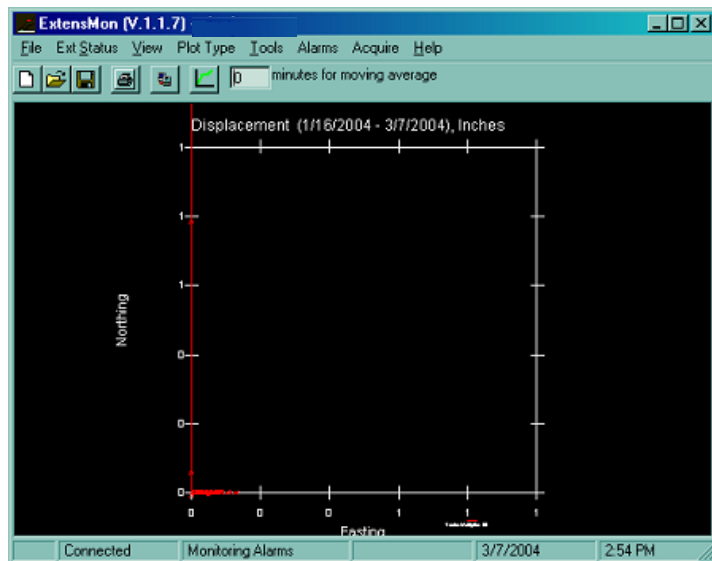


Figure 5-18. Bad Vector Graph

If a vector graph display is incorrect, select the “Modify Extensometer” option from the Tools menu on the main ExtensMon window. Select the desired extensometer from the “Name” drop-down box and enter the correct latitude

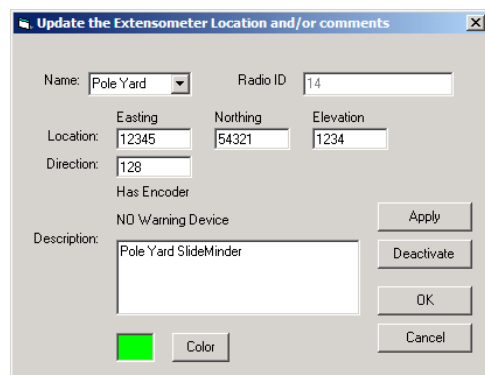


Figure 5-19. Modify (Update) Extensometer

and longitude in the “Location:” boxes. See Section 4-4.2 for further details regarding extensometer parameters.

### 5-2.3 Warnings Not Transmitted

The ExtensMon server may be configured to transmit various warning messages depending on the data received from the extensometers (RSUs). Warning messages may be transmitted based on ground movement and battery or temperature limits (Ch. 4, Sec. 4-5). If the ExtensMon server is not transmitting the warnings as specified, follow the procedures outlined below.

- Check for proper communication between ExtensBase and the ExtensMon server. See Sections 5-1.5 and 5-2.1, for details regarding communication problems between ExtensBase and the ExtensMon server.
- The status bar at the lower edge of the main ExtensMon server window must read “Connected” and “Monitoring Warnings.” If the status bar reads “Not Connected,” see Section 5-2.1. If the status bar reads “Connected” and “Not Monitoring Warnings,” click on the Warnings menu in the ExtensMon main window. Click on “Monitor Warnings” (Section 4-6.4). There will be a check mark next to “Monitor Warnings” when incoming data is being monitored. Clicking on “Monitor Warnings” toggles it on and off.
- Close the current database and bring up the “Program Settings” window. Check the communication settings to ensure that the warnings are directed as appropriate. No warnings will be issued if these settings are not properly configured (Ch. 4, Sec.4-2.1).
- Be sure that the client computer designated to receive the warning message is on and connected to the LAN.
- The file ExtensLog.txt, located in the ExtensMon directory is an error log file, which may contain information useful for debugging problems.

If all of these steps have been followed and the ExtensMon server still does not transmit warnings properly, contact the technical support team for further guidance.