O P E R A T I N G   M A N U A L

TWare32™

Gas Analysis Software

IPN 074-334

INFICON

O P E R A T I N G M A N U A L

TWare32™
Gas Analysis Software

IPN 074-334D

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Using the table below, please circle the appropriate rank for each aspect.
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Part # (see Title Page) 074-______________________________________

Aspect	Very Dissatisfied	Dissatisfied	No Opinion	Satisfied	Very Satisfied	Importance (ranked from 1 to 5, where 1 is low and 5 is high)
Found everything I needed	VD	D	NO	S	VS	
Easy to read	VD	D	NO	S	VS	
Easy to use	VD	D	NO	S	VS	
Relevant to my work	VD	D	NO	S	VS	
Accurate information	VD	D	NO	S	VS	
Well-written	VD	D	NO	S	VS	
Well-organized	VD	D	NO	S	VS	
Technical Enough	VD	D	NO	S	VS	
Helped me solve problems	VD	D	NO	S	VS	

If you have additional comments, please contact INFICON®.

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Chapter 1
Getting Started

1.1 Introduction

TWare32 is a Microsoft® Windows®-based application that both controls and collects data from the INFICON® Transpector® family of Residual Gas Analyzers (RGA). It is written as a full 32 bit application which takes full advantage of the capabilities of 32 bit operating systems such as Windows 95, Windows 98, Windows NT®, Windows 2000, and Windows ME.

TWare32 provides RGA control and data collection capabilities for monitoring production processes and diagnosing instrument malfunctions. The program makes use of a simple, intuitive user interface which clearly displays the data and facilitates the interpretation.

TWare32 makes use of “Wizards,” tab dialogs, and dockable button bars to simplify user interaction and control of the data collection and display. Recipes can be easily edited, copied, saved, and run. Data can be continuously saved to maintain a complete record of a process or “snapshots” can be taken only when an event of interest occurs.

Currently TWare32 works with all open ion source Transpectors (High Performance and Compact), XPR Transpectors, the Transpector CIS2 Gas Analysis system, the CPM (Compact Process Monitor), and the Preclude RGA.

NOTE: If the Transpector RGA is a Transpector as opposed to a Transpector2, the firmware version of the electronics unit must be version 1.13 or higher.

Please see the `Readme.wri` file distributed with the software for late-breaking information.

1.1.1 How To Contact Customer Support

If you have a question about your software, first refer to this Operating Manual. If you cannot find the answer here, contact Customer Support. When calling Customer Support, please have this manual at hand, along with the following information:

- The TWare32 version number (available from the **Help >> About TWare32...** dialog box).
- The type of computer that you are using and its specifications.
- Your MS Windows type and version number.
- A description of your problem.
- What you were doing when the problem occurred.
- An explanation of the corrective action that you may have already attempted.

CAUTION

Please contact your Customer Support Representative before sending any files.

Customer support may be reached at the following phone numbers. Please contact the location that is closest to you. If you are located outside the USA please contact your sales office, or see www.inficon.com for a complete listing of worldwide service centers.

Syracuse, NY. . . . ph. 315-434-1261. . . . . .fax 315-437-3803

San Jose, CA. . . . ph. 408-436-2828 ext. 125 . . .fax 408-436-1580

Austin, TX . . . . . . ph. 512-448-0488. . . . . .fax 512-448-0398

Customer support is also available on the World Wide Web and via e-mail:

WWW . . . . http://www.inficon.com/support.html

e-mail . . . . rga.support@inficon.com

1.2 Operating Manual Style Conventions

File names, diskette labels, environment variables, program names, screen prompts, command strings, and text that you must enter on your keyboard are presented in `this font`. For example, Enter `a:\install`.

Windows dialog options, title bars, and menu options are presented in **this font**. For example: select **Functions >> Monitor**.

When you must hold down a key then press another key, this is expressed as (for example) Press Ctrl+C

We assume that the floppy drive you'll be using is drive A. If you're using another drive, whenever you see "`a:`" substitute your floppy drive letter.

We also assume your hard drive is C, so if this isn't the case for you, whenever you see "`c:`" substitute the letter for your hard drive.

Often you will be required to select an option from a cascading menu. Instead of verbose statements, for example, "position the mouse pointer over the word **Functions**, press the left mouse button to display the cascading menu, then drag the pointer to highlight the words **Run Recipe** and release the left mouse button," you will read, "select **Functions >> Run Recipe**."

You will also be required to use icons and buttons. For example, instead of the statement, "position the mouse pointer over the **Run** icon, then press and release the left mouse button to select **Run**," you will read, "click the **Run** icon." or, you may read "select the **Run** icon".

Similarly, left-click means to press and release the left mouse button and right-click means to press and release the right mouse button.

TWare32 operates in the Windows environment. We make the assumption that you know how to use the Windows Graphical User Interface (GUI). Therefore, actions in the TWare32 GUI that are common to the Windows GUI are not explained in detail in this manual. If you do need help with the Windows GUI, please refer to the Windows documentation supplied by Microsoft.

NOTE: This is a note paragraph. Notes provide additional information about the current topic.

HINT: This is a hint paragraph. Hints provide insight into product usage.

CAUTION

This is a Caution paragraph. It cautions against actions which may cause damage to the Transpector or lead to the loss of data.

1.2.1 Usage of the Modern Metric System

In many places throughout this manual, American measurement units are given along with their International System of Units eqivalences. However, providing all measurement units in all discussions becomes cumbersome to the reader. Therefore, equivalences are not given in all cases. You may perform the conversion as follows:

- Converting from psig to bar:

  psig x 0.069 = bar

- Converting from psig to kPa:

  psig x 6.8947 = kPa

- Converting from Torr to mbar:

  Torr x 1.3332 = mbar

- Converting from Torr to Pascals

  Torr x 133.32 = Pascals

- Converting from inches (in.) to millimeter (mm)

  in. x 25.4 = mm

- Converting from feet (ft.) to meters (m)

  ft. x 0.3048 = m

- Converting from pounds (lb.) to kilograms (kg):

  lb. x 0.453593 = kg

- Converting Temperature from Farenheit (T_F) to Celsius (T_C)

  $(5/9) \times (T_F - 32) = T_C$

1.3 Inventory Of Supplied Items

- You should have five 3 1/2 inch floppy disks or one CD ROM which contain the TWare 32 program and online Operating Manual.
- You should have one hard copy of this Operating Manual.

1.4 Computer System Requirements

Table 1-1 Computer System Requirements

	Recommended for communication with up to 2 Transpectors	Recommended for communication with up to 8 Transpectors (more than 8, consult factory)
Processor	Pentium® 166MHz or greater	Pentium II 233MHz or greater
RAM	32Mb or greater	64Mb or greater
Hard Disk space to load TWare 32	5Mb	5Mb
Hard Disk Space for data storage	500Mb	500Mb
Monitor	14 inch, SVGA or greater	14 inch, SVGA or greater
Resolution	800 x 600 or greater	800 x 600 or greater
Serial Port	one free serial port for RS232 or TCA-485 connection	
Operating System	Windows NT 4.0 or newer, 95, 98, 2000, or ME	

The Transpector and Communications Interface must meet the requirements shown in the following sections.

1.5 Transpector Requirements

1.5.1 Firmware

The Transpector firmware must be Version 1.13 or higher.
Transpector2 firmware must be Version 2.0 or higher.

1.5.2 Serial Number

Your Transpector serial number must be series 40 or higher.
TWare32 will work with any Transpector2.

1.5.3 Transpector Models Supported

Compact, High Performance, XPR, XPR2, CIS1, CIS2, CPM and Precludes are supported in TWare32 Version 2.5.

1.6 Communication Interface

Communication interfaces supported are RS-232 for a single Transpector and RS-485 via a TCA-485 for up to eight Transpectors. For more than eight Transpectors, please contact Customer Support.

The TCA-485 (see Table 1-2) is required for RS-485 communication *(RS-485 cards used with TranspectorWare cannot be used with TWare 32.)* One end of the TCA-485 connects to the serial port of your computer and the other end connects to the RS-485 bus cable. An external power supply is also required and supplied for the TCA-485. See the instructions that come with the TCA-485 for details.

Table 1-2 Part Numbers for Various Version of TCA-485

Description	INFICON Part Number
TCA-485-US Version	916-600-G2
TCA-485-German Version	916-600-G3
TCA-485-Japanese Version	916-600-G4
TCA-485-UK Version	916-600-G5

1.6.1 Communications Baud Rate

- RS-232 — selectable: 9600, 4800, 2400
- TCA-485 — not selectable: 57.6k

1.6.2 Communications Cable

Communication cables are required to connect TWare 32 to the Transpector. Cables are different and dependant on the Communications Interface.

- If you purchased a single Transpector system, you will normally use RS-232 Communications which requires a single communications cable. Refer to the *Transpector Operating Manual* (IPN 074-276) section titled “RS-232 Communications” for detailed information concerning RS-232 cabling.
- If you purchased a multiple Transpector system or a CIS2 system, you must use RS-485 Communications, which requires two cables per Transpector. Refer to the *Transpector Operating Manual* (IPN 074-276) section titled “RS-485 Communications” for detailed information concerning RS-485 cabling.

Maximum Length

RS-232 — 50 feet (15 meters)

RS-485 — 1000 feet (305 meters)

1.7 How To Install TWare 32

There are two methods for installing TWare 32 — from Floppy Disks or from CD-ROM.

NOTE: To install TWare32 on a system running Windows NT you must have Administrative rights. For installations on a Windows 2000 system you must have Administrative or Standard user rights.

1.7.1 Installing From Floppy Disks

HINT: Make backup copies of the original disks prior to installation and store all of the disks in a safe place after installation.

Install TWare 32 from within Windows as follows:

1. Insert disk 1 in the "`a`" drive.
2. Select **Start >> Run...** to display the **Run** dialog
3. In the **Open** field, type **`a:\setup`**.
4. Select **OK**.
5. When you are prompted, answer the questions. You will be prompted to insert each disk during the installation. See note at bottom of page.
6. When installation is complete, put the original disks in a safe storage area.

1.7.2 Installing From CD-ROM

Install TWare 32 from within Windows as follows:

NOTE: This description assumes your CD-ROM drive is drive "**d**". If it is not "**d**", substitute the appropriate drive letter.

1. Insert the CD in the CD-ROM drive.
2. Select **Start >> Run...** to display the **Run** dialog
3. In the **Open** field, type **`d:\setup`**.
4. Select **OK**.
5. When you are prompted, answer the questions. See note at bottom of page.
6. When installation is complete, put the original CD in a safe storage area.

NOTE: If during the installation you are prompted to replace a system file (e.g. a DLL file), it is recommended that the file be replaced. Normally this prompt is only presented if the file on the hard disk is older than the file on the installation disk. The newer version should still work with older programs that use this file, however, if you are concerned that it may cause problems, then you can abort the TWare32 installation, save a copy of the file in question, and restart the installation program. TWare32 may not function properly if all files are not installed.

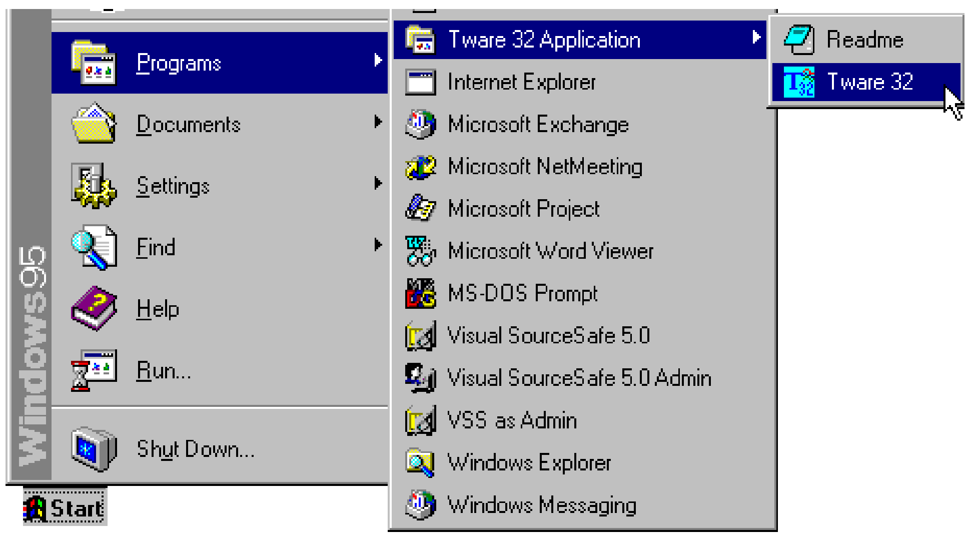
1.8 How To Start TWare 32

To start TWare 32 select **Start >> Programs >> TWare 32 Application >> TWare32** (see Figure 1-1).

HINT: You may want to make a shortcut to TWare 32 on your desktop to facilitate starting the program in the future. See the Windows documentation for instructions on how to create shortcuts.

When upgrading TWare32 it is not possible for the installation program to upgrade existing shortcuts. After an upgrade, an existing shortcut will not work if TWare 32 is installed in a folder that is not the folder pointed to by the shortcut.

Figure 1-1 Starting TWare 32



The first time TWare 32 is run on a computer it will start in the setup screen with the communication configuration dialog displayed. See Chapter 3 for information on how to configure the communications interface, individual sensors, and user preferences on your system.

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1.9 Where To Go From Here

This Operating Manual is intended to make the process of setting up, installing, and using TWare32 a pleasurable and trouble-free experience. Please, take a few moments to look through it and become familiar with its contents.

The information in this manual is organized into the following chapters:

Chapter 1, Getting Started
An introduction to the TWare32 application, provides instructions on how to install and run TWare32, and explains how to use this Operating Manual.

Chapter 2, How The Software Works
A discussion of the underlying principles of TWare32's operation and some general descriptions of the TWare32 user interface.

Chapter 3, Setup And Configuration
A description of how to set up the software for your installation and customize it to your preferences.

Chapter 4, Monitor
Talks about the Monitor function, how to view trend and spectral data, and how to control the measurement and display of the data.

Chapter 5, Editing Recipes
Describes how to edit recipes, which specify the measurement parameters, and how the data are collected and saved.

Chapter 6, Locating Leaks
Explains how to use TWare32 to help locate vacuum system leaks.

Chapter 7, Tuning the Sensor
A description of how to calibrate the sensor for resolution, mass position, and sensitivity.

Chapter 8, Saving and Recalling Data
Discusses how the data are saved and recalled.

Chapter 9, CIS2 and CPM Operation
Discusses the full operation of the Transpector CIS2 Gas Analysis System and the CPM (Compact Process Monitor).

Chapter 10, Preclude Operation
Discusses the full operation of the Preclude, a Transpector2 Residual Gas Analyzer (RGA) with special firmware that enables it to act as a detector of residual photoresist or other contaminants.

Chapter 11, Library
Provides a database of reference spectra for the compounds in your system. Allows capture, creation and subtraction of spectra while running Monitor or recipes.

Chapter 12, Using External Signals with Digital I/O

Describes in detail the installation, configuration, testing and use of the optional Digital I/O boards available for TWare32. The PCI-bus based boards provide digital inputs for use as recipe triggers and digital outputs (relays) for use as mass setpoint indicators.

Chapter 13, When Things Go Wrong

You should never need to refer to this chapter, however, if you find that things are not behaving as you expect this section provides some suggestions of what to check and how to fix problems.

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Chapter 2
How The Software Works

2.1 Overview

TWare32 is a standard 32 bit Windows application which uses many of the standard user interface features with which you are familiar from other Windows applications. The use of cascading menus, tool bars, and context sensitive menus which are common to many Windows applications makes TWare32 easy to learn and easy to use. This chapter gives you an introduction to the basic layout of the program and how it works. The individual functions are described in greater detail in subsequent chapters.

2.2 Navigating TWare32

The functionality of the program can be accessed in several ways: through the cascading menus, via the buttons and drop-down lists on the tool bars, and using the context sensitive menus. The user interface was designed to put the most frequently used functions in easily accessible places on the screen and to put less frequently used functions in less obtrusive places. To accomplish this, most of the functionality can be accessed via cascading menus. The most frequently used commands are duplicated on the tool bars, and a few less used functions, such as configuration options, are located in configuration dialogs and properties pages. You may want to refer to Figure 2-6 on page 2-8 while reading the following sections.

2.2.1 Menus

Menus are organized in the standard Windows layout, with the **File** menu on the left and the **Tools**, **View**, **Window**, and **Help** menus on the right. Between the **File** and the **Tools** menus are two menus specific to TWare32.

NOTE: Display of the Operating Manual through the Help interface is a nice feature but does have a drawback. The Help file is graphic intensive and will consume system resources as it is used (when multi-page scrolling, for example). Use of Help should be limited when collecting data or performing critical tasks within TWare32.

The first is the **Functions Menu**. This contains all the major function modes, such as **Monitor** and **Leak Check**, available in this installation. As described below, it is possible to add and remove modules from TWare32 to customize it to a specific installation. This menu contains only the functions in the modules which are currently installed.

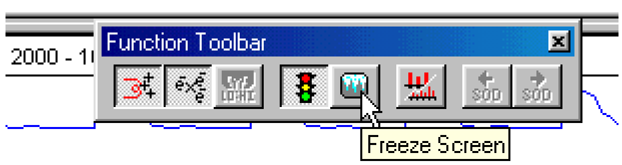
The next menu is specific to the current module (**View Specific Menu**). This contains commands specific to the current mode, such as **Select Recipe** in **Monitor** or **Calibrate** in **Tune**. The details of these menus will be described in subsequent sections.

2.2.2 Toolbars

TWare32 has several toolbars which can be enabled and disabled via the **View** menu. All the toolbars take advantage of the Windows "Tool Tips" feature. If you position the cursor over one of the buttons for a few seconds you will see a textual explanation of the button (the Tool Tip). This makes it easier to interpret some abstract icons.

Another feature of the toolbars is that they are "dockable." This means they can be dragged around and attached (or docked) to any edge of the window. If you place the cursor over an area between buttons on one of the toolbars, hold the left mouse button down and move the mouse, you will see that you are dragging the toolbar around. If you release the mouse button near one of the edges of the window it will be docked to that edge. Furthermore, if you release the mouse button in the middle of the window you will have a floating toolbar which can be positioned anywhere in the window. Figure 2-1 shows a floating toolbar with a tool tip showing.

Figure 2-1 Floating Toolbar



The **Main Toolbar** contains buttons which are common to most modes of the program. This includes the standard Windows buttons for opening and closing files and for printing the current document. In addition, it contains a few TWare32 specific buttons such as the **Recipe Editor** and the **Snapshot** buttons.

The **Sensor Toolbar** contains the **System Setup** button, which accesses the System and Sensor Configuration and Setup Options, the **Sensor Selection** box, which enables the selection of the sensor to view or control, and the **Function Buttons** which duplicate the items in the **Function Menu**.

The **Function Toolbar** gives ready access to features specific to the current mode or function. Many of these features are also in the **Mode Specific Menu**.

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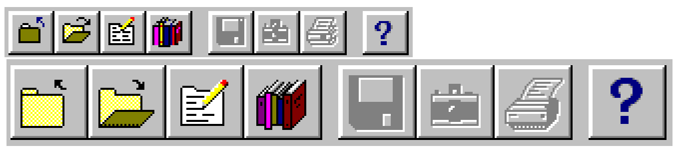
The Toolbar buttons are conservatively small, to preserve space, at startup. The buttons can be made significantly larger by using any of the following selections:

- The **View >> Toolbars Use Large Icons** menu selection.
- The **Toolbars Use Large Icons** selection on the **Display** tab of the **System Properties** page.

A comparison is provided in Figure 2-2.

Figure 2-2 Difference between small and large Icons

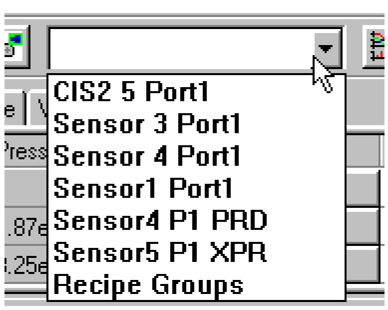


Due to icon size and screen size, some toolbars may be displayed on a second line when using **Large Icons**.

2.2.3 Using The Sensor Toolbar

Selecting a sensor from the drop-down list on the **Sensor Toolbar** (see Figure 2-3) will bring the view associated with that sensor to the front. For example if sensor S1 is running **Monitor** and sensor S2 is running **Tune** and is in the front, selecting S1 from the list will bring the **Monitor** session for S1 to the front.

Figure 2-3 The Sensor Toolbar



If the sensor is not running anything, a dialog is displayed with a list of functions available for that sensor (see Figure 2-4). Selecting the desired function will start it on the selected sensor. Note also that the **Sensor Toolbar** lists a "sensor" called **Recipe Groups**. For more information on **Recipe Groups**, refer to section 4.5, Running a Group Recipe, on page 4-28 and section 5.13, Recipe Groups, on page 5-32.

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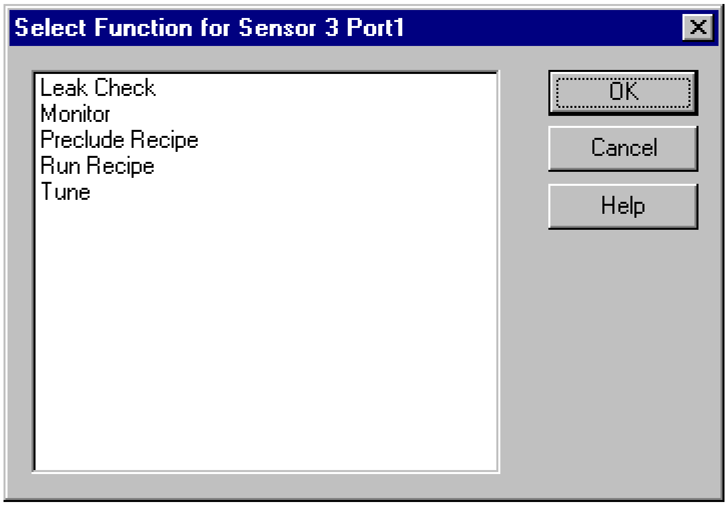
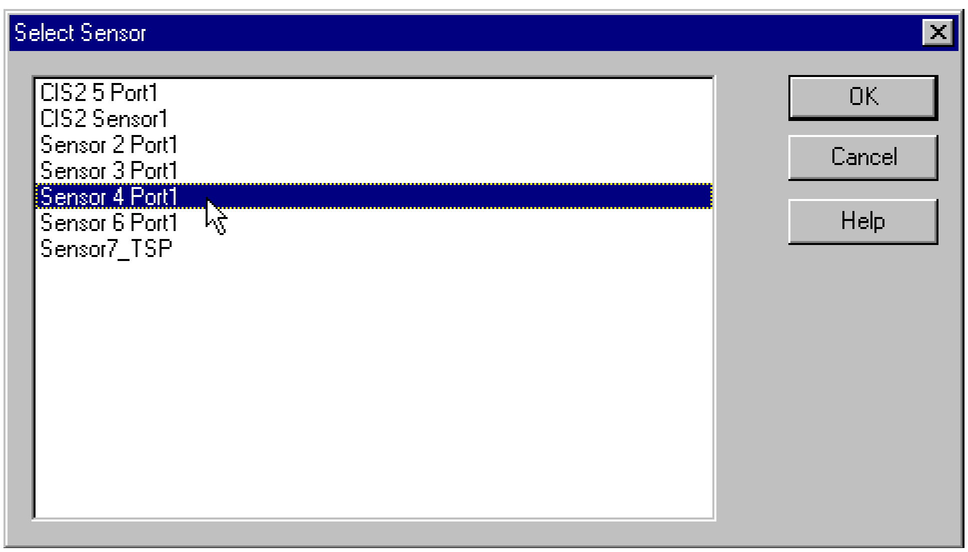
Figure 2-4 Selecting a Function for a Sensor



Selecting one of the functions on the **Sensor Toolbar** or from the **Functions Menu** will switch the current sensor to view the selected function, closing the current function view if necessary. If there is no current sensor (the **Sensor Selection** box is displaying a blank) a list of sensors is displayed (see Figure 2-5) from which you can select the one on which you want to run the specified function.

Figure 2-5 Selecting a Sensor for a Function



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2.2.4 Context Sensitive Menus

Context sensitive menus are pop-up menus which contain commands most likely to be used in a specific situation. If you click the right mouse button, a menu will appear near the cursor. The contents of this menu depend on what is being displayed and where on the screen the cursor is positioned. Experiment with this. You will find that quite often what you want to do can be quickly accessed via the context menu.

HINT: When you are uncertain what command to use next, position the cursor over the area of the screen of interest and click the right mouse button. In most cases the context sensitive menu will have the appropriate command for the current circumstance.

2.3 Basic Features

In its basic configuration, TWare32 supports the most common functions of a Residual Gas Analyzer (RGA). The next section describes the modularity of the program and how it can be expanded to perform a variety of specialized applications.

2.3.1 Monitor

The **Monitor** function is the workhorse of the program. It is in this module that most of the data will be collected and displayed. See Chapter 4 for details on using the **Monitor** function. The **Monitor** window has five components, the **Trend Graph**, **Mass Spectrum Graph**, **Total Pressure Graph**, **Process Graph** and **Data Grid/Control Panel**, each of which can be displayed or hidden to show the data as needed. The **Trend** shows the abundance of selected masses as a function of time and the **Mass Spectrum** shows the abundance as a function of mass at a given point in time. The **Total Pressure** shows the pressure as a function of time, the **Process** shows the overall profile of the Total Pressure and the **Data Grid/Control Panel** shows the intensities of the selected masses in the current scan. The **Data Grid/Control Panel** also allows selected parameters to be changed.

The acquisition parameters can be adjusted and saved to a recipe file. The recipe being run can be selected or edited. The data can be saved automatically or when the **Snapshot** icon is selected. All data can be saved by selecting **Monitor >> Save Data**.

2.3.2 Leak Check

This mode is designed to help detect and locate leaks in a vacuum system. See Chapter 6 for details on using the **Leak Check** mode. The display consists of a **Trend Display** showing the intensity of a single mass peak being monitored as a function of time, a **Bar Gauge** which gives a visual indication of the current intensity, and a **Control Panel** which allows some measurement parameters to be changed.

A **Full Screen Display**, with bold, easily visible colors, can be selected for checking for leaks while you are standing at a long distance from the computer screen. Sound can be enabled which changes pitch in proportion to the intensity of the mass, to allow checking when the computer screen is not within sight.

2.3.3 Tune

The Transpector is calibrated at the factory for correct mass alignment and resolution; however, during use this adjustment may drift or environmental conditions may make the initial tune invalid. For these reasons, it may be necessary to adjust the calibration of the instrument from time to time. See Chapter 7 for details on using the **Tune** mode.

The **Tune** mode displays one or more windows around nominal mass positions with a selectable number of points per AMU. The position of the peaks may be corrected or the resolution adjusted to provide a properly tuned instrument. The **Tune** mode also allows the **Calibration** of the **Sensitivity** of the sensor, **Total Pressure,** and the **Gain** of the electron multiplier.

2.4 Modular Design Of Software

TWare32 was designed with expandability in mind. The initial releases of the package had only the basic functionality, however, the design has allowed additional function modules (for specific applications) and sensor modules (CIS2, for example) to be added.

Modules can be added or removed as needed to produce a program which contains only the functionality (and therefore complexity) needed for a specific installation. Normally the modules will be automatically selected when the program is installed, however, if it is necessary to add or remove a module later it can be done by selecting **Tools >> Function Modules...** or **Tools >> Sensor Modules...** and then adding or removing modules as needed. See section 3.6 on page 3-29 for details on adding and removing modules.

2.5 Screen Layout

The TWare32 screen consists of several components, some of which change depending on the mode. Figure 2-6 on page 2-8 illustrates the components visible in **Monitor** mode. The **Sensor Status Grid** can be enabled or disabled by selecting **View >> Sensor Status Grid**. This is a toggle, that is, each time it is selected its status changes. When the item is checked the status grid will be displayed.

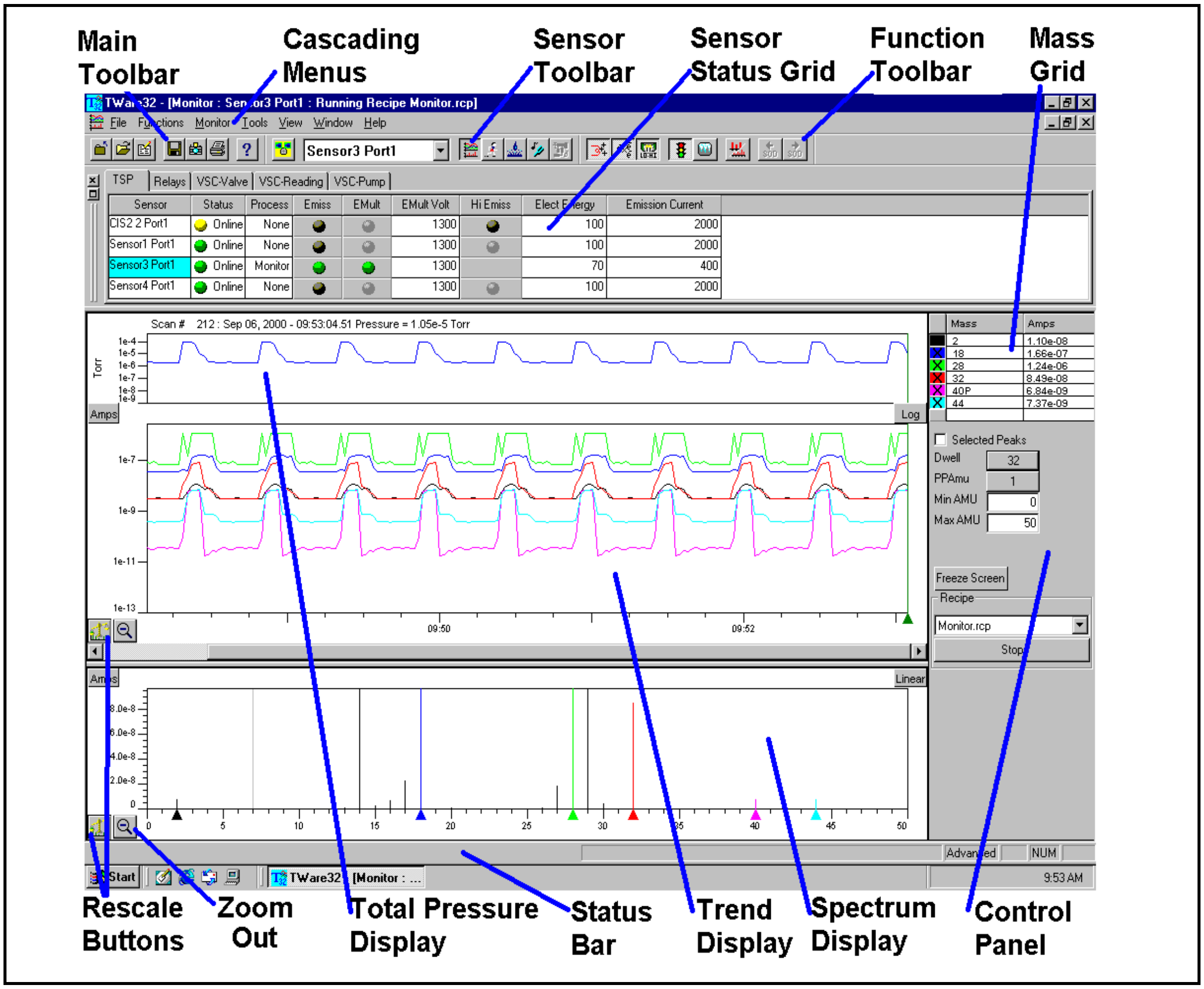
Like the tool bars, the **Sensor Status Grid** is dockable. If you position the mouse cursor over the grey bar on the left of the grid display and hold the left mouse button down, you will be able to drag the status bar around the screen. Double-clicking on the title bar of a floating tool bar or grid will return it to the docked position. Alternatively it can be dragged and dropped to the top or bottom of the window to dock it.

The following colors are used in different cells of the **Sensor Status Grid** and the **System Setup dialog** to indicate status.

Table 2-1 System Status Colors

Color	Status
Green	On or Online
Red	Error, Alarm or Went Offline (from Online)
Dark Grey	Off
Light Grey	Not Available
Yellow	Waiting or Maintenance Required
Dark Blue	Offline

Figure 2-6 TWare 32 Screen Layout



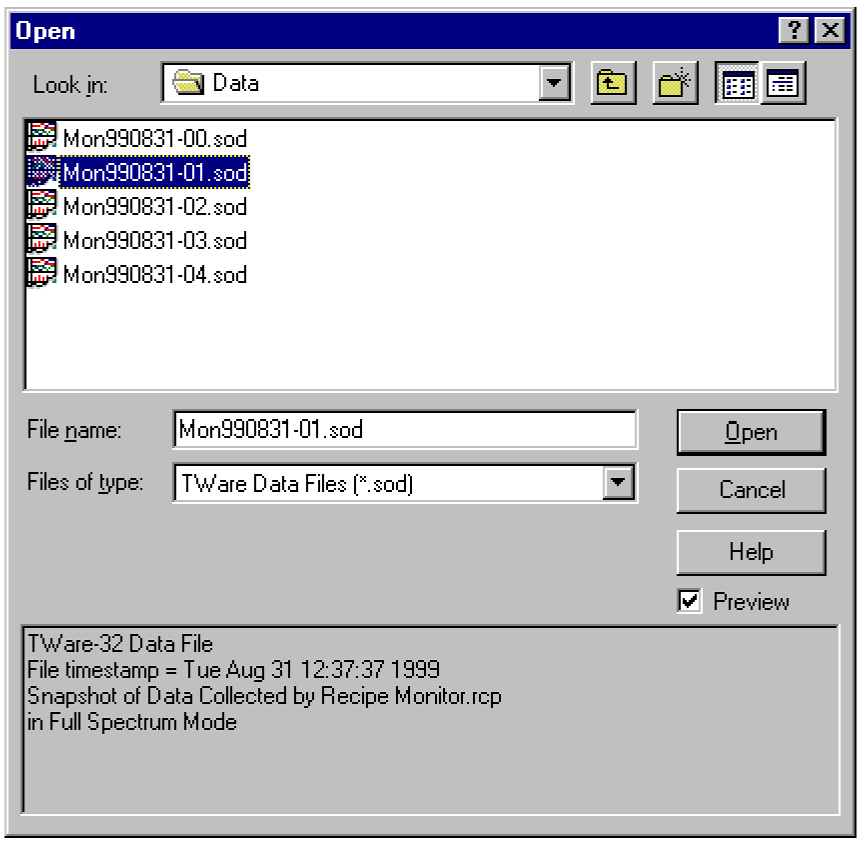
The **Status Bar** on the bottom of the screen is used to display short messages about the state of the program, the name of the file to which the data are being saved, and other informative messages. The Status Bar can be toggled on and off in a similar manner to the **Sensor Status Grid** using the **View >> Status Bar** menu item.

2.6 Opening Files In TWare32

In most places where you are asked to select a filename to open or save (for example, recalling a data file or editing a recipe), an enhanced **File Open** dialog, like the one in Figure 2-7, is used. The top portion is just like the standard file open dialog used in many Windows applications. The bottom portion has the **Preview Window** to allow you to see some information about the file without having to open it first.

If the **Preview** box is checked, the text box below it will have some basic information about the file highlighted in the list above it. In the case of recipes and data files it will include the recipe description from the first page of the **Recipe Editor** (see section 5.3 on page 5-3).

Figure 2-7 TWare32 File Open Dialog



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Chapter 3
Setup And Configuration

3.1 Introduction

When TWare32 is first installed on a system, there are a few things that need to be set to customize it to the particular hardware configuration. In addition, several aspects of how the program looks and acts can be customized to individual preferences. This chapter discusses how to customize your system to the needs of your location.

3.1.1 Initial Setup

The first time TWare32 is run the following steps should be taken to set up your system:

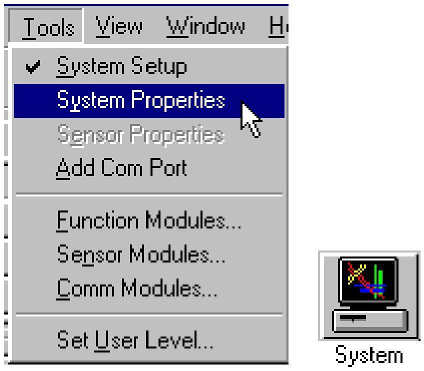
1. Set up the communications ports for your system (see section 3.2 below).
2. Configure each sensor (see section 3.3 on page 3-10).
3. Customize the sensor setup screen (see section 3.4 on page 3-21).
4. Configure remaining preferences (see section 3.5 on page 3-23).

3.2 Communication Setup

The communications interface is set up via the **System Properties Pages** which are accessed via the **Tools >> System Properties**, or from the **System >> System Properties** menu on the **System Setup Screen,** or by clicking on the **System Icon** on the **System Setup Screen** (see Figure 3-1 on page 3-2). The first time TWare32 is run on a computer, it starts up in the **System Setup Screen** with the communications port configuration dialog displayed (see Figure 3-2 on page 3-2).

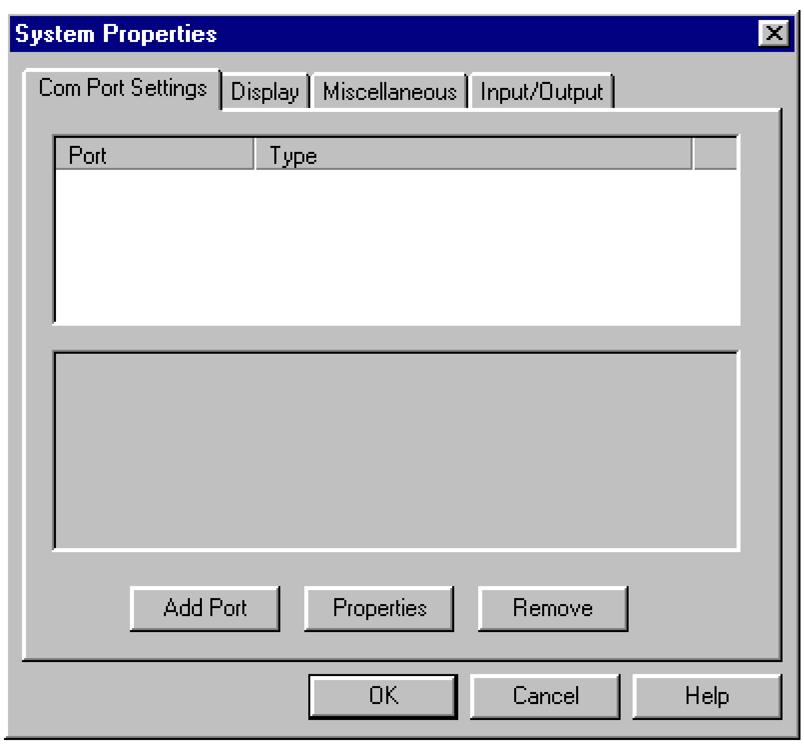
NOTE: Communication problems often occur when other programs (for example, PDA link programs) that either actively use the communications port, or wait for activity on the communications port, are running in the background. These types of programs should be disabled or removed from the computer used for TWare32 communications.

Figure 3-1 Accessing System Properties and Communications Settings



The **System Properties** page, shown in Figure 3-2, provides four tabs: **Com**munications **Port Settings**, **Display**, **Miscellaneous,** and **Input/Output**. The **Com Port Settings** tab is described in section 3.2.1 on page 3-3 and the **Display** and **Miscellaneous** tabs are described in section 3.5 on page 3-23. The **Input/Output** tab is described in section 12.4, Setup And Test of the Digital I/O, on page 12-6.

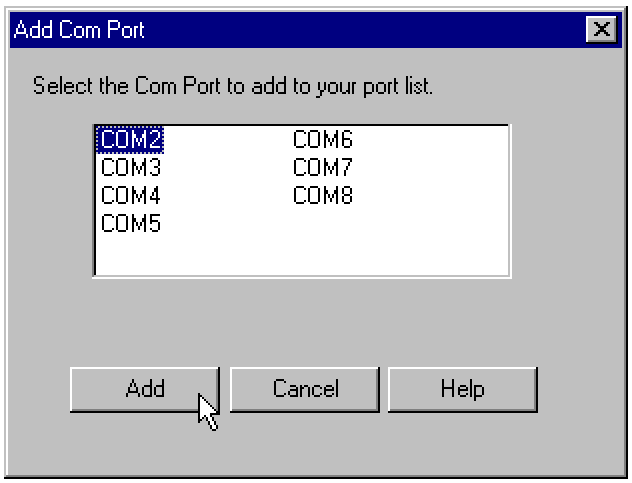
Figure 3-2 System Properties Page



3.2.1 Adding A Communication Port and Sensors

The **Com Port Settings** tab shows the currently configured ports. Clicking on the **Add Port** button will bring up the dialog shown in Figure 3-3. If communicating to the Transpector via the **TCA-485**, select the port in which the **TCA-485** is connected. If communicating to the Transpector via **RS-232**, select the port in which the **serial cable** is connected. After selecting the correct port, click the **Add** button. This will return to the **System Properties** dialog and will now display the added port as shown in Figure 3-6 on page 3-5.

Figure 3-3 Adding a Communications Port



If this is the first time the port has ever been added to TWare32, the following dialogs will assist with configuration.

Figure 3-4 asks if the port is a TCA-485 RS-485 port or an RS232 port. Select the correct port type and press the **Next** button to continue with the configuration.

Figure 3-4 Selecting the Communications Port Type

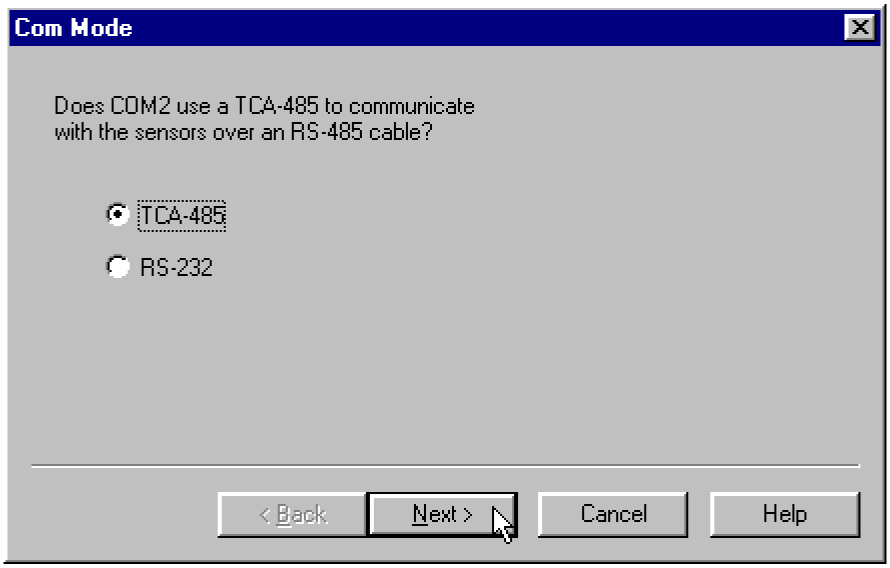
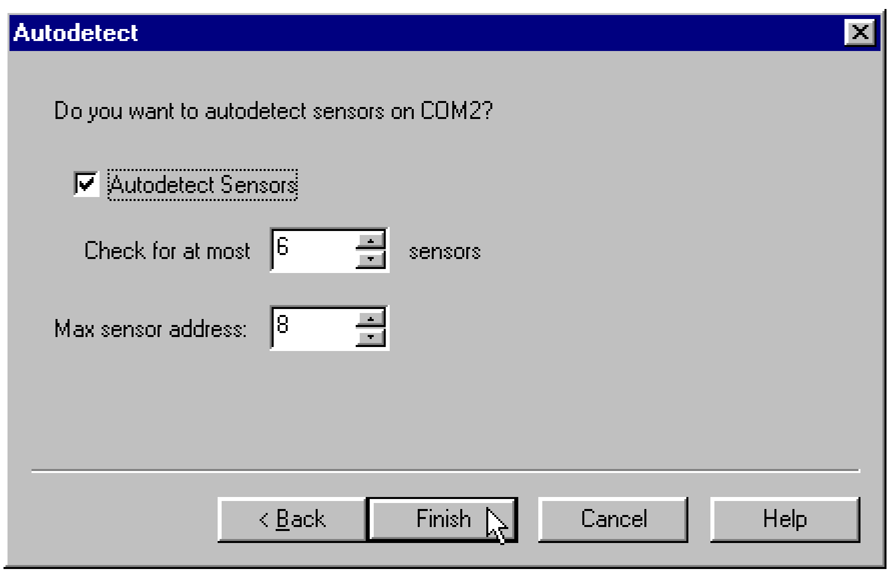


Figure 3-5 asks if **AutoDetect** should be enabled for this port. See Figure 3-10 on page 3-8 for information on setting up **AutoDetect**. Click finish when you are done.

Figure 3-5 Enabling AutoDetect for a New Communications Port



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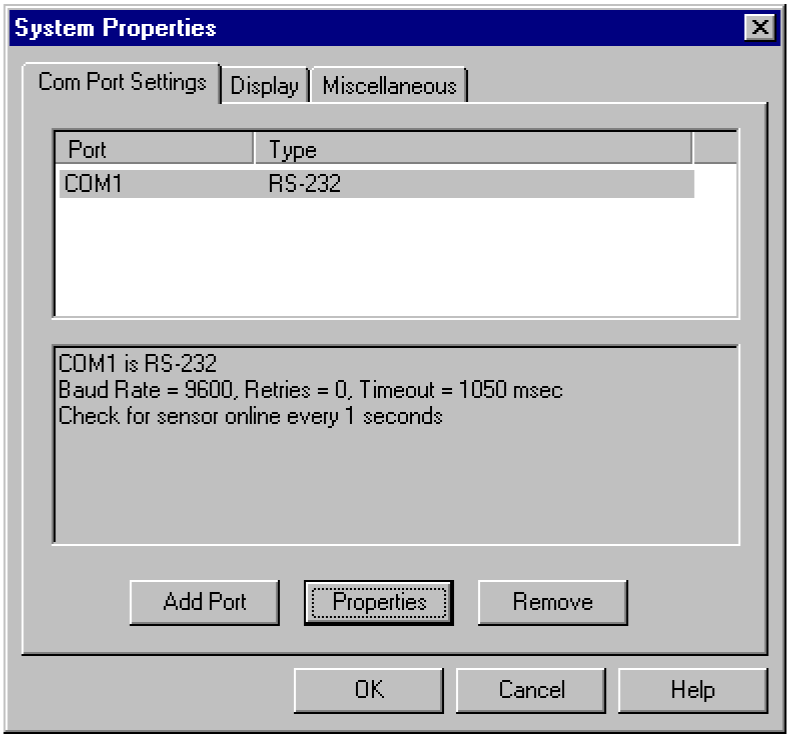
When the **Finish** button is selected, the display returns to the **Com Port Settings** tab of the **System Properties** display. (See Figure 3-6.)

Figure 3-6 System Properties: Com Port added

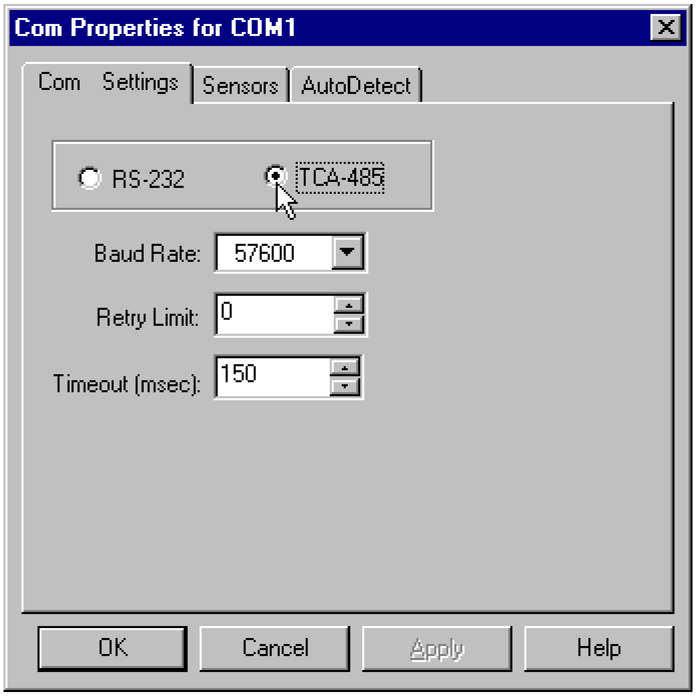


The port type and properties can be changed by clicking the **Properties** button in the **Com Port Settings** page. Clicking the **Properties** button will display the **Com Properties** page with three tabs: **Com Settings**, **Sensors**, and **AutoDetect** (see Figure 3-7 on page 3-6). The current setting will be selected. Options that are changed can be saved by selecting **OK**. Each tab and the parameters associated with it are discussed on the following pages.

Clicking **Remove** when a channel is highlighted will remove that channel from the list.

The **Com Settings** tab allows for the port type to be selected. Figure 3-7 shows the COM1 port being configured as a RS-485 port using the **TCA-485**.

Figure 3-7 Com Properties: Com Settings tab



The **Baud Rate** must be set, at this time, to **57600** for RS-485 communications using the TCA-485.

For RS-232 communications set the **Baud Rate** to **9600**.

The **Retry Limit** is the number of times the program will try to reestablish communications with the Transpector after a communication error. The default should be adequate for most installations, however, if the sensor goes off line frequently try setting it to a higher count.

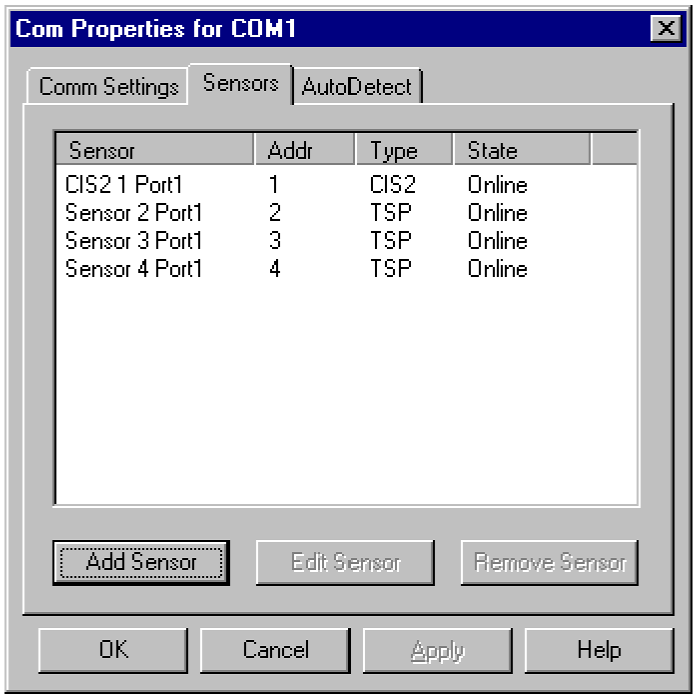
The **Timeout** is the number of milliseconds the communication module will wait for a response from the Transpector. Normally, the default value is adequate and should not be changed. Setting this value too high will increase the time it takes TWare32 to detect a sensor which has gone off-line, and setting it too low may cause an error to be reported when Transpector commands with long execution times are issued.

Click on **OK** to accept the selections, or on **Cancel** to abort the action. You can also click on another tab to access the other parameters associated with the **Com Properties** for this port.

The **Sensors** tab allows for set up of the on-line and off-line sensors. During the initial software installation this page should show some sensors, when it is first opened, if they are found on-line. A feature called **AutoDetect** (on the

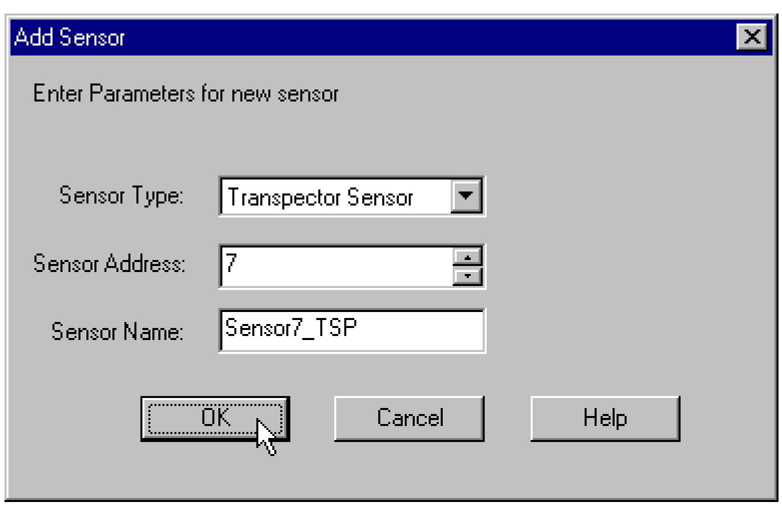
AutoDetect tab) will attempt to communicate with any sensor attached to the communications port. As communications are established, the sensors found are added to the **Sensors** tab as shown in Figure 3-8.

Figure 3-8 Com Properties: Sensors tab



Any sensor not found can be added by pressing the **Add Sensor** button. When adding a sensor, the selections of **Sensor Type**, **Sensor Address**, and **Sensor Name** can be made as shown in Figure 3-9.

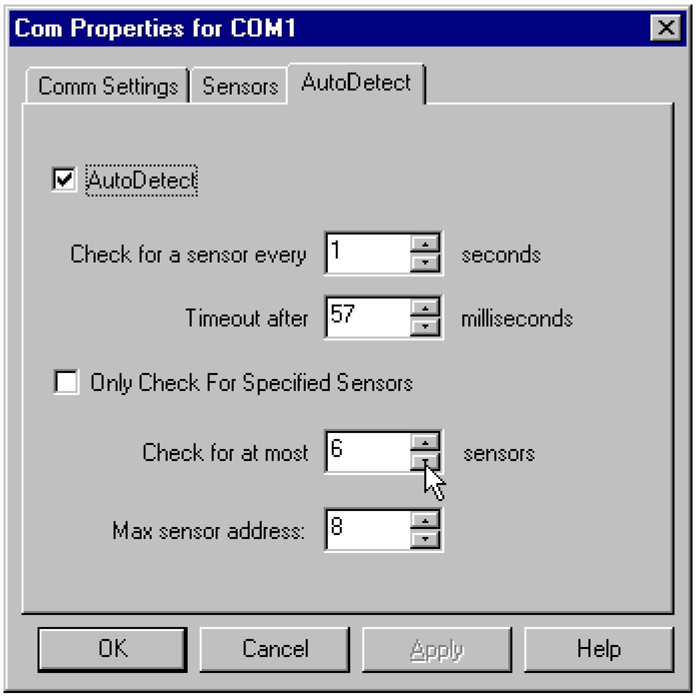
Figure 3-9 Add Sensor dialog



NOTE: If adding a Preclude or XPR sensor then set the **Sensor Type** to **Transpector Sensor**.

The **AutoDetect** tab allows the TWare32 communications to be streamlined to look only for those sensors specified on the **Sensors** page.

Figure 3-10 Com Properties: AutoDetect tab



The **AutoDetect** check box (see Figure 3-10 above) specifies whether TWare32 should periodically check the communication channels for sensors and automatically bring them on-line if it finds any. The **Only Check for Specified Sensors** will AutoDetect those sensors set up on the **Sensors** page. This selection will further reduce the communication overhead incurred while looking for sensors.

The other four boxes, two of which are active when **Only Check for Specified Sensors** is unchecked, can be set to further improve the timing of the communications. Specify the maximum number of sensors expected and the frequency with which TWare32 will check to achieve optimum communications performance.

Once the maximum number of sensors is found, TWare32 will not look for any more. If this value (**Check for at most "n" sensors**) is set to the actual number of sensors, it can save significant overhead of looking for more sensors every few seconds. The interval specified (**Check for a sensor every "t" seconds**) is the time between successive checks. Each time **Auto Detect** checks for a sensor it also checks two more addresses. Since there can be 62 addresses on each serial port it can take as much as 31 times the specified interval to detect a new sensor coming online. Specifying the maximum address (**Max sensor address:**) for each channel can significantly reduce this time.

NOTE: The **Max Address** is the largest address of any Transpector connected to this channel. If this value is set too high it could take a long time for TWare32 to detect a new sensor coming online, however, if set too low then sensors with addresses larger than this value will not be detected.

See the *Transpector Operating Manual* (IPN 074-276) for details on setting and determining the address of the Transpector.

When changes are finished on each page, click **OK** to accept the settings (or **Cancel** to abort the action). If **AutoDetect** was selected, the program should automatically detect and bring on-line any sensors connected to the configured channels. Depending on the specified checking interval and maximum address for each channel, this could take a few minutes.

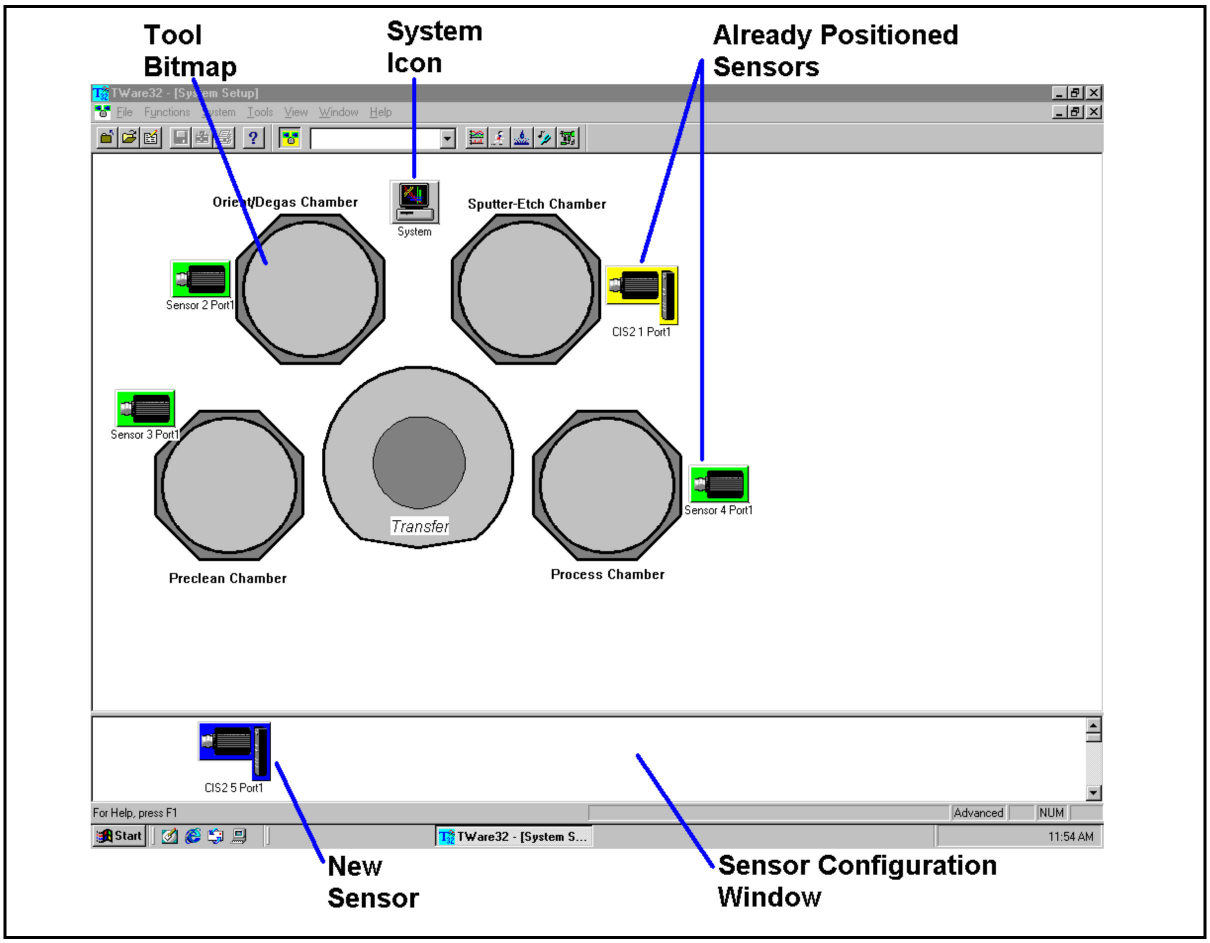
3.3 Sensor Configuration and Setup

When sensors first come on-line, their icons are placed in a sensor configuration window as shown in Figure 3-11. The icons can be dragged and dropped to any point on the **System Setup** screen, however, you may want to place them in a location which reminds you of their physical location on your tool.

3.3.1 Positioning Sensors

To drag the sensor icons or the system icon, place the cursor over the icon and hold the left mouse button down while moving the mouse to the desired location. When the left mouse button is released, the icon will stay where it was placed. The program will remember the location of these icons each time the program is run. After the last sensor is moved out of the configuration window, the window will disappear.

Figure 3-11 Sensor Setup Screen with Sensor Configuration Window



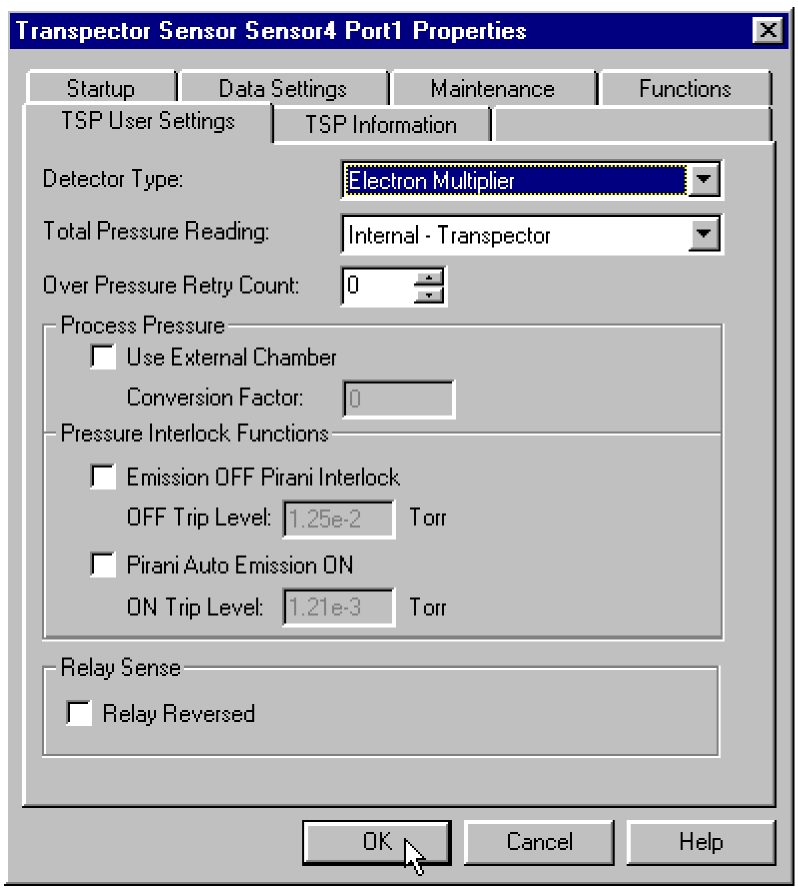
3.3.2 Configuring the Sensors

After the sensors have been placed in their desired locations on the page, you should examine the properties for each sensor and make any necessary changes.

NOTE: If it is desired to rename the sensors to names related to the installation, it is strongly recommended that the renaming occur as one of the first actions taken. Much of the system configuration is dependent on the sensor name; a sensor can be renamed at any time but doing so after the configuration is completed can affect the configuration.

To examine or change the properties of a sensor, click on the **Sensor Icon** or select **Properties** from the context menu (on the right mouse button). This will bring up the **Sensor Properties Pages** as shown in Figure 3-12 through Figure 3-15 and Figure 3-17 and Figure 3-18.

Figure 3-12 Transpector Properties, TSP User Settings Tab



The **TSP User Settings** tab contains information about options which may or may not be installed on a Transpector. These options are not detectable by the software and must be set by you to insure proper operation of the sensor.

NOTE: The first time a Transpector's properties are examined, the **User Settings** page will be displayed on top to remind you to check and modify the settings as necessary. The next time, the **Functions** tab will be on top to make it easier to select a function for this sensor.

Detector Type . . . . If an electron multiplier is installed on the sensor, this parameter should be set to **Electron Multiplier,** otherwise it should be set to **Faraday Cup**. If **Electron Multiplier** is selected, the sensor may still be run in Faraday Cup mode, however, if **Faraday Cup** is selected, it cannot be run with the multiplier.

Total Pressure Reading . . . . This specifies which gauge will be used for measuring the total pressure at the sensor. If an external pressure gauge, such as an **IG3**, **ITR100**, or **Pirani**, is installed on this sensor then the appropriate type should be selected. Otherwise, **Internal - Transpector** should be selected.

NOTE: The **Total Pressure Reading** only selects the source of the Total Pressure, it does not select the presence of an interlock device.

Over Pressure Retry Count . . . . . This is used to desensitize the automatic shutoff of the emission when an overpressure condition is detected. The number entered for this parameter is the number of consecutive pressure readings, over the trip-out pressure, before actually turning off the emission. When **Pirani Emission OFF Interlock** is selected, this value is ignored.

CAUTION

The default for the Over Pressure Retry Count parameter is zero. Changing this value will allow the filament to operate when the pressure is above the specified operating pressure. This may cause premature filament failure.

Process Pressure

Use External Chamber . . . . When checked, Monitor will display data converted to process chamber pressure. A **Conversion Factor** must be entered.

Conversion Factor . . . . When **Use External Chamber** is checked, a **Conversion Factor** must be entered. This is used where conversion to a process chamber pressure is desired.

Pressure Interlock Functions

Pirani Emission OFF Interlock . . . . When checked, the emission will be shut off when the pressure meets or exceeds the **OFF Trip Level**.

Pirani Based Auto Emission ON . . . . . . When checked, the pressure must drop below the **ON Trip Level** before the emission will be turned on.

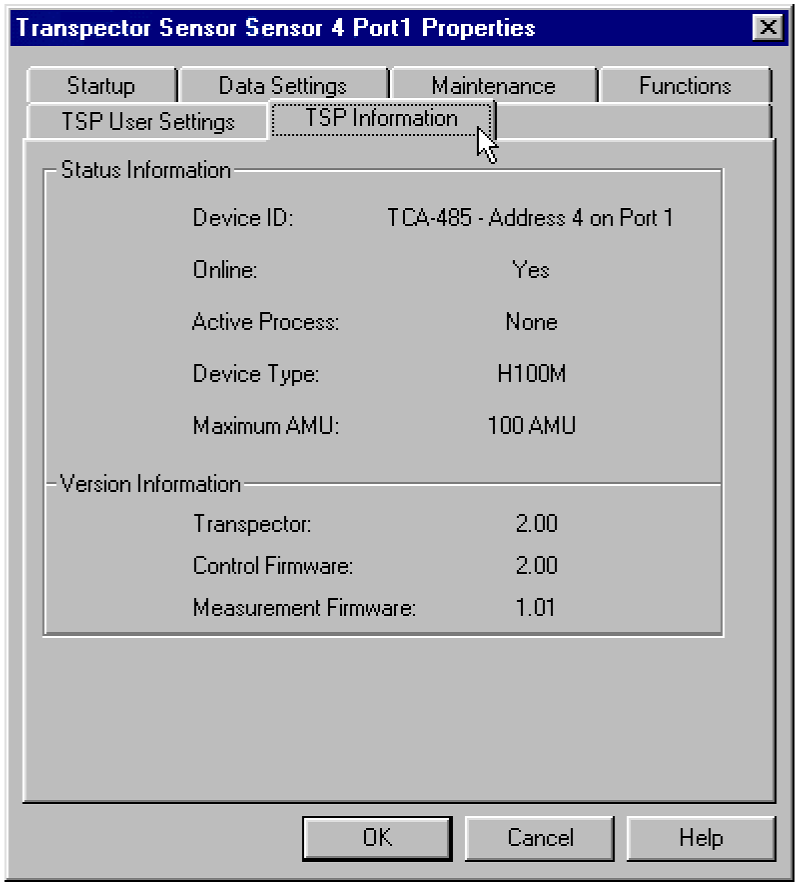
Relay Sense

Relay Reversed . . . . When unchecked (the default), the Transpector Relays are opened at the start of the program and remain opened (provided an alarm does not occur during a recipe). When checked, the Transpector Relays are closed at the start of the program and remain closed (provided an alarm does not occur during a recipe).

NOTE: In past TWare32 versions, this "closed relay" was only possible when running a recipe. This caused problems for devices that always required a closed relay signal, to indicate that no alarm existed, because when a recipe was not running the relay was set open.

The **Information** tab (Figure 3-13) shows information about the sensor's device ID, online status, the device type, AMU range, and version information. None of the information on this page can be changed.

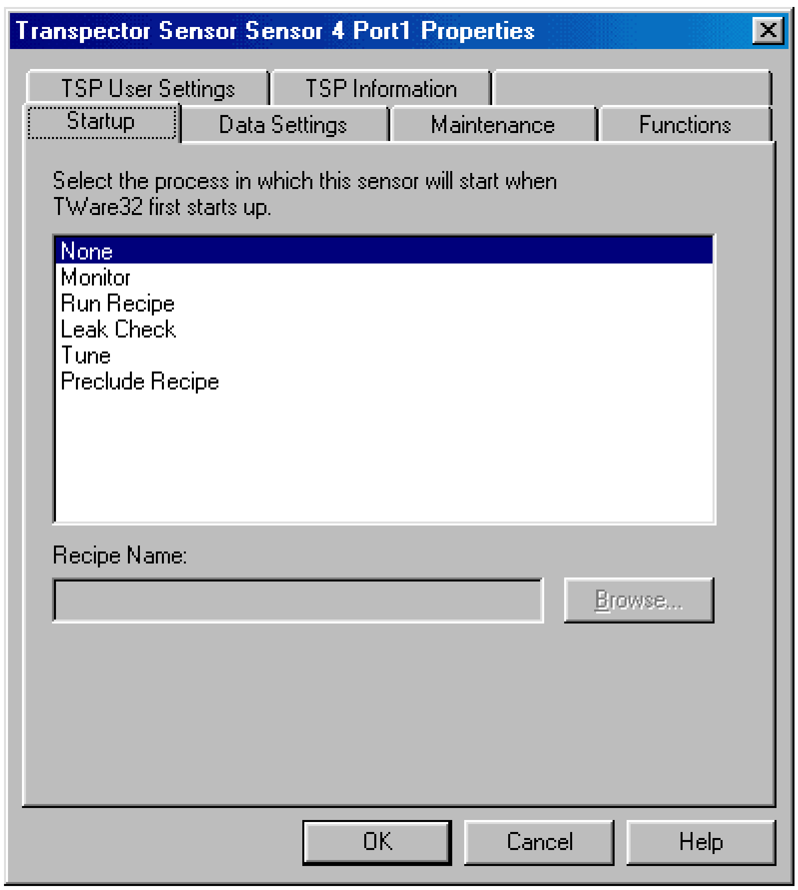
Figure 3-13 Transpector Properties, TSP Information Tab



The **Startup** tab (Figure 3-14) of the **Transpector Properties** pages allows you to select what process, if any, will be automatically run on each sensor when TWare32 is started. A list box is shown with the available functions (as they appear in the **Function Menu**) plus a line for **None**. Highlight the desired function and click **OK**. The next time TWare32 is started, this sensor will start in the selected mode. If the selected function takes a recipe name (for example, **Run Recipe**) the **Recipe Name** box will be enabled. A file path and name can be typed in this box, or click the **Browse...** button and select a recipe from the TWare32 file **Open** dialog box (refer to section 2.6 on page 2-9).

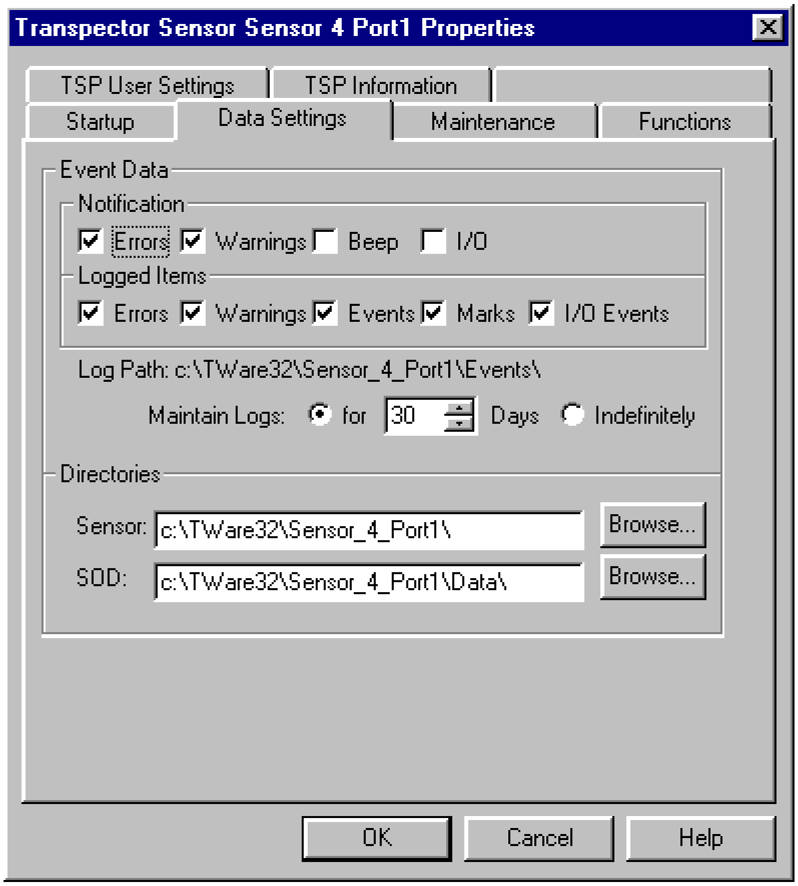
If **None** is selected for all sensors the program will start in the System Setup screen. Clicking on a sensor will display the functions available for that sensor. The desired function can be selected from the list. Alternatively, the desired function can be selected from the context menu for the desired sensor.

Figure 3-14 Transpector Properties, Startup



The **Data Settings** tab (Figure 3-15) allows the configuration of the event reporting and logging facility and the specification of the directory paths for storage of event data, sensor data, recipes, and other TWare32 files.

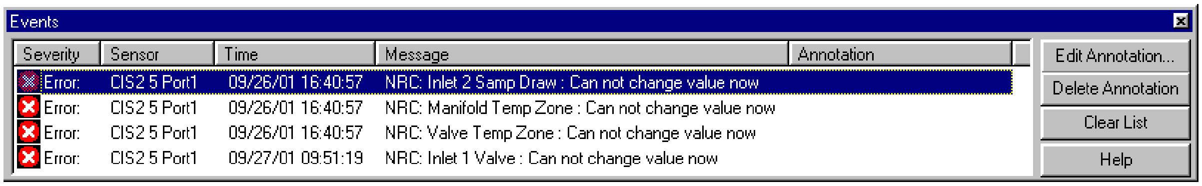
Figure 3-15 Transpector Properties, Data Settings



Event Data

Notification . . . . This parameter allows the specification of the level of errors that will be reported to the user in an error dialog box (see Figure 3-16). The choices are **Errors, Warnings Beep**, and **I/O**. If only **Beep** is selected then the error dialog box will *not* be displayed when an error is detected, but rather the terminal will beep once indicating an error has occurred. The error log can be examined to determine the nature of the error.

Figure 3-16 Error Dialog Box



Logged Items

Errors . . . . When checked, all errors reported from this sensor will be logged in the event log file.

Warnings . . . . When checked, all warnings reported from this sensor will be logged in the event log file.

Events . . . . When checked, all events for this sensor will be logged in the event log file.

Marks . . . . When checked, if a mark is automatically inserted in a data stream as a result of an alarm condition, it will be logged in the event log file.

I/O Events . . . . When checked, all I/O events (from the Digital I/O board, if installed) for this sensor will be logged in the event log file.

NOTE: Any of the logged items can be annotated by highlighting the item and using the **Edit Annotation** button.

Log Path . . . . The location where the event log files will be written. A new event log file is written each day and named according to the date with a `.evt` extension. The path is automatically determined by the program, which automatically adds **\Events** to the **Sensor** directory path (see below).

Maintain Logs . . . . Event log files over a specified age will be automatically deleted. The expiration may be specified or **Indefinitely** may be selected to keep them until explicitly removed.

Directories

Two paths can be specified for the storage of files associated with TWare32: **Sensor** and **SOD**. To change any directory you may type in the new path or select a path using the **Browse** button.

Sensor . . . . This is the top level directory for all files that are related to a specific sensor. Sub directories under the **Sensor** directory are used to save **Tune Files**, **Recipes**, **Event Logs**, etc. The default **Sensor** directory is built by adding the sensor name (with illegal characters converted to underscores) to the **Main** directory specified during installation.

SOD . . . . This is where the **Sea of Data** (**SOD**) files are stored. This can be changed to a larger disk or network drive to allow saving of more data without overflowing a local disk. The default **SOD** directory is built by adding **\Data** to the **Sensor** directory.

CAUTION

If a network or removable drive is selected to save data, it must be available and writable when TWare32 is ready to write data. If the network or drive is not available, a loss of data could occur.

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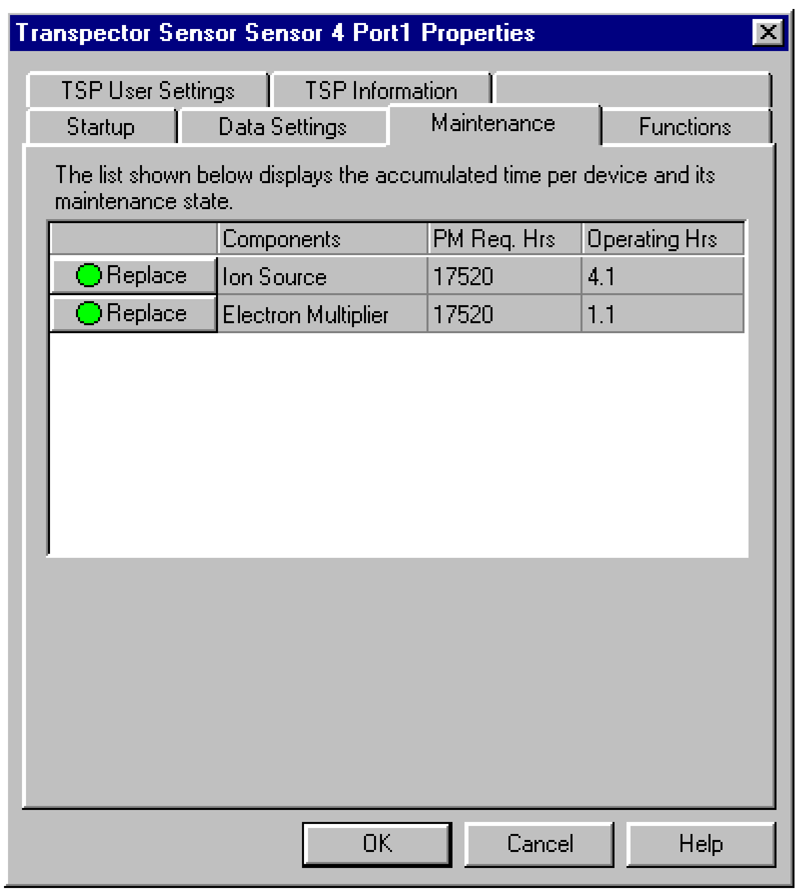
The **Maintenance** tab (Figure 3-17) displays the replaceable components of the Transpector, the recommended required hours of operation before Preventative Maintenance is due, and the accumulated operating hours since the component was last replaced.

NOTE: The **Replace** button on this page is an active button that will zero the **Operating Hrs** column for the selected component. Click on this button only if the component has actually been replaced.

CAUTION

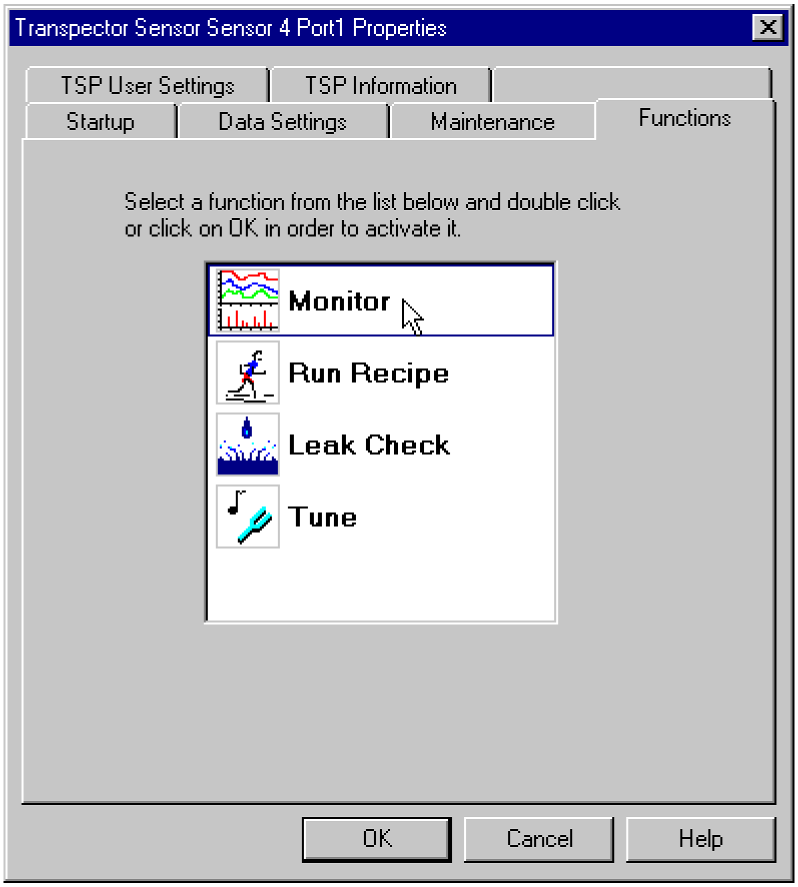
Failure to perform the required Preventative Maintenance at the required time will shorten the life of the component and void the warranty.

Figure 3-17 Transpector Properties, Maintenance page



The **Functions** tab (Figure 3-18) contains a list of the functions available for this sensor. This is the first page displayed when selecting a sensor which has already been configured. Select the desired function and click **OK** or double-click on the function to run that function on this sensor.

Figure 3-18 Transpector Properties, Functions Page



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3.4 The Sensor Setup Screen

The **Sensor Setup Screen** is the first screen displayed when TWare32 is started (unless a **Startup Function** is specified for one of the sensors). It can also be displayed by selecting **Tools >> System Setup** or by clicking on the **Setup Icon** on the sensor toolbar. See Figure 3-19.

Figure 3-19 Invoking the Sensor Setup Screen

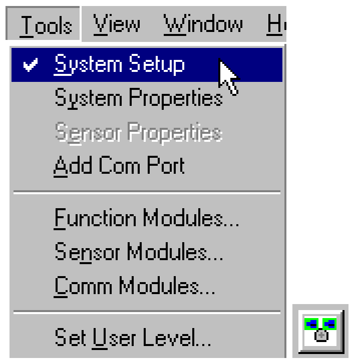


Figure 3-20 on page 3-22 shows the layout of the **System Setup** page. When the software is run for the first time, the sensors and the annotations are not there. They are added during the initial system setup.

The **System Setup** page consists of a **Bitmap Backdrop**, a **System Icon**, **Sensor Icons**, and optional **Annotations**. Selecting the **Set Image** item from the context menu of the screen allows the **Backdrop** to be replaced with any bitmap image. Several images are supplied with TWare32. Select the one which most closely resembles your tool layout or substitute your own bitmap.

Sensor Icons and the **System Icon** can be dragged to any location on the screen to provide a visual cue of the physical location of each sensor. **Annotations** may be added to the image to identify individual chambers or the tool itself. To add **Annotations** select **Annotate Image** from the context menu. The dialog shown in Figure 3-21 will be displayed. Type in the text, change fonts if desired, and click on **OK**. Position the text and left-click to set it in place. The context menu of the **Annotations** (right-click on the annotation text) allows the text to be moved, edited, deleted, or the font to be changed.

Figure 3-20 Sensor Setup Page

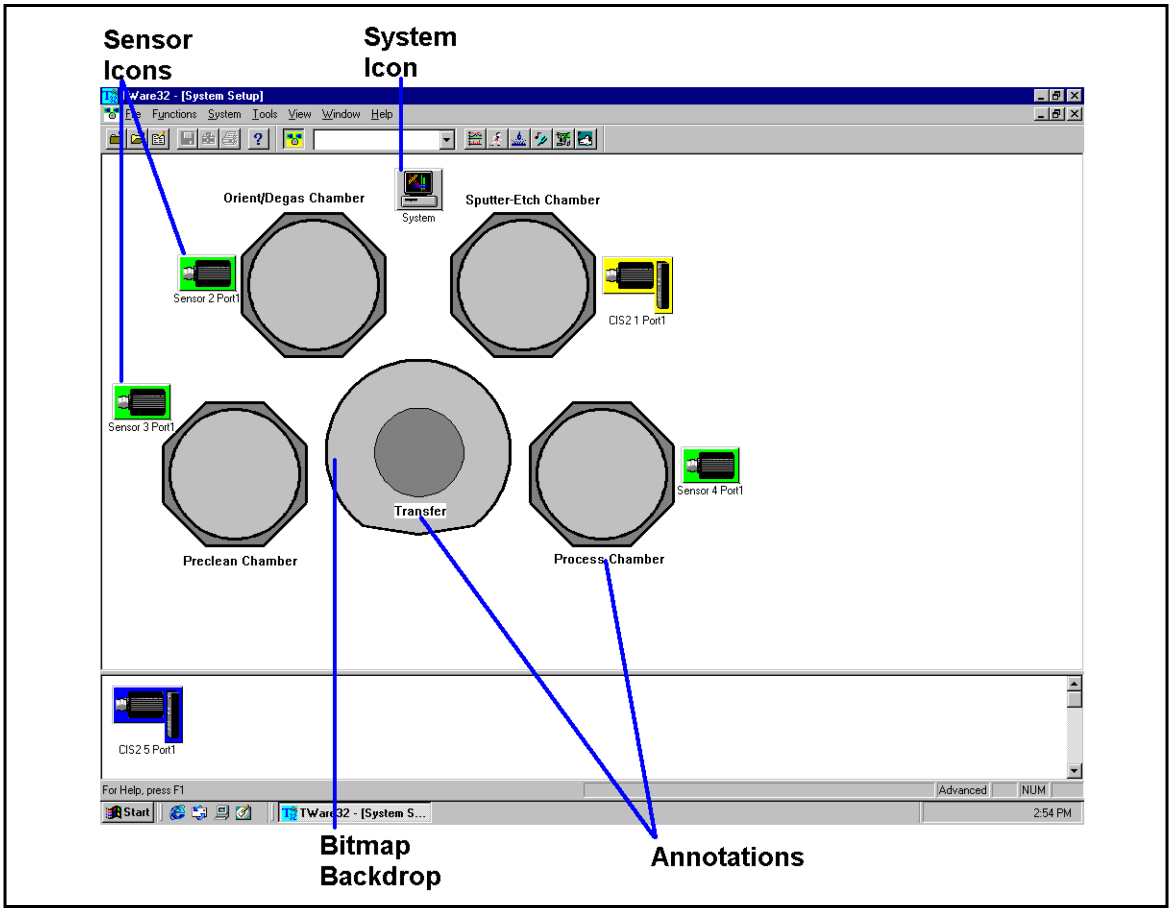
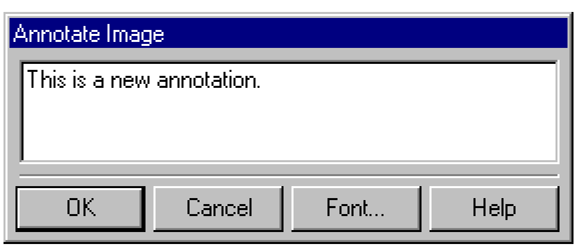


Figure 3-21 Annotation Editing Dialog



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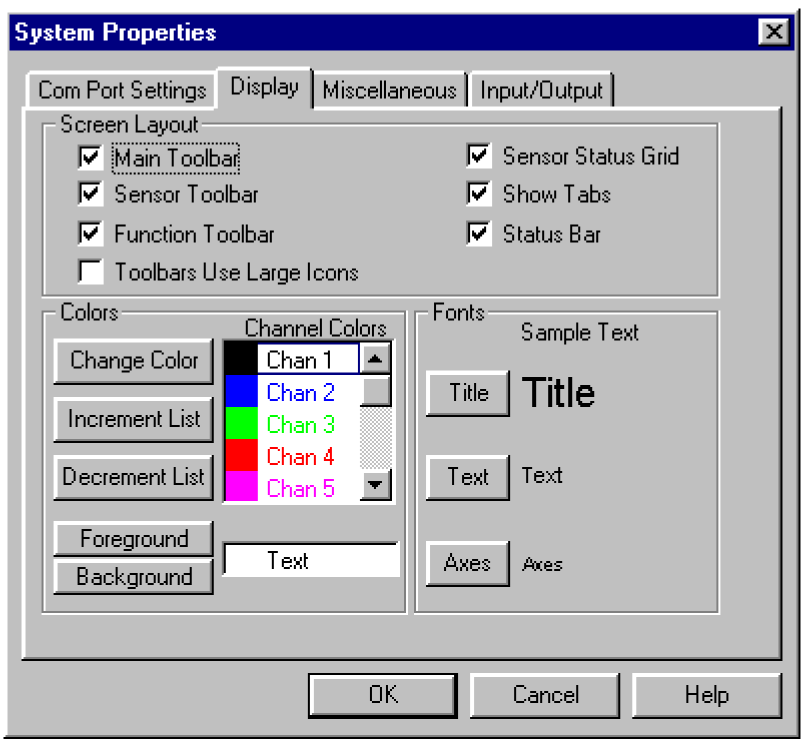
3.5 User Preferences

The **System Properties** pages allow the customization of several global (that is, system wide as opposed to sensor specific) options. Selecting **Tools >> System Properties** on the main menu, selecting the **System >> System Properties** menu on the **System Setup** screen or by clicking on the **System** icon on the **System Setup** screen brings up the **System Properties** display used to configure your system. The **Com Port Settings** tab allows the configuration of the communication channels (refer to section 3.2 on page 3-1). The **Display** tab has several options which customize the display (see section 3.5.1 below). The **Miscellaneous** tab allows the customization of several options (see section 3.5.2 on page 3-26). The Input/Output tab allows for configuration and testing of the Digital Inputs and Outputs if the board is installed (see section 12.4 on page 12-6).

3.5.1 Configuring The Display Options

Figure 3-22 shows the **Display** tab of the **System Properties** pages.

Figure 3-22 System Properties, Display Tab



Screen Layout

This section allows the specification of which screen elements are displayed by default when the program is run. They can be enabled and disabled at any time while the program is running. Refer to Figure 2-6 on page 2-8 for the naming of the various components of the screen.

Main Toolbar. . . . . The **Main Toolbar** is displayed when checked.

Sensor Toolbar. . . . . The **Sensor Toolbar** with function buttons is displayed when checked.

Function Toolbar . . . . The **Function** or view specific toolbar is displayed when checked.

Toolbars Use Large Icons . . . . . . When checked, all toolbars will use larger icons than initially presented at startup. Due to icon size and screen size, some toolbars may be displayed on a second line when using **Large Icons**.

Sensor Status Grid . . . . The **Sensor Status Grid** is displayed when checked.

Show Tabs . . . . If the **Sensor Status Grid** being displayed contains multiple pages, tabs are used to select the desired page. This option displays the tabs when checked and hides them when unchecked.

Status Bar. . . . . The program **Status Bar** is displayed at the bottom of the screen when checked.

Colors

Channel Colors . . . . The colors used for trend channels in **Monitor** are displayed in this box.

Change Colors . . . . Change the color used for the highlighted channel. A standard color selection palette is displayed. Select the desired color and click **OK**.

Increment List . . . . Add a channel to the end of the list.

Decrement List. . . . . Delete a channel from the list.

Foreground . . . . Set the color in which text will be displayed on the graphs. A standard color selection palette is displayed. Select the desired color and click **OK**. The selected color is displayed in the text box to the right of the button.

Background. . . . . Set the background color for the graphs. A standard color selection palette is displayed. Select the desired color and click **OK**. The selected color is displayed in the text box to the right of the button.

Fonts

Title . . . . Select the font size and typeface to be used for titles on the graphs. A standard font selection dialog will be displayed. Select the font and size and click **OK**. A sample of the text in the selected font is displayed to the right of the button.

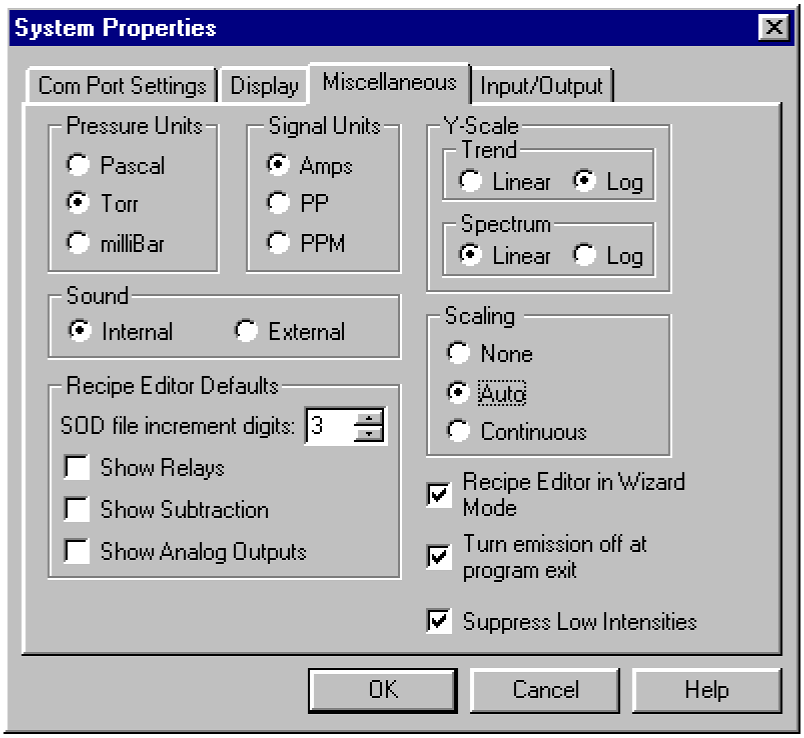
Text . . . . Select the font size and typeface to be used for miscellaneous text on the graphs. A standard font selection dialog will be displayed. Select the font and size and click **OK**. A sample of the text in the selected font is displayed to the right of the button.

Axes. . . . . Select the font size and typeface to be used for the axis labels on the graphs. A standard font selection dialog will be displayed. Select the font and size and click **OK**. A sample of the text in the selected font is displayed to the right of the button.

NOTE: The affect of changing the above parameters may differ based on the monitor, graphics board, and user settings.

3.5.2 Miscellaneous User Options

Figure 3-23 System Properties, Miscellaneous Tab



<u>**Pressure Units**</u>

Pascal . . . . Select to display all pressures in Pascals.

Torr . . . . Select to display all pressures in Torr.

milliBar . . . . Select to display all pressures in milliBars

<u>**Signal Units**</u>

Amps . . . . Select to display intensities of signals in terms of ion currents in amps by default. The signal units can be changed at any time.

PP . . . . Select to display intensities of signals in terms of partial pressures in the current pressure units by default. In **Spectrum** mode the partial pressures are displayed as Nitrogen equivalents.

PPM . . . . Select to display intensities of signals in terms of parts per million relative to the intensity of a specified mass.

<u>**Y-Scale**</u>

Trend . . . . Select either **Log**arithmic or **Linear** scale for the Y axis in **Monitor Trend** and **Leak Check**.

Spectrum . . . . Select either **Log**arithmic or **Linear** scale for the Y axis in **Monitor Spectrum** and **Tune**.

<u>**Sound**</u>

Internal . . . . Use internal computer speakers for sound in **Leak Check**.

External . . . . Use sound card with external speakers for sound in **Leak Check**. If a sound card is not installed, this option will be disabled.

<u>**Scaling Options**</u>

None . . . . When selected, the display will only be rescaled when the **Rescale** button is clicked.

Auto . . . . When selected, the display will be automatically rescaled after the first scan, after the emission turns on or off, and after the electron multiplier turns on or off. If not selected, re-scaling only occurs when the **Rescale** button is clicked. The **Rescale** button can be clicked at any time to force the display to be rescaled.

Continuous . . . . When selected, the display will be rescaled on every scan.

<u>**Recipe Editor Defaults**</u>

SOD file increment digits . . . . . . This entry allows for configuration of the number of numerical places used in the file name index for the SOD files. For example, selecting 3 will allow the index to increment to 999 as SOD data files are saved before data collection is stopped or rolls over. See section 8.4 on page 8-2.

Show Relays . . . . When selected, all **Selected Peaks** recipes created with the Recipe Editor will display the **Relays Setup** page for editing. If unchecked, the **Relays Setup** page is skipped for convenience.

Show Subtraction . . . . When selected, all Spectrum recipes created with the Recipe Editor will display the Subtraction page for editing. If unchecked, the Subtraction page is skipped for convenience.

Show Analog Outputs . . . . When selected, all **Selected Peaks** recipes created with the Recipe Editor will display the **Analog Outputs** page for editing. If unchecked, the **Analog Outputs** page is skipped for convenience.

Turn emission off at program exit. . . . . If selected, when exiting the TWare32 program the emission of all sensors will be shut off. If not selected, the sensor emission state will be unchanged.

Wizard Mode for Recipe Editor . . . Use the Wizard Mode for the Recipe Editor if checked, otherwise the Recipe Editor is presented as a tab dialog. Advanced users may find the tab dialog easier to use when modifying recipes, however, since the Wizard Mode guides you through the process of setting up and editing a recipe it is recommended for most users.

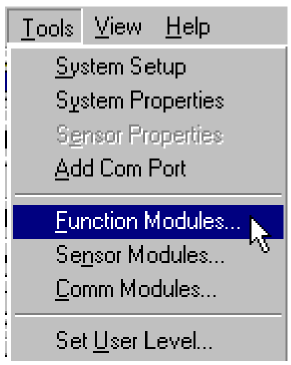
Suppress Low Intensities . . . . . . When checked, any intensities less than 1e-16 amps will be reported as 1e-16 amps. When unchecked, the actual value of the data will be displayed, even if the value is negative, which can occur with **Baseline Subtraction** on. In either case the actual values of the data are always stored.

3.6 Adding And Removing Modules

When TWare32 is installed, the installation program automatically selects and loads the standard modules and any optional modules which were purchased with the software. In the event that a module needs to be removed or re-installed, commands have been provided to facilitate this process without the need to re-install the entire program.

In order to add or remove a **Function Module** such as **Monitor** or **Tune**, select **Tools >> Function Modules...**.

Figure 3-24 Tools >> Function Modules

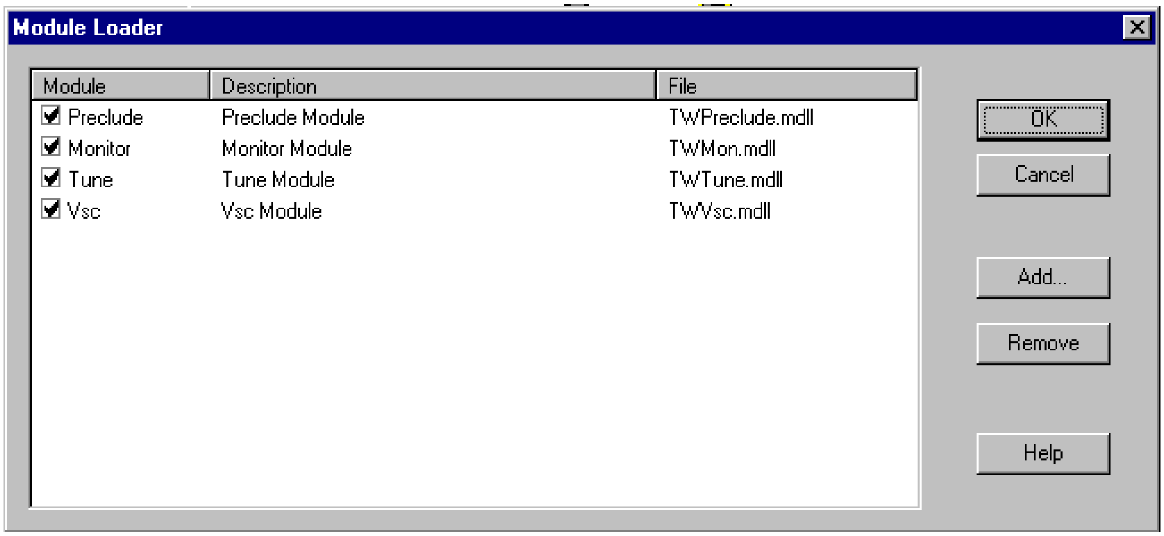


The **Module Loader** dialog shown in Figure 3-25 will be displayed. Any currently loaded modules will be displayed in the list box. If the box is checked, the module is enabled. Unchecking the box next to a module will disable that module without unloading it. Highlighting a module and clicking **Remove** will completely remove it from the list and it will not be reloaded the next time the program is loaded.

To add a function, either because it was removed or disabled or because a new module was sent out without an installation program, follow these steps.

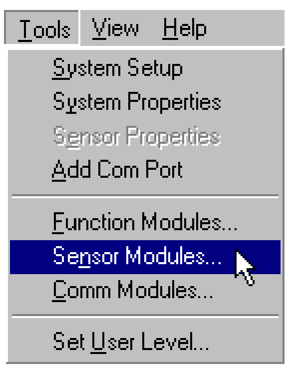
1. Bring up the **Module Loader** as described above.
2. If the desired module is in the list but unchecked, then check the box and click **OK**.
3. If the desired module is not in the list, click **Add**. A file **Open** dialog will be displayed from which you can choose the desired module. Then click **OK**.

Figure 3-25 Adding And Removing Function Modules



In order to add or remove a **Sensor Module**, such as a new Transpector model or a CIS2, select **Tools >> Sensor Modules...**

Figure 3-26 Tools >> Sensor Modules



and proceed exactly as described above for **Function Modules**.

In order to add or remove a **Comm Module** (communications module), such as a new protocol, select **Tools >> Comm Modules...** and proceed exactly as described above for **Function Modules**.

NOTE: TWare32 must be shut down and restarted for any Module changes to take effect.

3.6.1 User Level (Access Levels)

Tware32 can be operated from one of two User Levels — *Advanced* or *Normal*. These levels, referred to as Access Levels, provide protection against modifications of Sensor configuration, Calibrations, Recipes, and System Setup. An Advanced user may want to completely set up the system and then set the User Level to Normal for the system operators. The Tware32 system can be password protected to operate at one of two access levels:

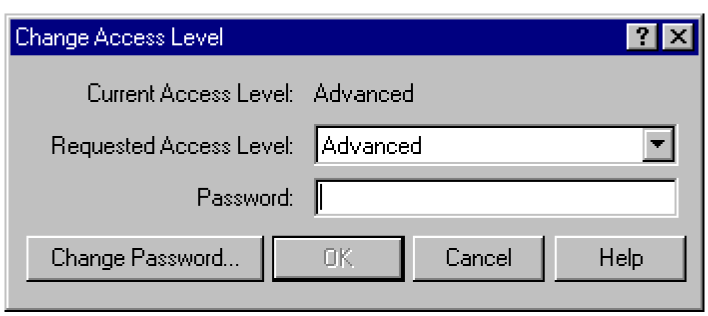
- **Advanced**. All system controls are available. The system may be controlled manually while in **Advanced** mode. See section 9.3.6, Advanced Level Functions, CIS2, on page 9-9 for information specific to the CIS2.
- **Normal.** A limited set of system controls are available. Major functionality that is not available to a **Normal** user includes **Tune**, **Edit Recipe**, and any changes to the System and Sensor configurations. Many functions are available but provide read-only access at the **Normal** user level. See section 9.3.5, Normal Level Functions, CIS2, on page 9-9 for information specific to the CIS2.

To change the security level, select **Tools >> Set User Level...**. See Figure 3-27.

Figure 3-27 Tools >> Set User Level

The **Change Access Level** dialog will display the current security level. In Figure 3-28 the **Current Access Level** is set to **Advanced**.

Figure 3-28 Change Access Level Dialog



When changing from **Normal** level to **Advanced** level, enter the correct password in the **Password:** field and click **OK**. To change a Password, click the **Change Password...** button, enter the old Password and the new Password in the appropriate boxes, and click **OK**. As with any password, it should be remembered and protected.

3.7 Analog Outputs Option

The Analog Output Accessory is implemented as a feature option to the Transpector 2.0 family of sensors. This option is not available for Transpector 1.0 sensors or any CIS sensor. Contact your local service center for availability of retrofitting this option to existing sensors.

The Analog Output Accessory provides four external connections which carry voltages that vary in proportion to the abundance of the specified ions. The software provides a means for the user to assign a mass, as part of a recipe, to each of the four channels. The Analog Output Accessory is available in one of two voltage ranges: 0 to 5.0 V(dc) or 0 to 10 V(dc).

In addition to the analog signals there is a normally open relay which is closed when the analog outputs are updating. The outputs are updating when in selected peaks mode and one or more channels are enabled and the emission is on and the EM is on (if selected). There is an LED on the back panel of the Transpector which reflects the status of this relay.

NOTE: Analog Outputs continue to update after TWare32 is terminated (or after a recipe or Monitor is stopped) until power is removed from the Transpector.

Table 3-1 lists the connector pins and their corresponding signals.

Table 3-1 Pinouts for Analog Output Connector

Pin #	Signal Name	Pin #	Signal Name
1	Channel 1 Output	9	Ground Reference
2	Channel 2 Output	10	Ground Reference
3	Channel 3 Output	11	Ground Reference
4	Channel 4 Output	12	Ground Reference
5	Unused	13	Unused
6	Status Relay Common	14	Unused
7	Status Relay (NO)	15	Cable Shield
8	Unused		

For information on programming a recipe to use Analog Outputs, see section 5.9, Analog Outputs Setup Page, on page 5-22, or the *Transpector2 Operating Manual* (IPN 074-276).

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Chapter 4
Monitor

4.1 Introduction

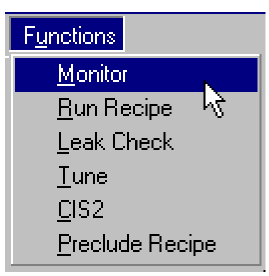
In TWare32, **Monitor** and **Run** are one and the same. There are, however, two separate commands in the **Functions** menu: **Monitor** and **Run Recipe**. The only difference between these two commands is that **Monitor** always uses `Monitor.rcp` for the recipe while **Run Recipe** prompts you for a recipe name.

In TWare32, if the recipe is saving data to an SOD file, the scanning must be stopped before changing parameters, but if the recipe is not saving data to an SOD file, parameters can be changed at any time and they take effect immediately. The default `Monitor.rcp` does *not* save data automatically (although you can take a **Snapshot** at any time). See section 5.10 on page 5-24 for information on changing a recipe to save or not save data automatically.

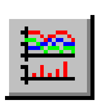
4.2 Invoking Monitor And Running Recipes

Monitor can be invoked in several ways:

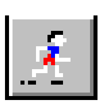
- through the **Functions >> Monitor** menu item or the **Functions >> Run Recipe** menu item.



- by clicking on the **Monitor Icon** on the **Sensor Toolbar**.

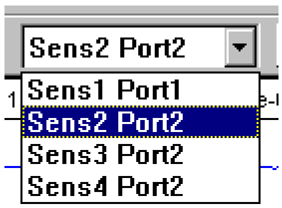


- by clicking on the **Run Icon** on the **Sensor Toolbar**.

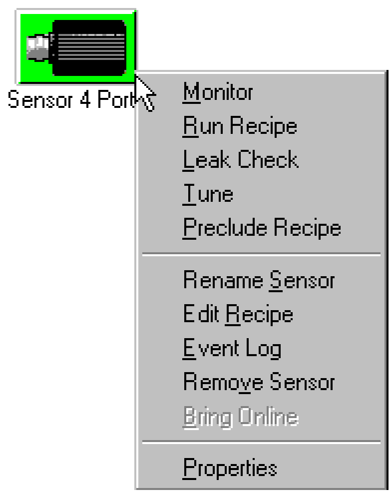


IPN 074-334D

- by selecting a sensor from the **Sensor Toolbar**, which is not currently running a process, and then selecting **Monitor** or **Run Recipe** from the list of functions.



- by selecting **Monitor** or **Run Recipe** from the context menu when the mouse pointer is on a sensor in the **System Setup Screen**.



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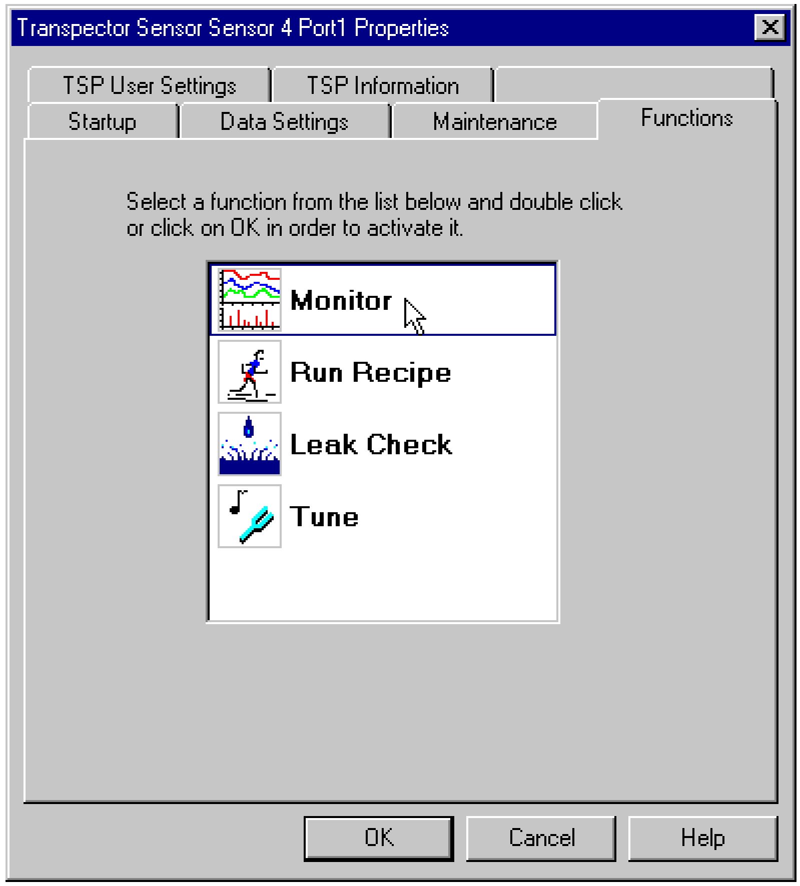
- by selecting **Monitor** or **Run Recipe** from the **Functions** tab of the **Transpector Properties page**.

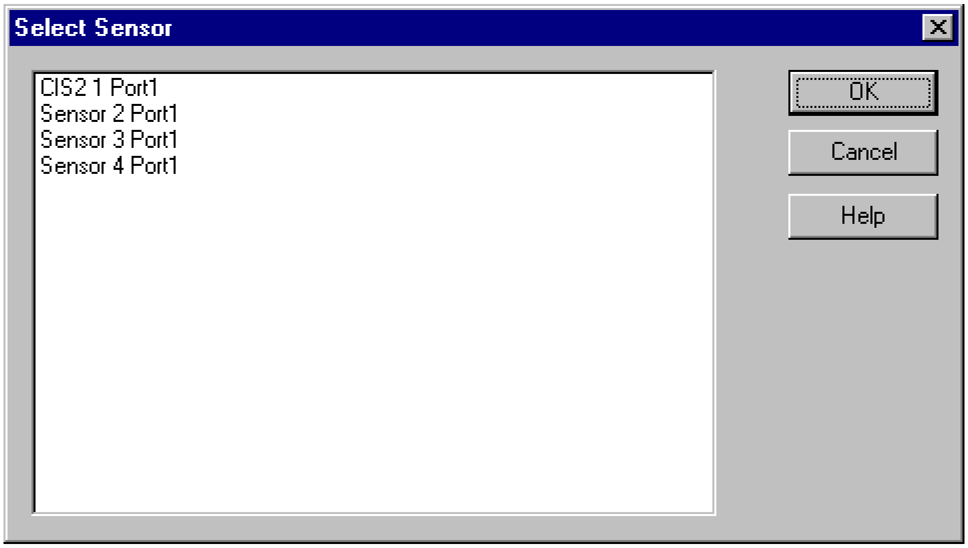


Selecting **Monitor** from a sensor's context menu or property page, if that sensor is online, will immediately open up the **Monitor** screen and recipe Monitor.rcp will be run according to its start conditions. Selecting **Monitor** from the **Functions** menu or clicking on the **Monitor Icon** will do the same if there is a current sensor displayed in the sensor bar. Otherwise, a list of available sensors is displayed (see Figure 4-1). Selecting the desired sensor will start up the **Monitor** screen as above.

Selecting **Run Recipe** from the context menu or property page will display a TWare32 file **Open** dialog (refer to section 2.6, Opening Files In TWare32, on page 2-9). When the desired recipe is selected, it will open up the **Monitor** screen and run the selected recipe according to its run conditions. Selecting **Run Recipe** from the **Functions** menu or clicking on the **Run Icon** will do the same if there is a current sensor displayed in the **Sensor Toolbar**. Otherwise a list of available sensors is displayed (see Figure 4-1). Selecting the desired sensor will then display a TWare32 **File Open** dialog. When the desired recipe is selected it will open up the **Monitor** screen and run the selected recipe according to its run conditions.

Selecting a sensor from the **Sensor Toolbar** will display a list of available functions for that sensor. Selecting either **Monitor** or **Run Recipe** from that list will have the same effect as selecting that function from the context menu.

Figure 4-1 Selecting A Sensor



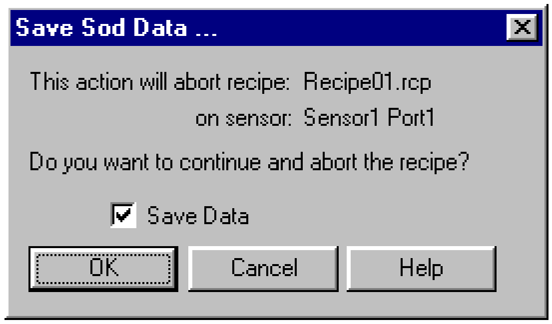
If **Monitor** is already running, a new recipe can be started by one of the following:

- selecting the desired recipe from the list of recipes on the control panel.
- selecting **Browse** from the recipe list on the control panel.
- selecting **Functions >> Run Recipe** from the **Functions** menu.
- selecting **Monitor >> Select Recipe** from the **Monitor** menu.

Figure 4-2 Selecting A New Recipe To Run

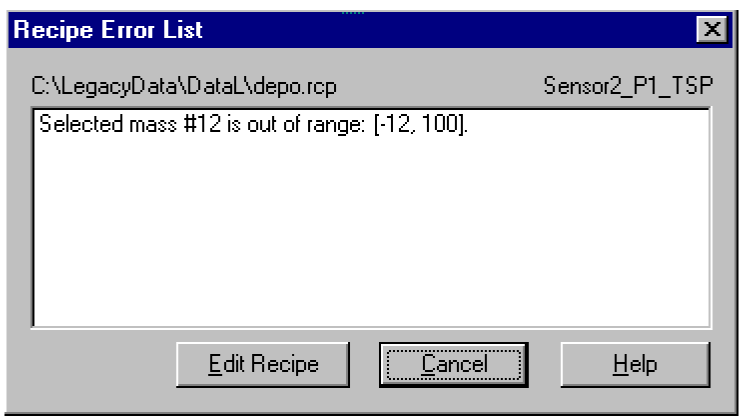
If a recipe is currently running, and has been programmed to save data, a dialog will be displayed (see Figure 4-3) asking for confirmation before the current recipe is stopped. Clicking **OK** will stop the current recipe. If the **Save Data** box is checked then the data acquired so far will be saved to the file specified in the recipe. Clicking **Cancel** will return to running the recipe. If the current recipe is not saving data or the current recipe is aborted (see Figure 4-3 on page 4-5) then a file **Open** dialog will be displayed (refer to section 2.6 on page 2-9). Selecting the desired recipe from the list will run it.

Figure 4-3 Warning Dialog When Interrupting A Recipe



The **Select Recipe to Run** dialog, which is produced when the **Run Recipe** selection is made, allows full navigation of the hard drive to any stored recipe. However, it is highly recommended to run only recipes created for the sensor being run. In the case where an incompatible recipe is selected, an error dialog will appear as shown in Figure 4-4.

Figure 4-4 Recipe Error List Dialog

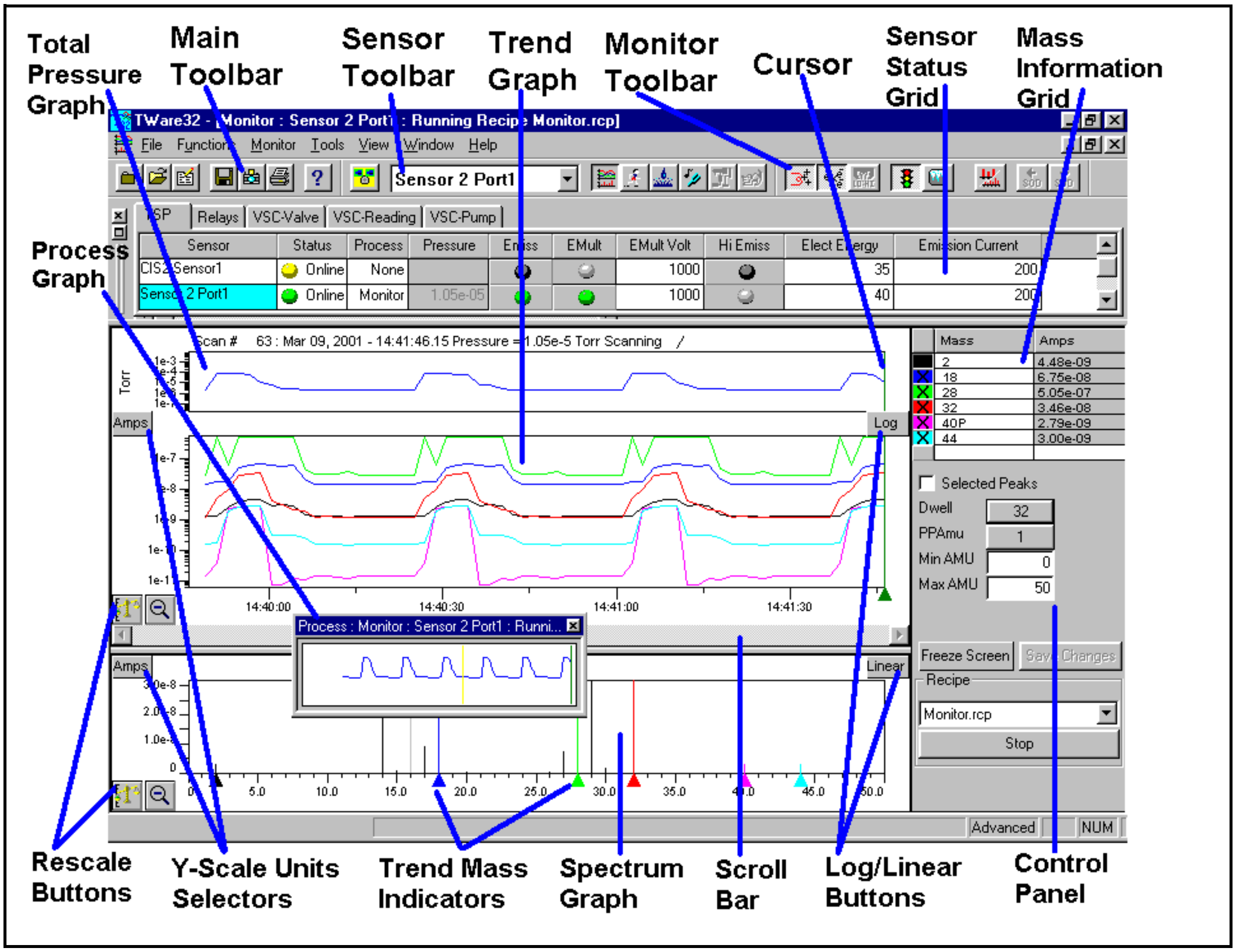


The error shown in Figure 4-4 indicates that the mass programmed in channel 12 of the list is outside the operating range of the Transpector sensor. This will occur if, for example, an attempt to run a recipe for a 200AMU sensor is made on a 100AMU sensor. The AMU range of the target sensor is shown in brackets (including Special Peaks, shown as negative numbers).

4.3 The Monitor Display

Regardless of how the **Monitor** is invoked, the display is the same. Figure 4-5 shows a typical **Monitor** display with its major parts identified. The exact configuration can be modified through options in the **Monitor Property** sheet and Context Menu as described below.

Figure 4-5 The Monitor Display



Total Pressure Graph . . . . A plot of total pressure versus time. The Y-axis is always logarithmic in the current pressure units and the X-axis is always to the same scale as the **Trend** graph.

Process Graph . . . . A plot of the total pressure profile. Has moveable bars to change the x-axis of the **Total Pressure** and **Trend** graphs.

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Main Toolbar . . . . A toolbar which contains standard functions available in most modes of the program, such as **Open**, **Close**, or **Print**. This toolbar is dockable and can be hidden with the **View >> Main Toolbar** command.

Sensor Toolbar . . . . A toolbar from which sensors can be selected and the function or mode in which to run the sensors can be launched. This toolbar is dockable and can be hidden with the **View >> Sensor Toolbar** command.

Monitor Toolbar. . . . . A toolbar which is only available when in the **Monitor** mode. This toolbar contains several commonly used functions in the **Monitor** module. It is dockable and can be hidden with the **View >> Function Toolbar** command.

Trend Graph . . . . A plot of ion abundance versus time of selected masses of a run. If in **Selected Peaks** mode, the traces are those of the **Selected Peaks**. If in **Spectrum** mode, masses can be selected in two ways — by selecting a mass from the grid, or by dragging the **Selected Mass Indicators** (colored triangles) in the **Spectrum** graph.

Cursor . . . . Indicates the position in the **Trend Graph** of the spectrum being displayed in the **Spectrum Graph**. By placing the mouse pointer over the Cursor and pressing the left mouse button, the display is frozen and the Cursor can be dragged to a new position. Releasing the mouse button will change the **Spectrum** graph to show the spectrum under the Cursor. Clicking on the **Freeze Screen** button will resume updating the display. Data continues to be acquired while the display is frozen. Double-clicking the left mouse button anywhere on the **Trend Graph** will place the cursor at that position.

Sensor Status Grid . . . . A dockable tabbed grid that indicates status for each Transpector and CIS2 component.

Mass Grid . . . . In **Selected Peaks** mode, this grid indicates the masses being observed and their intensities. Clicking on the right column header gives a list containing **Intensity, Dwell, Mat**erial **Fact**or, **Mult**iplier**, Offset, Lo**w **Relay, Hi**gh **Relay, Relay Num**ber, and **Edit Current Recipe**. Select the one to be displayed in the right column. In **Spectrum** mode, only **Intensity** will be displayed. The check boxes on the left of the grid indicate the color of the trace in the **Trend Graph**. Clicking on the box toggles the display of that mass on and off. An **X** in the box indicates it is being displayed.

Rescale Buttons. . . . . Clicking on these buttons rescales the corresponding display so the largest intensity in view is about 95% of full scale.

Y-Scale Units Selectors . . . . Clicking on these buttons displays a list containing **Amps, PP,** and **PPM**. Selecting **Amps** will display the ion current, selecting **PP** will display the abundances as partial pressures in the current pressure unit (refer to Figure 3-23 on page 3-26), selecting **PPM** will display the abundances in parts per million relative to a specified mass. In **Spectrum** mode, the partial pressures are expressed as Nitrogen equivalents.

Trend Mass Indicators . . . . In **Spectrum** mode, these triangles indicate the masses which are being displayed in the **Trend Graph** and **Mass Grid**. Dragging these indicators will change the mass in the **Trend** and **Mass Grid**. These indicators are not present in **Selected Peaks** mode.

Spectrum Graph. . . . . In **Spectrum** mode, this is a plot of ion abundance versus mass at the current resolution. In **Selected Peaks** mode it is a bar plot of ion abundance at the selected masses.

Scroll bar . . . . Sliding the **Scroll Bar** allows viewing of data which has scrolled off the left side of the screen. When the **Scroll Bar** is moved, the display is automatically frozen. Clicking on the **Freeze Screen** button, when frozen, will resume updating the display.

Log/Linear Buttons . . . . Clicking on either button allows the selection of either a logarithmic or a linear scale on the Y-axis for that graph.

Control Panel . . . . The **Control Panel** provides quick access to functions needed while running monitor. In **Spectrum** mode, controls are provided to change to **Selected Peaks**, change the Dwell, points per AMU, the mass range being observed, freeze and unfreeze the display, change recipes, and start/stop the data acquisition. In **Selected Peaks** mode, controls are provided to change to **Spectrum** mode, freeze and unfreeze the display, change recipes, save changes to recipes and start/stop the data acquisition.

NOTE: Starting and stopping the data acquisition during Monitor restarts scanning — it does not continue scanning, it restarts scanning. All data displayed at the time the **Start** button is pressed is lost if it has not been captured using **Snapshot** (see section 4.4.2 on page 4-22) or **Monitor >> Save Data**.

The five main parts of the display — **Total Pressure Graph**, **Process Graph**, **Trend Graph**, **Spectrum Graph**, and **Control Panel** — can be individually displayed or hidden by selecting or de-selecting the corresponding item from the context menu (see Figure 4-7 on page 4-12). These are also available on the **Monitor Properties** page. Display of the **Sensor Status Grid** can be selected or de-selected from the **View Menu**.

4.3.1 The Total Pressure Graph

The **Total Pressure** graph is a plot of the total pressure of the RGA versus time. It is always on the same time scale as the **Trend** graph, allowing the total pressure to be easily correlated with the abundances of individual ions.

If either the **Total Pressure** or **Trend** graphs are visible, a line containing information on the current data is displayed on the top of the window. The information displayed includes the current scan number (or the scan at the Cursor if the display is frozen), the date and time at the Cursor, and the total pressure at the Cursor. A rotating bar indicates that data are being acquired.

The **Total Pressure** is always displayed as a logarithmic display. Clicking near the top or bottom of the Y-axis allows the range of the Y-axis to be changed. See section 4.3.6, Getting A Closer Look, on page 4-17 for details on how to adjust the scale of the display.

4.3.2 The Process Graph

The **Process** graph provides a profile of the process based on the Total Pressure measured by the Transpector (or Total Pressure Source). There are no X or Y-axis units in this window and the profile is only provided as a visual indicator of the overall process.

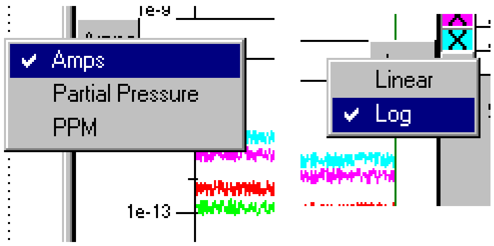
The **Process** graph does provide two yellow cursors which can be used to set the X-axis width of the **Trend** and **Total Pressure** graphs. The graph window is dockable and can be floated to any point within the view (as shown in Figure 4-5).

4.3.3 The Trend Graph

The **Trend** graph provides a history of the process. The masses selected in the **Mass Grid** are displayed as a function of time. It is possible to view the complete data set in one window or a smaller section of the whole display. If less than the whole data set is displayed, the **Scroll Bar** on the bottom of the window can be used to move around the data. See section 4.3.6, Getting A Closer Look, on page 4-17 for more information on zooming and expanding the display.

The Y-axis units can be selected between **Amps**, **PP**, and **PPM** for displaying ion current, partial pressures, or parts per million respectively. Clicking on the units displays a menu (see Figure 4-6) from which you can choose the units. In the same manner it is possible to change between a logarithmic and a linear display by clicking on the word **Linear** or **Log** and selecting the desired scale from the pop up menu.

Figure 4-6 Selecting Axis Units and Log/Linear



A specific scan can be examined by placing the mouse pointer over the Cursor, pressing the left mouse button and sliding the Cursor to the left. This automatically freezes the display if data are currently being acquired and changes the spectrum or bar display to show the data at the Cursor. The Cursor position can also be set by right-clicking and selecting **Select Scan** from the context menu (Figure 4-7), which changes the Cursor to Crosshairs, then clicking on the desired scan. This method is especially convenient when moving the Cursor a long distance. Fine adjustments can be made to the Cursor position with the cursor keys on the keyboard. Each time the keyboard's left or right cursor key is pressed, the Cursor moves one scan in that direction.

Annotated Marks may be added to the **Trend Graph** to identify specific events that need to be correlated with the data. Right-clicking on the **Trend Graph** and selecting **Set Mark** will change the Cursor to Crosshairs. Position the Crosshairs at the point on the **Trend** where you want the mark and click the left mouse button. This will display the dialog shown in Figure 4-8. The time at the Crosshairs and the scan number are displayed. If the **Snap to Scan** box is checked, the exact scan number can be typed into the **Scan Number** box. A short label (16 characters maximum) and a long annotation can be typed in if desired. The short label will be displayed in the status bar at the bottom of the screen if the Cursor is positioned over the mark. Clicking on an existing mark on the **Trend Graph** will display the **Set Mark** dialog (see Figure 4-8) showing the details of the mark. The color of the mark can be selected and if the **Hide Mark** box is checked then the mark will not be displayed on the **Trend Graph**. Clicking **OK** will save the mark.

Figure 4-7 Context Menu In Trend Graph

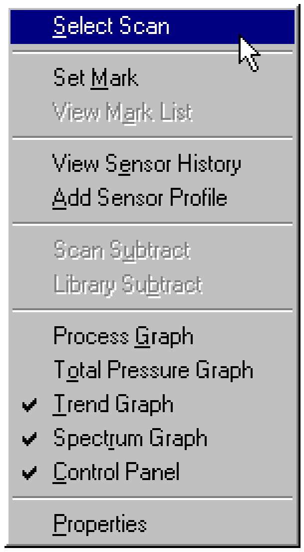
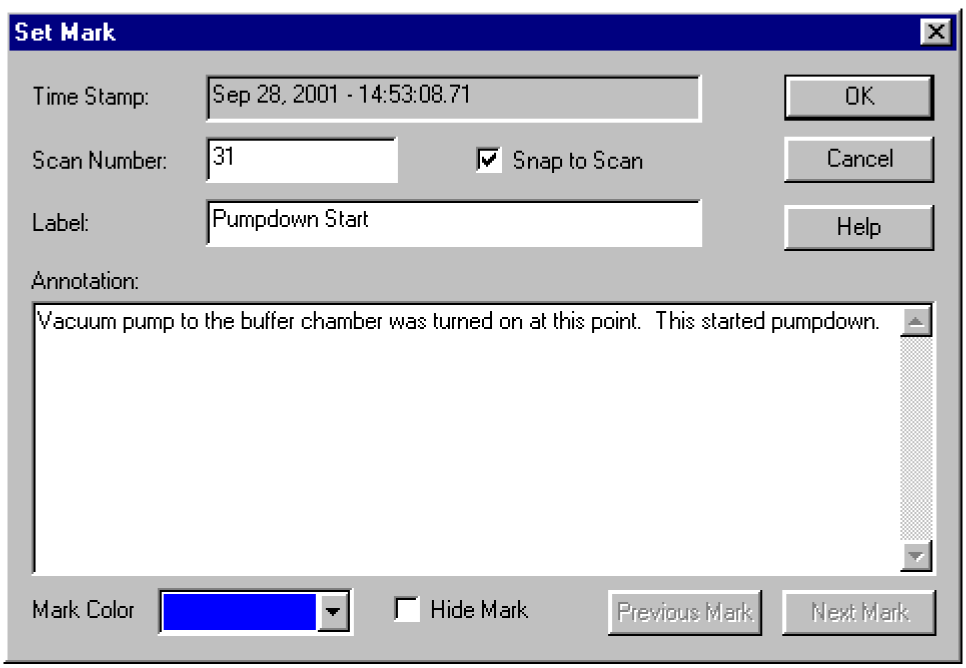
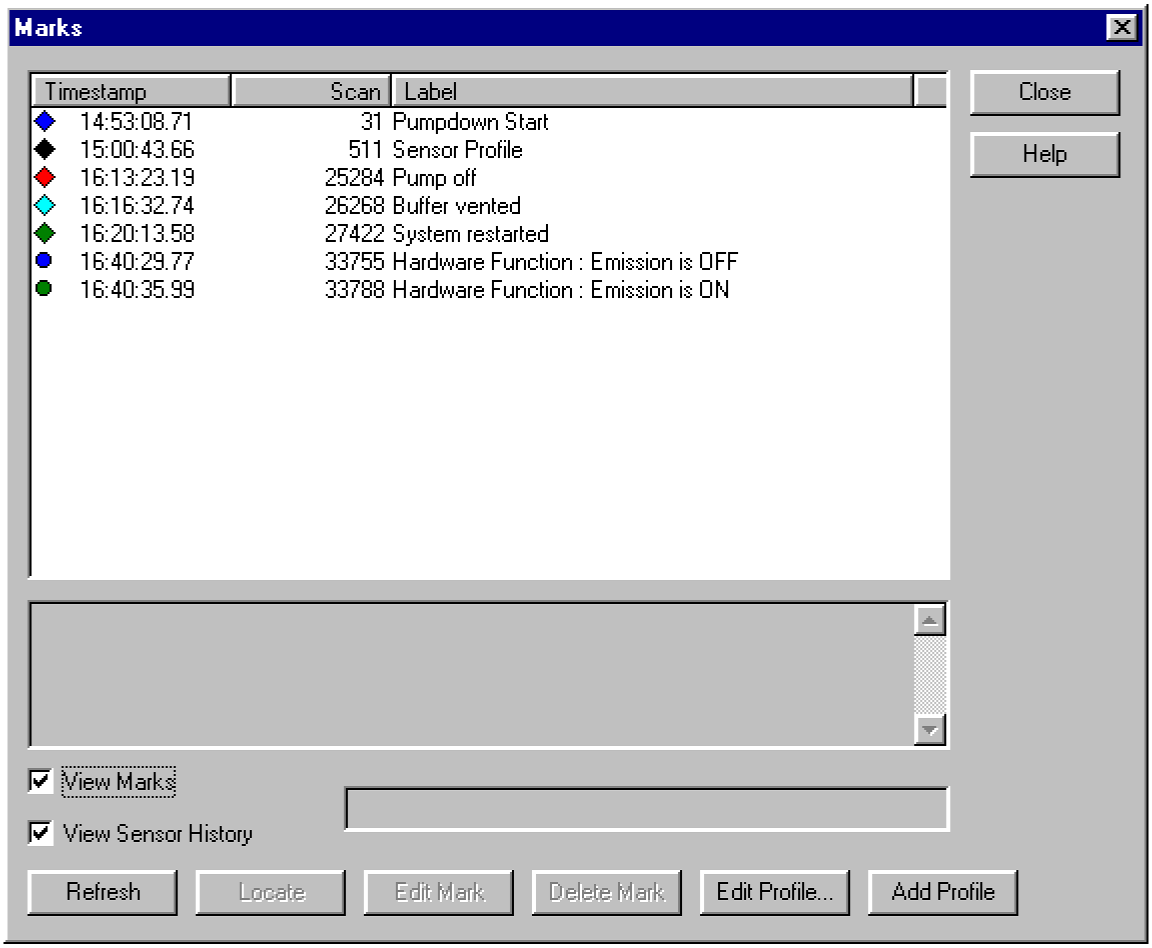


Figure 4-8 Setting Marks In Trend Graph



If there are any marks in a data set, the **View Mark List** will be enabled in the **Monitor** and **Monitor Context Menus**. Selecting this menu item will display the **Marks** dialog shown in Figure 4-9. The list shows the colored diamond corresponding to the marker on the graph, timestamp, scan number, and short label for all the marks in the current data set. Highlighting a mark will display its long description in the text box below the list.

Figure 4-9 Viewing Marks and Sensor History



This is the same dialog displayed when **View Sensor History** is selected from the **Trend** context menu. The **View Marks** and **View Sensor History** check boxes can be used to display either **Marks**, **Sensor History**, or both. **Marks** are identified in the list and on the **Trend Graph** by colored diamonds, whereas **Sensor History** entries are identified in the list by colored circles. The color of the circle indicates something about the event: **Green** is turning something on, **Blue** is turning something off, **Red** is an error, **Yellow** is a warning. The sensor history is not identified on the graph. The buttons on the dialog have the following effects:

Refresh . . . . Refreshes the list with any new entries which may have occurred since the dialog was displayed.

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Locate . . . . Dismisses the dialog, freezes the display if it is not already frozen, and positions the Cursor at the scan corresponding to the highlighted **Mark** or **Sensor History** item. A vertical line is drawn at the location of the event or mark on the Trend. The line is cleared when the **Freeze Screen** button is pressed.

Edit Mark . . . . Displays the **Marks** dialog (refer to Figure 4-8) for the highlighted **Mark** and allows the various fields to be modified. **Sensor History** entries cannot be edited.

Delete Mark . . . . Removes the highlighted **Mark** from the list. **Sensor History** entries cannot be removed.

Edit Profile . . . . Allows customizing of the system and sensor profile for the **Sensor History**. See section 4.6, The Sensor Profile, on page 4-32 for details.

Add Profile . . . . Allows a customized profile of the system and sensor to be added to the **Sensor History**. See section 4.6, The Sensor Profile, on page 4-32 for details.

Close . . . . Closes the dialog, returning control to the TWare32 application.

When viewing recalled data or when the display is frozen, the **Subtract Feature** can be enabled. Right-clicking in the **Trend Graph** displays a context menu like the one in Figure 4-7. Selecting the **Set Subtract** item marks the scan under the Cursor as the reference scan and subtracts it from all the other scans in the data set. The **Subtract** item toggles the subtraction on and off (subtraction is on when checked). This feature can be used to monitor deviations from a normal profile, or to remove background levels from the data.

Other items in the context menu allow the various sections of the display to be enabled or disabled and the **Monitor Properties** to be viewed or modified.

4.3.4 The Spectrum Graph

The lower portion of the screen can be used to display the mass spectrum at the Cursor. This is the current scan while acquiring data, but can be moved when viewing recalled data or when the display is frozen.

In **Spectrum** mode, the data between the minimum and the maximum AMU are displayed at the selected resolution. If the resolution is set to one point per AMU, a stick plot is displayed. If the resolution is greater than one point per AMU, an analog plot is displayed. Small triangular markers (**Trend Mass Indicators**) along the X-axis indicate the trend masses. By placing the mouse pointer over a triangular marker and pressing the left mouse button, these markers can be grabbed and dragged to change the mass being displayed in the **Trend**. In **Selected Peaks** mode the selected masses are displayed as bar graphs in the **Spectrum Graph**.

The Y-axis units can be selected between **Amps**, **PP**, and **PPM** the same way as the **Trend Graph** described above. The display can be switched between **Log** and **Linear** the same as with the **Trend Graph** described above.

4.3.5 The Mass Information Grid

The Mass Information Grid is a three column table which displays information about the masses being observed. The first column has colored boxes with ✔ (checkmark) in them. The color corresponds to the color of the trace in the **Trend Graph** and the ✔ indicates whether or not that mass is displayed in the **Trend**.

The second column contains the mass for that trace in **Spectrum** mode, or the mass for that channel in **Selected Peaks** mode. New masses can be typed in or selected from the pull-down list in **Selected Peaks** mode. In **Selected Peaks** mode the name of the species attributed to that ion is also displayed (for example, 18 Water).

The third column displays the intensity at the Cursor for **Spectrum** mode. In **Selected Peaks** mode the third column can display **Intensity**, **Dwell**, **Mat**erial **Fact**or, **Multiplier**, **Offset**, or **Relays**. Clicking on the column header (see Figure 4-10) presents a menu from which one of these labels can be selected. The last item in this menu (**Edit Current Recipe**) displays a tab oriented dialog of the **Recipe Editor** like the example shown in Figure 4-11. This dialog allows you to view the different **Selected Peak** parameters and edit (and save) the values as necessary.

See Chapter 5 for information on editing recipes and the **Selected Peak** parameters.

Figure 4-10 Mass Grid, Column Header Menu

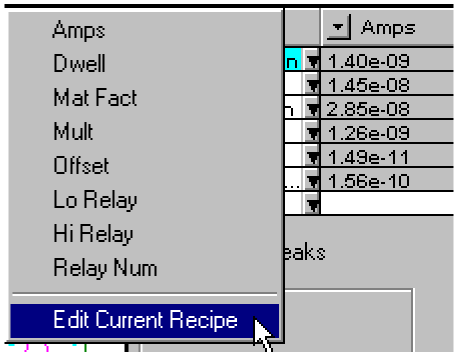
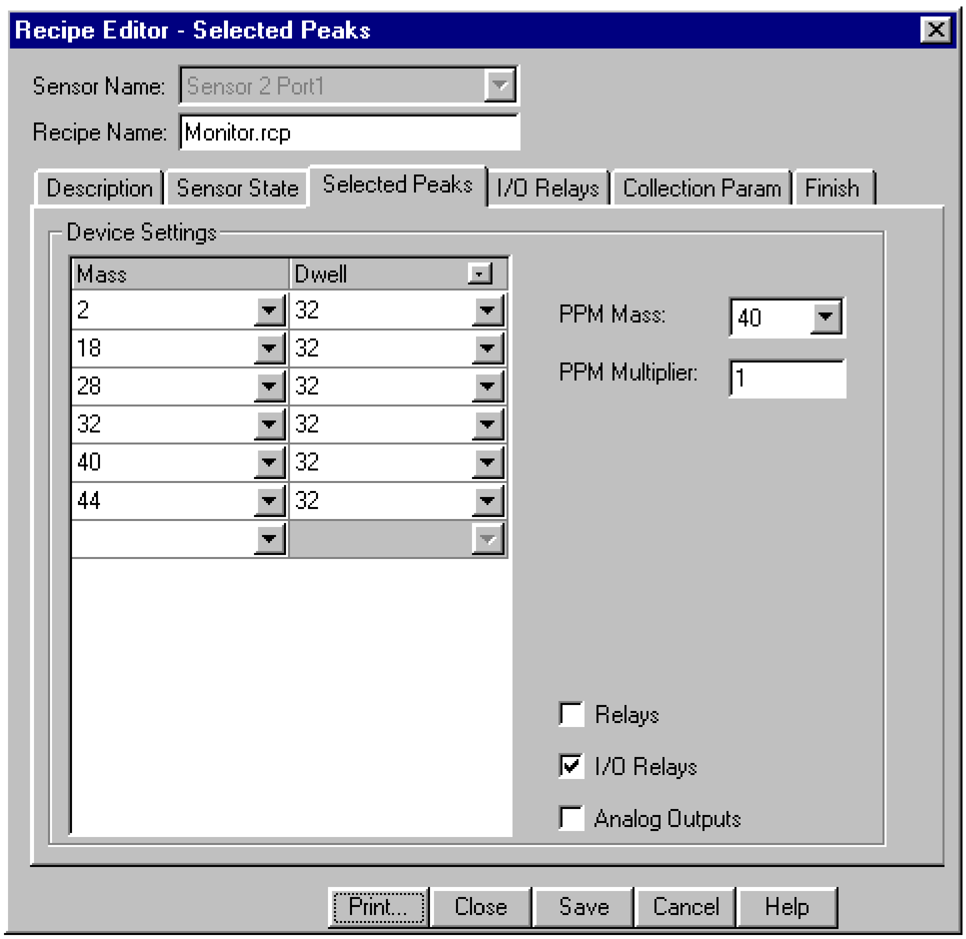


Figure 4-11 Selected Peaks Table Edit



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4.3.6 Getting A Closer Look

There are a few different ways to get a closer look at the data — zoom in on an area of interest, expand the trend or spectrum to fill the whole screen, or adjust the scale of the axis to show more detail. These are discussed below.

4.3.6.1 Zooming

Pressing the left mouse button with the mouse pointer in the **Trend** or **Spectrum Graph**, moving the mouse diagonally across the view and releasing it, will draw a box. This box can be moved by pressing the left mouse button while inside the box and moving the mouse. The box can be resized by placing the mouse pointer over an edge or corner, pressing the left mouse button and moving the mouse. Clicking inside the box will expand the portion of the display inside the box to fill the view. Clicking outside the box will cancel the zoom and clear the box. When the display is zoomed the display is automatically frozen. Clicking in the display again will expand it to full scale. Clicking on the **Freeze Screen** button will resume updating the display and expand the display to full scale.

The **Spectrum Graph**, when in **Selected Peaks** mode, can only be zoomed in the vertical direction. Clicking in the **Spectrum Graph** and moving the mouse up or down will display two horizontal lines. Clicking in between these two lines will expand the Y-axis so the data between the two lines is full scale. Expanding the **Spectrum Graph** does not freeze the display. Clicking in the display again will restore the display to full scale.

4.3.6.2 Adjusting The Size Of The Views

Grabbing the bar which separates the **Trend** from the **Spectrum** graph and dragging it will resize both views, allowing you to expand the one which is of interest and shrink the one which is not. The **Total Pressure**, **Trend**, and **Spectrum** graphs, as well as the **Grid/Control Panel,** can also be turned off completely using the **Monitor Property** sheets described in section 4.4.4 on page 4-26 or the context menu shown in Figure 4-7 on page 4-12.

4.3.6.3 Rescaling The Axes

The width of the **Trend** X-axis can be set in the **Monitor Properties** page described in section 4.4.4 on page 4-26. In addition, clicking near the left or right side of the X-axis displays a dialog (see Figure 4-12) which allows the width of the display to be adjusted. There is also an **Zoom Out** button (see Figure 4-13) which will scale the X-axis to the width of all data collected during the run. This button is convenient for viewing data collected over a long period of time.

Rescaling of the Y-axis can be done automatically by clicking on the **Rescale** buttons in the lower left corner of the display.

Figure 4-12 Monitor Width Adjustment

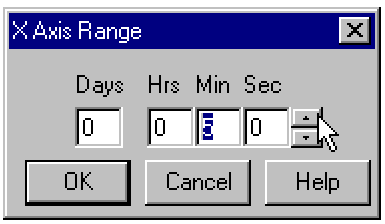


Figure 4-13 Zoom Out button

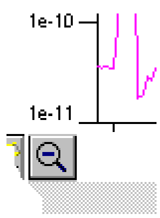
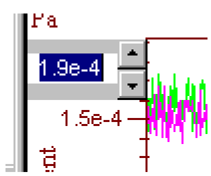


Figure 4-14 Adjusting the Scale of the Y-axis



The scale of the Y-axis can be adjusted by clicking near the top or bottom of the axis and entering a new upper or lower limit for the axis. The spinner arrows can also be used to adjust the axis scale instead of entering a specific value.

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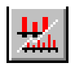
4.4 Monitor Commands

4.4.1 Changing Parameters

When not saving data (as with the default `Monitor.rcp`), when scanning has been stopped with the **Stop** button, or before starting scanning with the **Start** button, several parameters can be changed using the controls on the **Control Panel**, **Monitor Toolbar**, and **Monitor Menu**.

4.4.1.1 Commands In Both Spectrum And Selected Peak Modes

The following commands are available in both **Spectrum** and **Selected Peak** modes.

Selected Peaks  . . . . Clicking the box on the **Control Panel** or the button on the toolbar will toggle between **Selected Peaks** and **Spectrum** modes. When selected, **Selected Peaks** mode is enabled, otherwise **Spectrum** mode is enabled.

Freeze Screen 

. . . . Selecting the **Freeze Screen** button on the **Control Panel** or **Monitor Toolbar** will freeze the display to allow examination of a portion of the **Trend** without it scrolling off the screen. When the screen is frozen the button on the **Control Panel** is yellow and the button on the toolbar is depressed to indicate that the display is not being updated. Several display manipulating actions (described above) will automatically freeze the display. Clicking again will unfreeze the display.

NOTE: Data continue to be collected while the display is frozen.

Recipe

Recent Recipe List . . . . The current recipe is displayed in a box on the **Control Panel**. Clicking on the arrow on the right of the box will display a list of recently used recipes. Selecting one of the listed recipes immediately stops the running recipe and starts the selected recipe. Selecting **Browse** will bring up a file **Open** dialog which will allow you to select a recipe to run.

Start/Stop, 

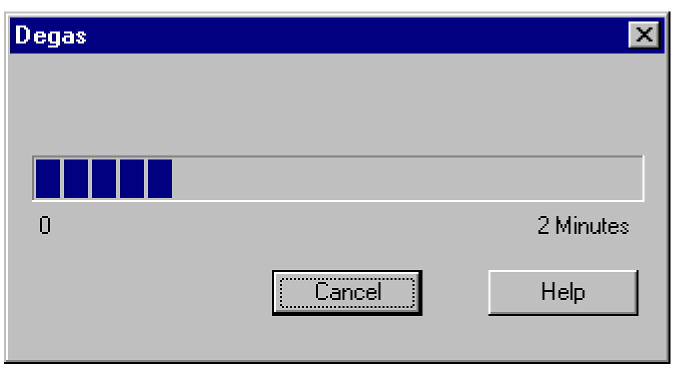
. . . . When scanning, the label on the **Control Panel** button will be **Stop** and the toolbar button will be depressed. Selecting either button will stop the scanning. When not scanning, the label on the **Control Panel** button will be **Start** and the toolbar button will be raised. Selecting either button will start the scanning.

NOTE: If a sensor goes off-line while acquiring data, when the sensor comes back on-line it will not restart the acquisition until the **Start** button is selected.

Monitor >> Advanced >> Set Sensitivity. . . Allows the sensitivity for this sensor to be set. See section 4.4.3 on page 4-24 for details.

Monitor >> Advanced >> Degas . . . . Begin degassing the sensor. The process lasts about two minutes and stops and restarts data collection. A dialog is displayed with a bar indicating the Degas progress. See Figure 4-15.

Figure 4-15 Degas progress dialog



Advanced >> Hi Emission . . . . . . On sensors which can vary the emission energy (XPR and CIS), this command toggles between the high and low settings. When checked, the high value is used; when not checked, the low value is used.

Properties. . . . . Displays the property sheet for **Monitor**. See section 4.4.4 on page 4-26 for details.

4.4.1.2 Commands In Spectrum Mode

In **Spectrum** mode (when **Selected Peaks** is not checked) the following commands are available.

Dwell . . . . Clicking the **Dwell** button on the **Control Panel** will display a list of available dwell times (in msec). Select the desired dwell from the list to change dwell or integration time.

PPAmu . . . . Clicking the **PPAmu** button on the **Control Panel** will display a list of available resolutions. Select the number of points per AMU to be used for collecting data.

MinAMU . . . . Enter the minimum mass to be scanned in the box on the **Control Panel**. It must be a value between zero and the **MaxAMU**.

MaxAMU . . . . Enter the maximum mass to be scanned in the box on the **Control Panel**. It must be a value between **MinAMU** and the upper limit of the mass filter.

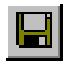
NOTE: Changing any of the parameters above will stop and restart the monitor scanning. If saving this data is desirable, **Snapshot** (see section 4.4.2 on page 4-22) the current monitor data prior to changing a parameter.

4.4.1.3 Commands In Selected Peaks Mode

Monitor >> Advanced >> Show Relays . . . Selecting this command from the **Monitor Menu** in **Selected Peaks** mode toggles the display of the relay status on the **Control Panel** on (checked) and off.

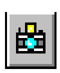
4.4.2 Saving And Recalling Data And Recipes

Several commands are available to save and recall the data to a disk file or to save the current parameters as a new recipe. These commands are described in this section.

Save Current Recipe  . . . . . Selecting **Monitor >> Save Current Recipe,** or clicking on the **Save As** icon or the **Save Changes** button, will save the current parameters as a recipe. A file selection dialog will be displayed to allow a name and/or path to be specified. The saved recipe can be edited using the **File >> Edit Recipe** command (see Chapter 5) or run as described in the beginning of this chapter.

Edit Current Recipe . . . . Selecting **Monitor >> Edit Current Recipe** will open the **Recipe Editor** as a tab dialog so that changes can be made to the current running recipe. If changes are made, and saved, the recipe will stop and restart automatically.

Monitor>>Save Data. . . . . Selecting **Monitor>>Save Data** will save all data that has been collected since the monitor session was started. This provides a way to save data for the **Monitor** recipe, or any recipe, that is programmed to not save data automatically.

Snapshot  . . . . Selecting **File >> Snapshot** or clicking on the **Snapshot** icon will save the portion of data *currently being displayed* in a SOD file. The name of the file will be **Mon*yymmdd-nn*.sod**, where ***yy*** is the year, ***mm*** is the month, ***dd*** is the day, and ***nn*** is a count within each day to keep the filenames unique. The data will be stored in the default data directory for the current sensor. **Snapshot** is available whether or not data are being saved automatically to a SOD file.

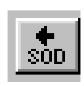
NOTE: **Snapshot** only saves the data displayed at the moment it is performed. If one hour of data has been collected, and the X axis width is set to ten minutes, **Snapshot** will save only the ten minutes of data displayed. Changing the **X** axis width will allow more data to be saved per **Snapshot**.

NOTE: Selecting the **Zoom Out** button (refer to Figure 4-13 on page 4-18) will display all the data currently collected. The **Snapshot** button can then be used to save it all.

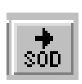
NOTE: No dialog or visual prompt is shown when a **Snapshot** is saved. However, the destination path and filename are displayed in the **Status Bar** at the bottom of the screen.

Open  . . . . Open (recall) a file from disk. A file open dialog is displayed from which the desired SOD file is selected. Recalled data is displayed in a **Monitor** window with the commands that control data acquisition and the sensor state disabled.

When viewing data that have been recalled from disk, the following two commands are available to step through a series of data files.

Previous SOD File 

. . . . . . Selecting **Monitor >> Previous SOD File** or clicking on the **Previous File** icon closes the current file and opens the SOD file which precedes it in the directory.

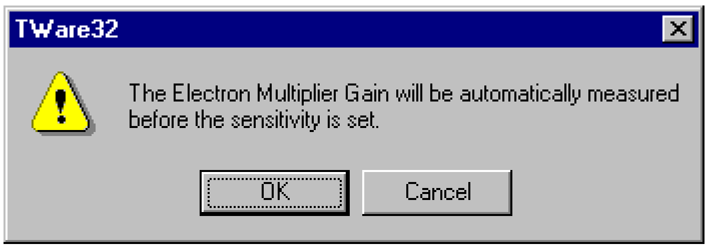
Next SOD File 

. . . . Selecting **Monitor >> Next SOD File** or clicking on the **Next File** icon closes the current file and opens the SOD file which follows it in the directory.

4.4.3 Setting Sensitivity

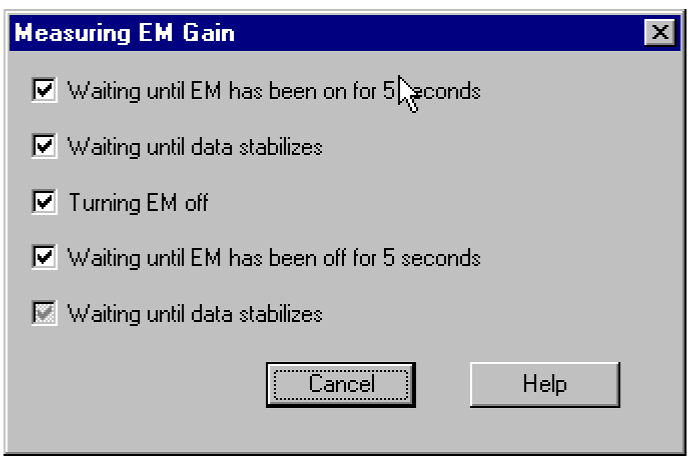
Normally, the sensitivity is set through the calibration sequence in the **Tune** module (see section 7.8, Calibrating The Instrument, on page 7-19). However, at times it is convenient to set the value directly from the **Monitor** module. Selecting **Monitor >> Advanced >> Set Sensitivity** starts this process. If this sensor has an Electron Multiplier which is currently on and has not yet been calibrated, a warning is issued (see Figure 4-16).

Figure 4-16 EM Calibration Warning



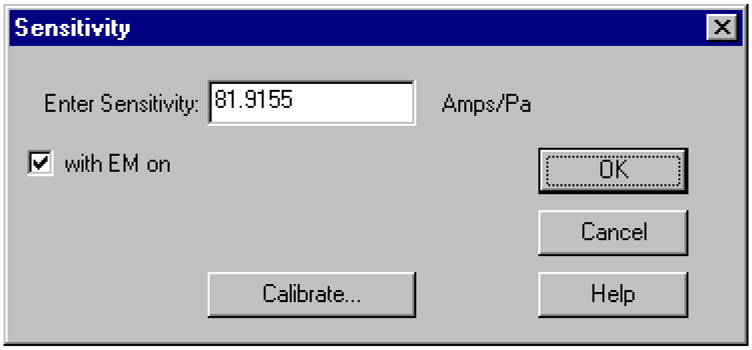
Selecting **OK** will start the EM calibration sequence. The progress of this sequence is tracked in the dialog shown in Figure 4-17.

Figure 4-17 Measuring The Electron Multiplier Gain



When the EM Gain measurement is finished, or if it is not necessary, the sensitivity dialog shown in Figure 4-18 is displayed.

Figure 4-18 Entering Sensitivity Value

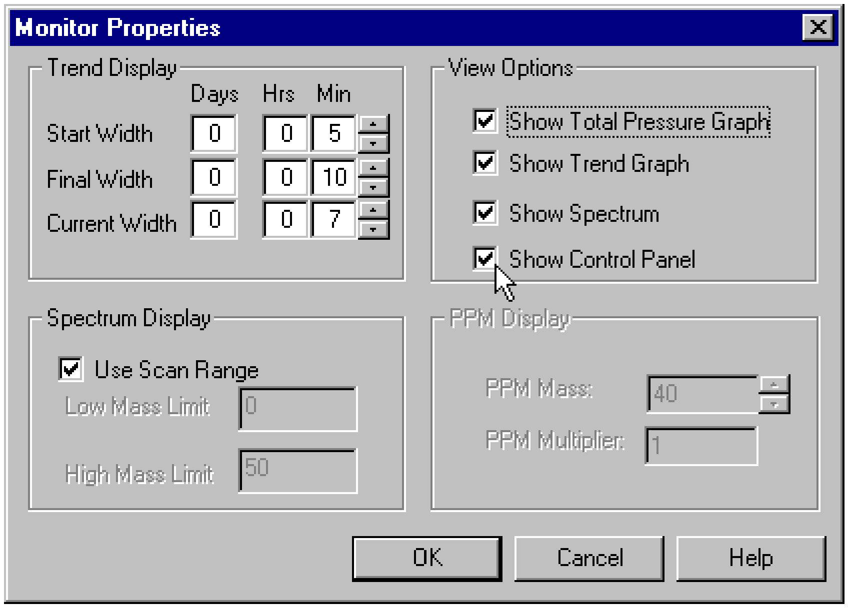


The effective sensitivity can be entered in **Amps/Pa** units in the **Enter Sensitivity** box, or the **Calibrate...** button can be selected. Clicking the **Calibrate...** button will start the sensitivity calibration sequence described in the **Tune** section (see section 7.8.2, Calibrating the Sensitivity, on page 7-23).

4.4.4 Monitor Properties

The **Monitor Properties** dialog can be displayed by selecting **Monitor >> Properties** from the main menu, or by selecting **Properties** from the context menu. The **Monitor Properties** dialog is shown in Figure 4-19.

Figure 4-19 Monitor Properties Sheet



Trend Display

Start Width . . . . Specify the width in days, hours, and minutes, of the displayed portion of the trend display when first starting **Monitor** or **Run**.

Final Width . . . . Specify the maximum width in days, hours, and minutes, of the displayed portion of the data. The display will start with a width of **Start Width** and each time the display fills up the width is doubled until it reaches the **Final Width**.

Current Width . . . . Specify the width in days, hours, and minutes, of the displayed portion of the **Trend Graph** at any time during data collection.

Manually setting the **Current Width** will override the automatic axis change towards the **Final Width**.

Spectrum Display

Use Scan Range . . . . If checked, the display width of the **Spectrum** display will be the range being scanned (**Spectrum** mode only). Otherwise, the **Spectrum** display width is set separately.

Low Mass Limit . . . . Specify the mass of the left edge of the **Spectrum** display. For display only, the actual data scan width is set in the **Control Panel**.

High Mass Limit . . . . Specify the mass of the right edge of the **Spectrum** display. For display only, the actual data scan width is set in the **Control Panel**.

View Options

Show Total Pressure Graph . . . . When selected, the **Total Pressure** graph will be displayed on the **Monitor** screen.

Show Trend Graph . . . . When selected, the **Trend Graph** will be displayed on the **Monitor** screen.

Show Spectrum . . . . When selected, the **Spectrum Graph** will be displayed on the **Monitor** screen.

Show Control Panel . . . . When selected, the **Control Panel** will be displayed on the **Monitor** screen.

PPM Display Options

PPM Mass . . . . Mass to be used as the reference for displaying intensities as parts per million.

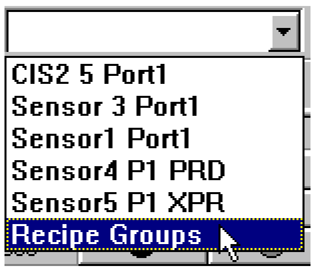
PPM Multiplier . . . . Enter a multiplier to be applied to the PPM mass intensity before calculating the PPM ratio.

4.5 Running a Group Recipe

A **Recipe Group** can be run in the same manner as a single recipe — from the **Functions >> Run Recipe** menu item, by clicking on the **Run Icon** on the **Sensor Toolbar**, by selecting **Run Recipe** from the context menu when the mouse pointer is on a sensor in the **System Setup Screen**, or by selecting **Recipe Groups** from the **Sensor Toolbar** as shown in Figure 4-20.

For information on creating and editing a **Recipe Group**, see section 5.13, Recipe Groups, on page 5-32.

Figure 4-20 Selecting Recipe Groups from the Sensor Toolbar



Once **Recipe Groups** has been selected, a standard File Open dialog will appear from which a group recipe (file extension of **.grcp**) can be selected. The group recipe will load immediately and start based on the **Group Recipe Start Condition**.

The **Recipe Group** view, shown in Figure 4-21, displays a sectioned window with control buttons, recipe information and recipe status. The data graphs (Process Profile, Total Pressure, Trend and Spectrum) for the last recipe loaded is displayed in the foreground. Each data view can be brought to the foreground by selecting the recipe and sensor name in the Group Recipe information box. All data views can be displayed by using the **Tile** selections in the **Window** menu.

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Figure 4-21 Recipe Group, Started

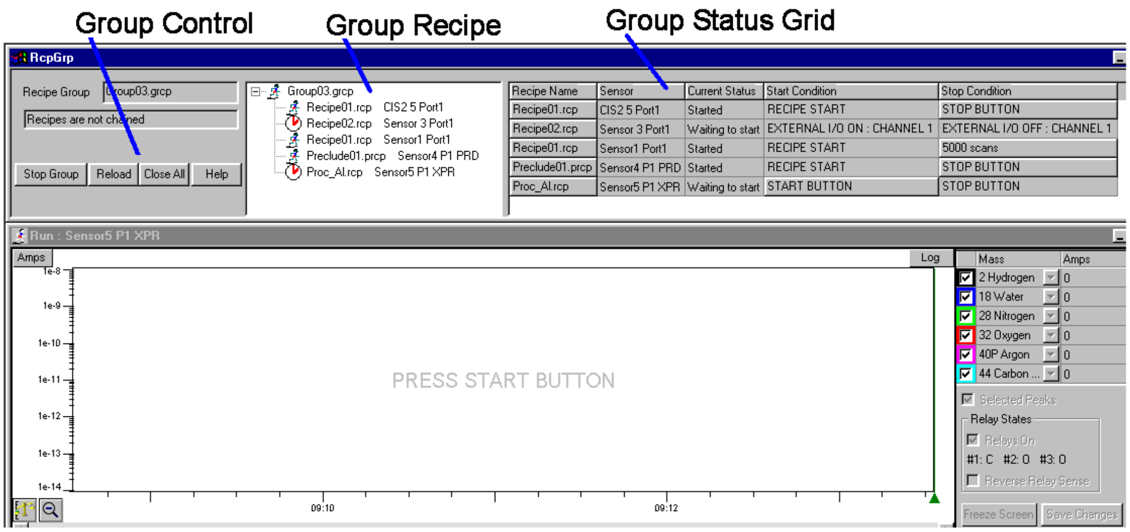
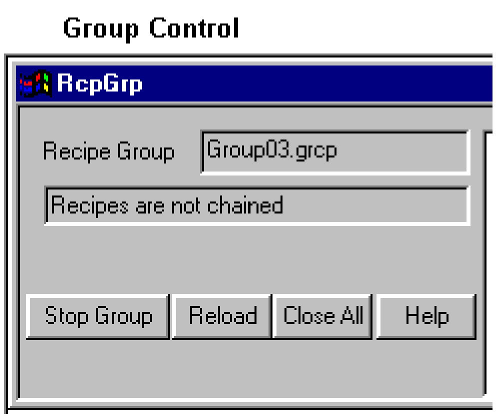


Figure 4-22 Recipe Group Control



The left side of the Recipe Group window provides basic information about the Group and three control buttons that affect the Group.

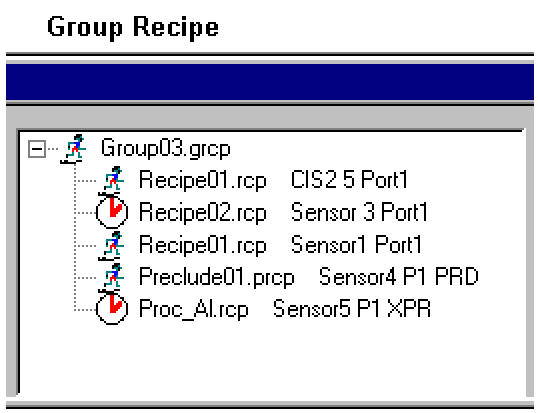
Recipe Group . . . . Displays the name of the loaded **Group Recipe**. The **Chain** status of the group is also displayed.

Start/Stop Group . . . . This button, when displayed as **Stop**, will stop all running recipes regardless of the individual **Stop Conditions** of each recipe. This is a convenient way to stop all recipes at once. When this button is displayed as **Start** it resets all recipes to await their individual **Start Conditions**.

Reload . . . . This button reads and reloads each recipe in the Recipe Group. If the Group is running, all recipes are stopped and restarted (after collected data is saved).

Close All . . . . This button stops data collection in each of the recipes (regardless of the Stop Conditions), saves and closes any data file collected, and closes all views associated with the Recipe Group except the Recipe Group view.

Figure 4-23 Group Recipe List



The center of the Recipe Group window shows the loaded Groups and each recipe included within the group. The following icons are used to indicate status:

 . . . . Indicates that the recipe or Group is waiting for the activation of the Start Condition.

 . . . . Indicates that the recipe or Group is actively running.

 . . . . Indicates that the recipe or Group is stopped.

The recipe name and associated sensor is shown alongside the status icon. From this view, any recipe name and sensor can be highlighted to bring the associated view to the foreground. Any recipe can be double-clicked to launch the Recipe Editor for that recipe.

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NOTE: Changes made to a recipe will only take affect if the Group is reloaded by use of the **Reload** button. However, the **Reload** button will stop and restart all recipes.

Figure 4-24 Recipe Group Status Grid

Group Status Grid

Recipe Name	Sensor	Current Status	Start Condition	Stop Condition
Recipe01.rcp	CIS2 5 Port1	Started	RECIPE START	STOP BUTTON
Recipe02.rcp	Sensor 3 Port1	Waiting to start	EXTERNAL I/O ON : CHANNEL 1	EXTERNAL I/O OFF : CHANNEL 1
Recipe01.rcp	Sensor1 Port1	Started	RECIPE START	5000 scans
Preclude01.prcp	Sensor4 P1 PRD	Started	RECIPE START	STOP BUTTON
Proc_Al.rcp	Sensor5 P1 XPR	Waiting to start	START BUTTON	STOP BUTTON

The right side of the Recipe Group window provides a more detailed status about each recipe in the Group. The first column displays the Recipe name, the second shows the sensor name for which the recipe is loaded, the third column shows the current status of the recipe, the fourth column shows the Start Condition programmed in the recipe, and the fifth column shows the Stop Condition programmed in the recipe.

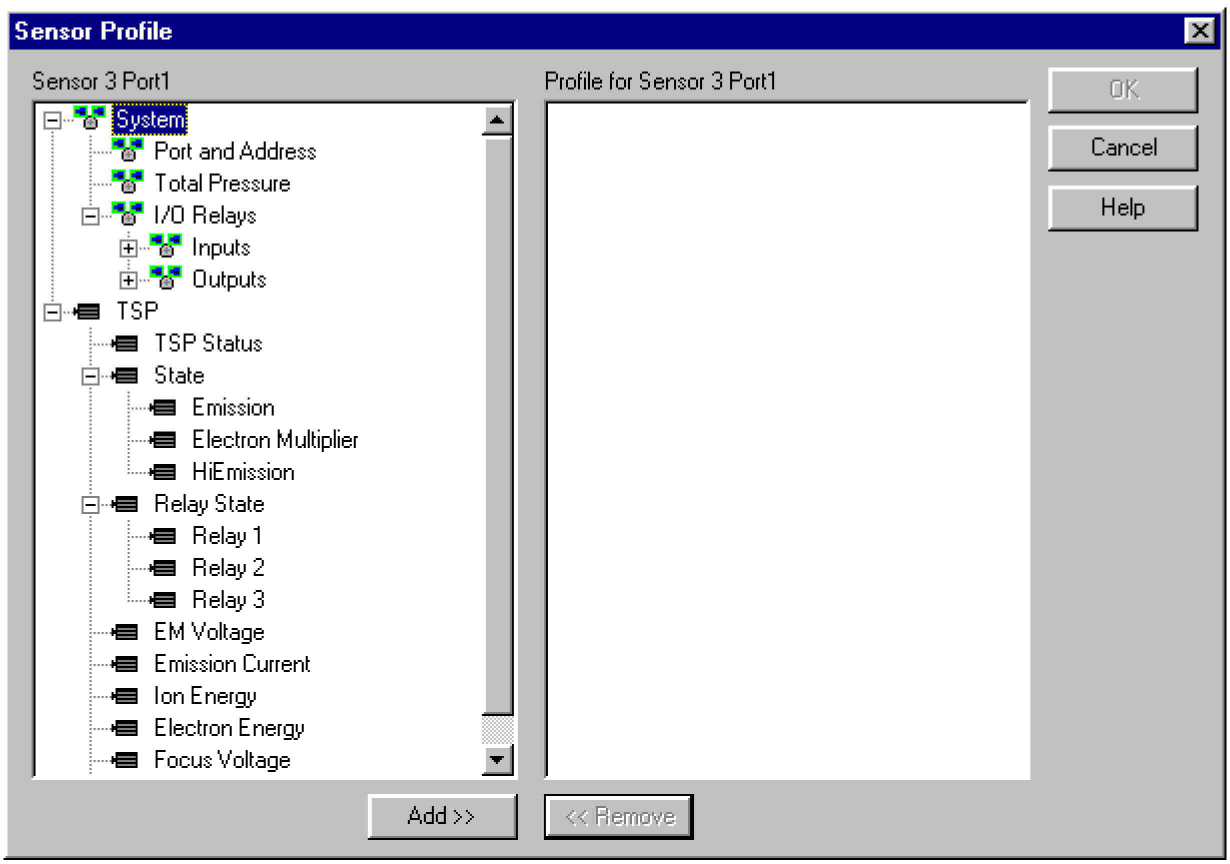
NOTE: The **Start** and **Stop Condition** columns are often active buttons. Any recipe with a **Start Condition** of **Start Button** will display an active button when the recipe is not running. Once a recipe is running, the **Stop Condition** column will contain an active button that can be used to stop the recipe regardless of the programmed **Stop Condition**. This provides a convenient technique to quickly stop a recipe and is consistent with the Stop button availability when running a standalone recipe. Also note that in the case of chained recipes, pressing the **Stop Condition** column button for one recipe will cause the next recipe to load and prepare for the **Start Condition**.

4.6 The Sensor Profile

The **Sensor History** now allows the addition of a **Sensor Profile** when either the **Sensor History** or **View Marks List** view is open or directly from the **Trend Graph Context Menu**. This provides a convenient, customizable way to record the parameter settings of the system or sensor while collecting data in **Monitor** or from a recipe.

To edit the Sensor Profile, press the **Edit Sensor Profile** button in either the **Sensor History** or **Marks List** view. To add a Sensor Profile to the **Sensor History** or **Marks List**, press the **Add Sensor Profile** button in either of the views or from the **Trend Graph Context Menu**. The **Edit Sensor Profile** button will display all of the system and sensor parameters that can be stored as a profile. The profile must be set up before the **Add Sensor Profile** selection on the **Trend Graph Context Menu** will be enabled. See Figure 4-25 on page 4-32.

Figure 4-25 The Sensor Profile window



The first time the **Sensor Profile** window is viewed it will display the profile for the sensor in use as blank in the right panel. To add parameters to the profile, simply highlight a parameter in the left panel and press the **Add>>** button. This

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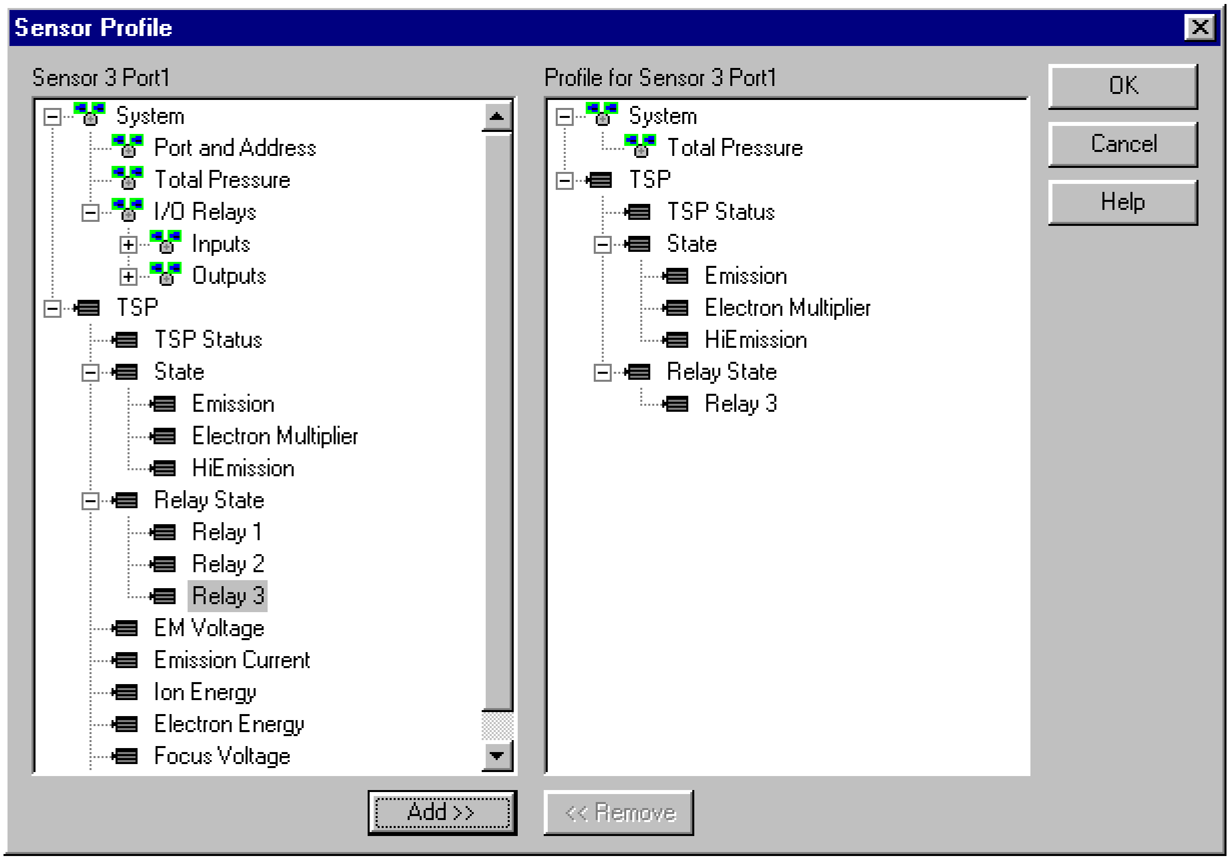
action will add the parameter to the right panel. Parameters can be added in any order and can be removed from the right panel by highlighting them, in the right panel, and pressing the **<<Remove** button.

The profile established for the sensor will be maintained for this sensor (and any like sensor) until changed through this window, by the user, in the future. A sample profile is shown in Figure 4-26 on page 4-33.

Figure 4-26 The Sensor Profile Window, Programmed

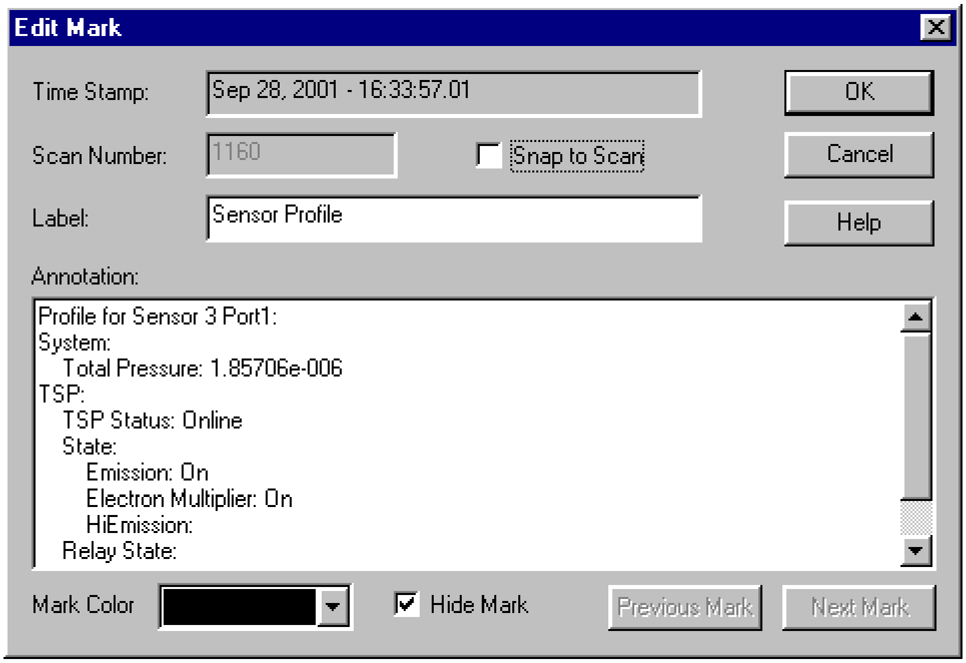


Once the profile for the sensor has been programmed, the **OK** button must be pressed to actually add the profile to the history. Pressing the OK button will produce the **Edit Mark** dialog shown in Figure 4-27.

NOTE: It is at this time, when the OK button is pressed, that the actual Sensor Profile is captured and assigned to the current data scan. Due to the time required to set up the profile it is expected that the profile will not get captured, for the desired scan, the first time it is executed. It is recommended to the user that the profile be set up in advance, within the first few scans of data collection, so that future profile additions can be done near the desired scan.

After the profile has been set up, the **Add Sensor Profile** selection on the **Trend Graph Context Menu** will be enabled. This allows a quick technique for adding the **Sensor Profile** while collecting data.

Figure 4-27 Editing and Adding the Sensor Profile (Mark)



The **Sensor Profile** is then treated as a Mark and is, by default, hidden.

Chapter 5
Editing Recipes

5.1 Introduction

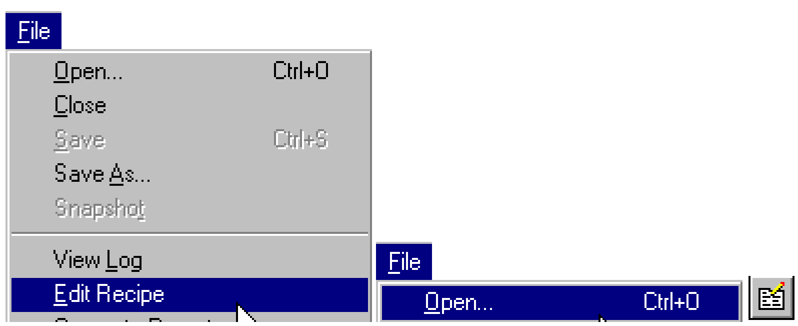
TWare32 uses a "Wizard" to guide you through the process of creating and editing recipes. You may already be familiar with wizards. They are used in many other programs, including the program used to install TWare32. A Wizard is a series of dialog boxes strung together for the purpose of guiding the user through a step-by-step process. This chapter describes the **Recipe Editor** Wizard and how to use it.

Specific **Recipe Editor** functions for the **Transpector CIS 2 Gas Analysis System** and the **Preclude** are covered in Chapter 9 and Chapter 10, respectively.

5.2 Using the Recipe Editor Wizard

The **Recipe Editor** is invoked by selecting **File >> Edit Recipe**, **File >> Open**, or clicking on the **Recipe Editor Icon** (see Figure 5-1).

Figure 5-1 Opening the Recipe Editor



If either **File >> Edit Recipe** or the **Recipe Editor** Icon is selected, the dialog shown in Figure 5-2 will be displayed. To open an existing recipe select **Open**, to create a new recipe from scratch select **Monitor Recipe**, **Bakeout Recipe**, **Preclude Recipe**, or **Recipe Group**. Select **Cancel** to abort the command.

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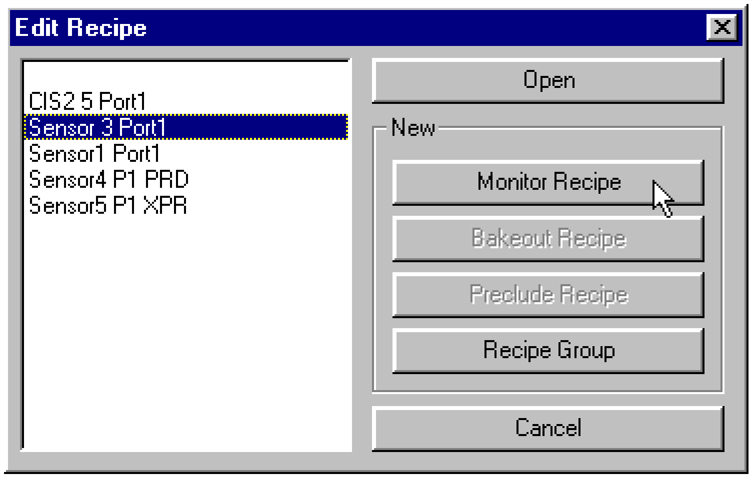
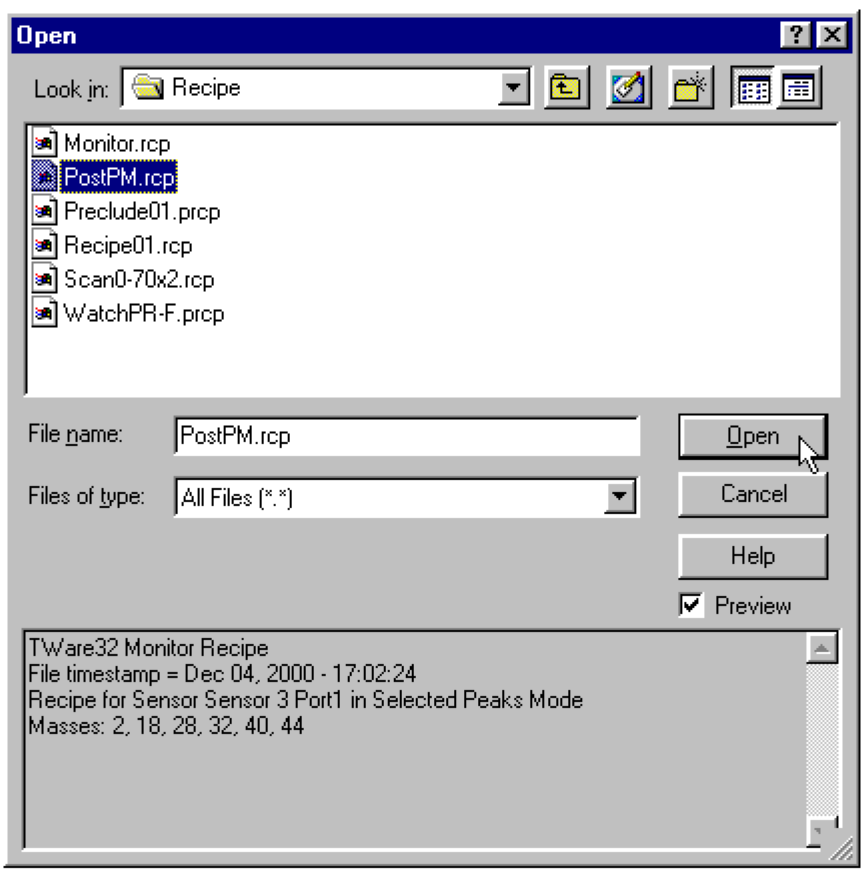
Figure 5-2 Selecting A New Or Existing Recipe



If **Monitor Recipe** is selected, the first page of the **Recipe Editor** Wizard will be displayed (see section 5.3 on page 5-3). If **Open** is selected, or if the **File >> Open...** command was used, a file **Open** dialog, like the one in Figure 5-3, will be displayed.

Figure 5-3 Selecting A Recipe To Open



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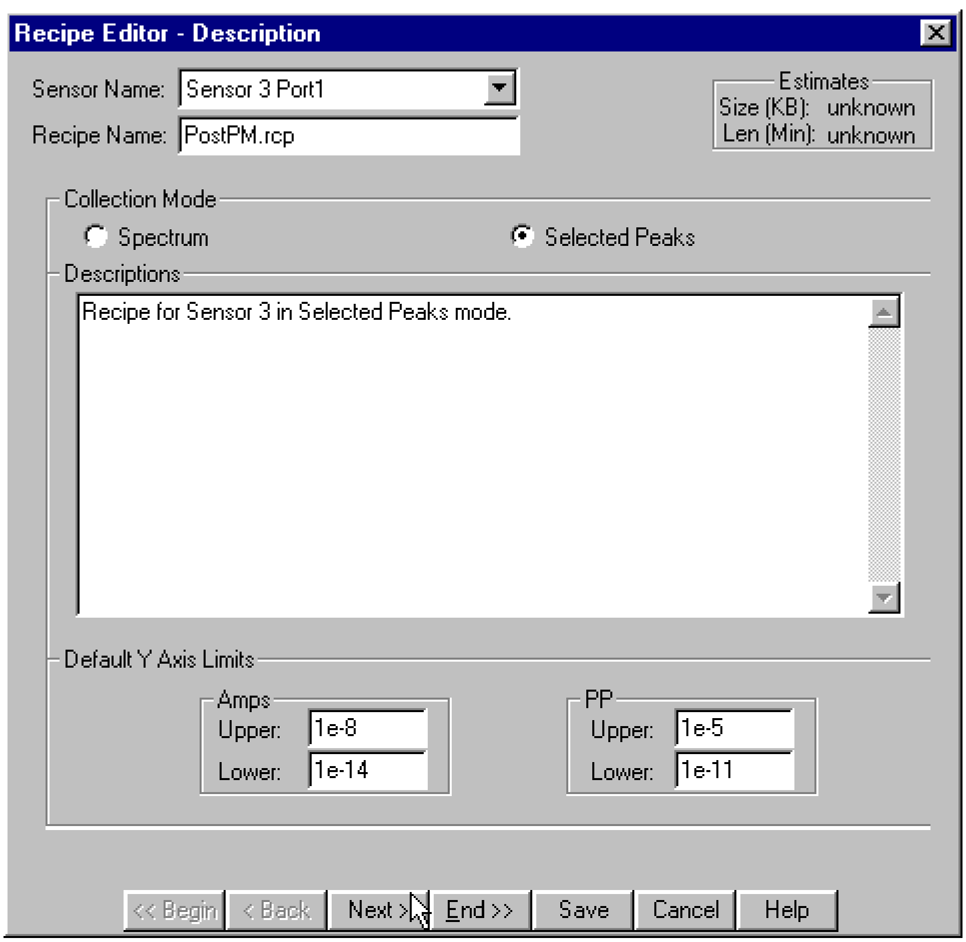
If the **Files of type** box does not show a Monitor recipe (`*.rcp`), click on the triangle to the right of the box and select one from the list. Clicking on a filename will display a few lines of text in the preview box describing the recipe. See Figure 2-7 on page 2-9 for more information on using the TWare32 file **Open** dialog. Once a file is selected, the first page of the **Recipe Editor** Wizard will be displayed (see Figure 5-4).

5.3 Recipe Description Page

Figure 5-4 shows the **Description** page of the **Recipe Editor** Wizard. The **Sensor Name** and **Recipe Name** appear on every page of the Wizard and can be changed at any time. The **Estimates** box is also displayed on every page and is updated to reflect the current parameters; however, unless an explicit time or size is used for the stop condition the estimates will be displayed as **unknown** (see section 5.11 on page 5-26). The first thing to do in creating a new recipe is to decide the collection mode, **Spectrum** or **Selected Peaks**. This selection will determine which dialogs will be seen next. You may also enter a short description of the recipe for future reference. This will appear in the preview box, when opening this recipe, or with data files acquired while using this recipe.

Figure 5-4 Recipe Editor: Description Page



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Sensor Name. . . . . The name of the sensor to be used to collect data. Select from the drop-down list. If the sensor name is changed after any parameters have been changed, a warning similar to Figure 5-5 will be displayed. This warning gives you the option to save the recipe for the current sensor before creating a new recipe for the new sensor.

Figure 5-5 Warning When Changing Sensor

The last line in the **Sensor Name** list is a blank line. This can be selected when creating a recipe for a sensor which is off-line or on a different computer. When editing a sensor which is off-line, or if a blank sensor name is selected, the bounds checking at this point is not reliable. However, when the recipe is run it will be checked against the actual limits for the sensor on which it is being run, and any parameters that are out of bounds will be flagged as errors.

Recipe Name . . . . The file name used to save the recipe. Any name can be used, but a descriptive name is recommended. Since TWare32 is a 32 bit application, the name is not limited to eight characters and an extension, thus allowing a more descriptive name to be chosen. If the extension is omitted, `.rcp` will be appended. The filename can be changed at any time during the recipe editing process.

Estimates

Size . . . . The approximate size, in kilobytes, of the resulting SOD file is shown here. If there is insufficient information to determine this (for example, the stop criterion is indeterminate) **unknown** will be displayed.

Len. . . . . The approximate duration of the recipe, in minutes, is shown here. If there is insufficient information to determine this (for example, the stop criterion is indeterminate) **unknown** will be displayed.

Collection Mode

Spectrum . . . . Scan and collect a full spectrum between the limits specified on the **Spectrum Page** (see section 5.5 on page 5-11).

Selected Peaks . . . . Collect data only at the masses specified on the **Selected Peaks Page** (see section 5.6 on page 5-13).

Descriptions

A description of the recipe, its uses, etc. should be entered here. This text will be displayed in the preview box when opening a recipe and can be used to identify the proper recipe to use in various circumstances. This is especially useful if several people will be using the system. The description text is also saved with all data files acquired with this recipe and is displayed in the preview box when recalling the SOD files.

Default Y Axis Limits

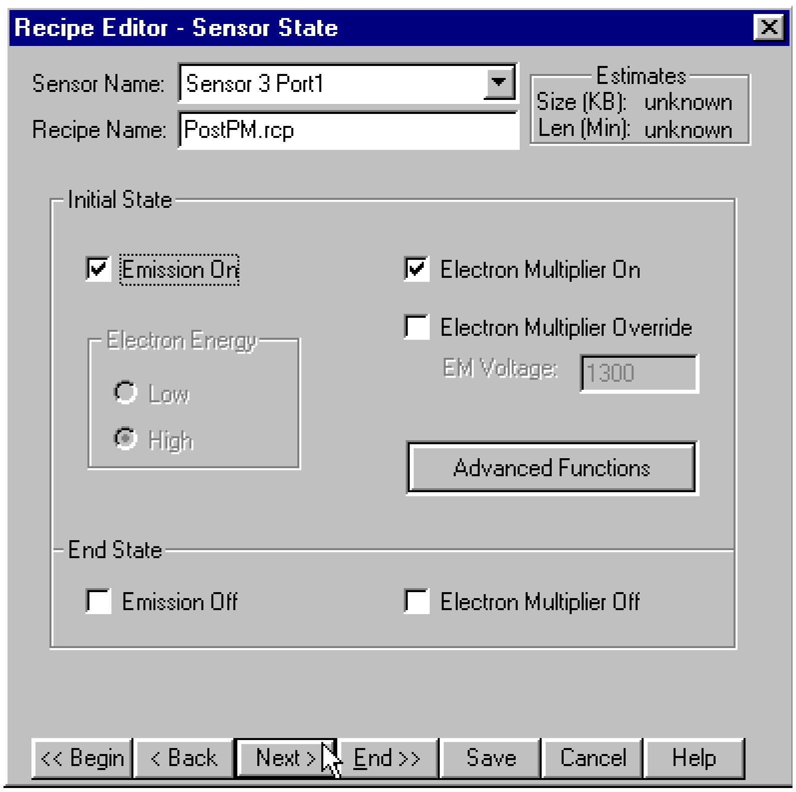
These entry boxes allow for setting the default Y axis upper and lower settings for the display. These settings will be used on the **Trend Graph** at recipe startup. However, if **AutoScale** is enabled, TWare32 may rescale the axis and change the settings after the first scan. These settings work best with **Scaling** set to **None**. Refer to section 3.5.2, Miscellaneous User Options, on page 3-26 for information on setting the **Scaling** option.

Click **Next>** to go to the next page of the Wizard or click **End>>** to go directly to the last page and view the summary. This second option is especially useful when checking an existing recipe's settings. You can quickly check the recipe on the summary page and save it if it's acceptable, or you can back up and change any incorrect parameters. Clicking **Next>** on the **Description Page** will bring up the **Sensor State Page** described in section 5.4.

5.4 Sensor State Page

Figure 5-6 shows the **Sensor State** page of the **Recipe Editor** Wizard. This page specifies the state of the sensor before starting to collect data and after the recipe is terminated. The **Advanced Functions** button will bring up the dialog shown in Figure 5-7 to allow some advanced options to be set or selected.

Figure 5-6 Sensor State Page



Initial State

Emission On . . . . When checked, the emission will be turned on before starting to collect data. When unchecked, the emission will be off at the start of data collection.

Electron Multiplier On . . . . When checked, the electron multiplier will be turned on before starting to collect data. When unchecked, the electron multiplier will be off at the start of data collection. This option is disabled if the sensor is not equipped with an electron multiplier. See section 3.3, Sensor Configuration and Setup, on page 3-10.

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Electron Multiplier Override . . . . When checked, the value specified in the **EM Voltage** box will be loaded into the sensor when the recipe is started, overriding the current setting. When unchecked, the value last set will be used. This item is disabled if the **Electron Multiplier On** box is not checked, or if the sensor is not equipped with an electron multiplier.

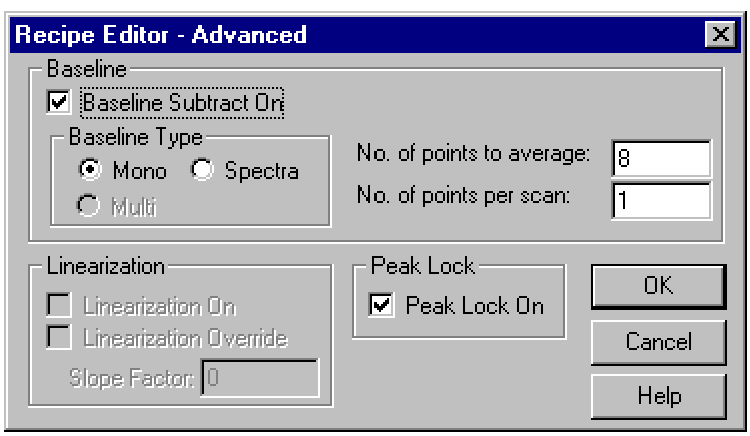
EM Voltage. . . . . The electron multiplier voltage to be used when running this recipe. This item is disabled and the value ignored if the **Electron Multiplier Override** is not checked.

Electron Energy

If the sensor is equipped with a variable electron energy (for example, XPR sensors), this item will be enabled and either **High** or **Low** range can be selected.

Advanced Functions . . . . Clicking on this button will invoke the dialog shown in Figure 5-7, enabling changes to the **Baseline**, **Linearization**, and **Peak Lock** functions.

Figure 5-7 Advanced Functions of Sensor State Page, With Mono Baseline Subtraction Selected



Baseline

Baseline Subtract On . . . . When checked, the recipe will be run with **Baseline Subtract** on. Otherwise, **Baseline Subtract** will be off.

No. of points to average . . . . Enter the number of baseline points to average in order to calculate the baseline. This parameter is only used for **Mono** and **Multi** baseline.

No. of points per scan . . . . Enter the number of baseline points from each scan to use to calculate the baseline. This parameter is only used for **Mono** and **Multi** baseline.

For example, if **No. of points to average** is 8 and the **No. of points per scan** is 4, the program will take 4 points from the current scan and 4 points from the previous scan, sum them up, and divide by 8 to determine the baseline value.

Baseline Type

Mono . . . . Select to perform a baseline reading after every scan. Available in all modes.

Multi . . . . Select to perform a baseline reading before reading each selected peak. Available in **Selected Peaks** mode only.

Spectra . . . . Uses **SpectraBase** baseline subtraction. If selected, a set of baseline masses (default masses are 9, 23, 33, 47 in the order shown) are used to interpolate a baseline between those masses. The baseline value of the lowest mass is extrapolated to lower masses and that of the highest mass is extrapolated to the higher masses. Up to 10 user defined baseline masses can be selected in a recipe (see Figure 5-8). Available in all modes. This is only available on Transpectors with firmware version 2.1 or higher. In Transpectors with firmware version 2.14 or greater, the scan order of the **SpectraBase** masses can be set.

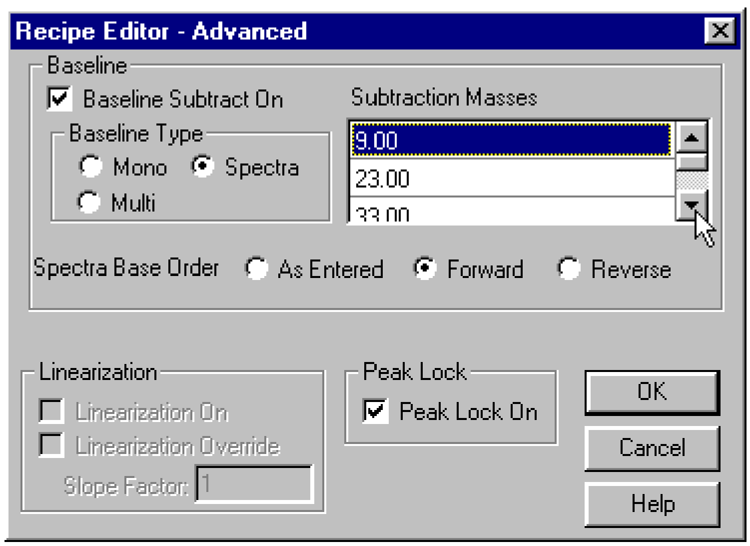
SpectraBase Order

As Entered. . . . . Masses are scanned in the Transpector in the order listed in the **Subtraction Masses** list.

Forward . . . . Masses are scanned in the Transpector in an ascending order regardless of the list order in the **Subtraction Masses** list.

Reverse . . . . Masses are scanned in the Transpector in a descending order regardless of the list order in the **Subtraction Masses** list.

Figure 5-8 Advanced Functions Of Sensor State Page, With SpectraBase Baseline Subtraction Selected



Linearization

Linearization On . . . . Enable linearization when checked. Only available on XPR Transpectors; default is On for XPR Transpectors.

HINT: It is recommended that the Linearization always be left on for an XPR.

Linearization Override . . . . Use the specified slope factor instead of using the previously set value. The value will remain set after the recipe is done.

Slope Factor . . . . Specify the slope factor to use.

Peak Lock

Peak Lock On . . . . When checked, **Peak Lock** is on. Disable **Peak Lock** only if extremely fast data acquisition is needed and the peak position is carefully set, or as recommended by INFICON (for example, in the Transpector XPR2 Best Known Methods document). Improper operation with **Peak Lock** off can result in incorrect data.

CAUTION

Peak Lock must be on (selected) for normal TWare32 operation. Turning Peak Lock off is not recommended, except as specified by INFICON.

End State

Emission Off . . . . If checked, the emission will be turned off at the end of the recipe. Otherwise, the emission will be unchanged.

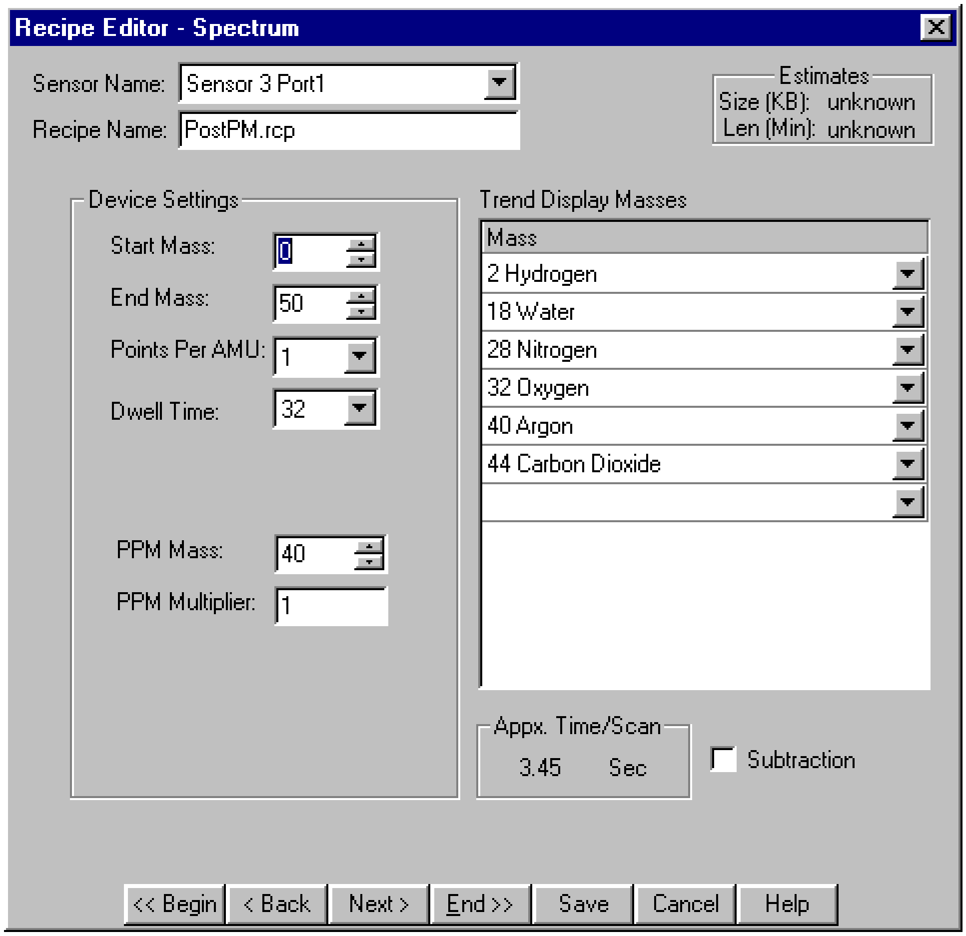
Electron Multiplier Off . . . . If checked, the electron multiplier will be turned off at the end of the recipe. Otherwise, the electron multiplier will be unchanged.

If **Spectrum** mode was selected on the first page, clicking **Next>** will bring up the **Spectrum** page described in section 5.5 below. Otherwise, it will bring up the **Selected Peaks** page described in section 5.6 on page 5-13.

5.5 Spectrum Page

Figure 5-9 shows the **Spectrum** page of the **Recipe Editor** Wizard. This page describes how the data will be collected and displayed, including the mass range of interest and the default masses to display on the **Trend Graph**.

Figure 5-9 Recipe Editor: Spectrum Page



Device Settings

The following **Device Settings** are programmable in the recipe:

Start Mass . . . . Lowest mass to be scanned. The value may be typed in or incremented or decremented using the spinner control.

End Mass . . . . Highest mass to be scanned. The value may be typed in or incremented or decremented using the spinner control.

Points Per AMU . . . . Select the number of points to be acquired for each AMU. A value of 1 will give a bar plot with a single line at each mass and a value greater than 1 will give an analog plot with the consecutive points connected.

Dwell time. . . . . Select the dwell or integration time for each point being acquired.

PPM Mass. . . . . Mass to be used as the reference for displaying intensities as parts per million.

PPM Multiplier . . . . Enter a multiplier to be applied to the PPM mass intensity before the PPM ratio is calculated.

Subtraction. . . . . Check this box to show the Recipe Editor Library Subtraction page as the next page. The Subtraction page allows the recipe to include Compounds for automatic subtraction of spectra during data collection. See section 11.4, Programming a Recipe to Use Library Subtraction, on page 11-13 for information on programming a recipe to use Library Subtraction.

Trend Display Masses

This is a list of masses to be displayed on the **Trend Graph** in **Monitor** during data acquisition. Values may be typed in or selected from the pull-down list. Entering a value in the blank line on the bottom of the list adds it to the list. Highlighting an element in the list and pressing the keyboard's **Delete** key will remove that entry from the list.

Approximate Time/Scan

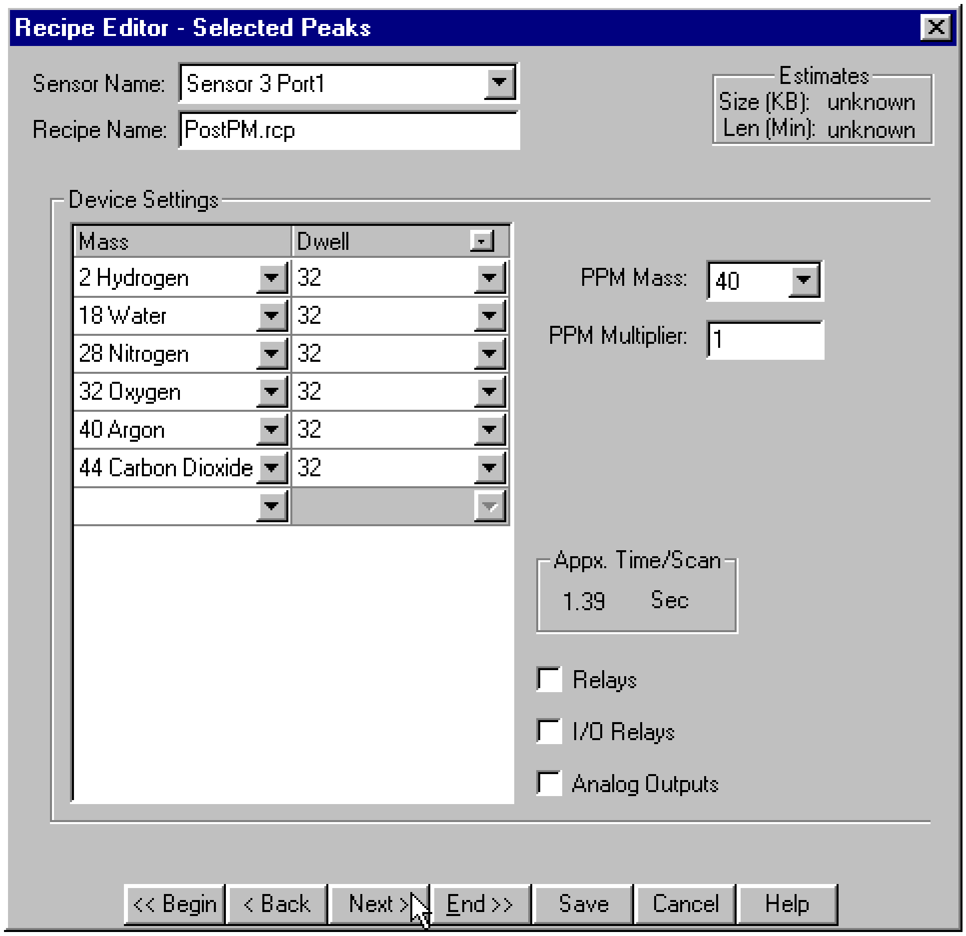
The approximate time from the start of one scan to the start of the next scan is shown here.

Clicking on **Next>** will display the **Collection Parameters Page**, described in section 5.10 on page 5-24, or the **Subtraction Page**, described in section 11.4, Programming a Recipe to Use Library Subtraction, on page 11-13.

5.6 Selected Peaks Page

Figure 5-10 shows the **Selected Peaks Page** of the **Recipe Editor** Wizard. This page describes how the data will be collected and displayed, including the masses that will be measured and displayed.

Figure 5-10 Recipe Editor: Selected Peaks Page

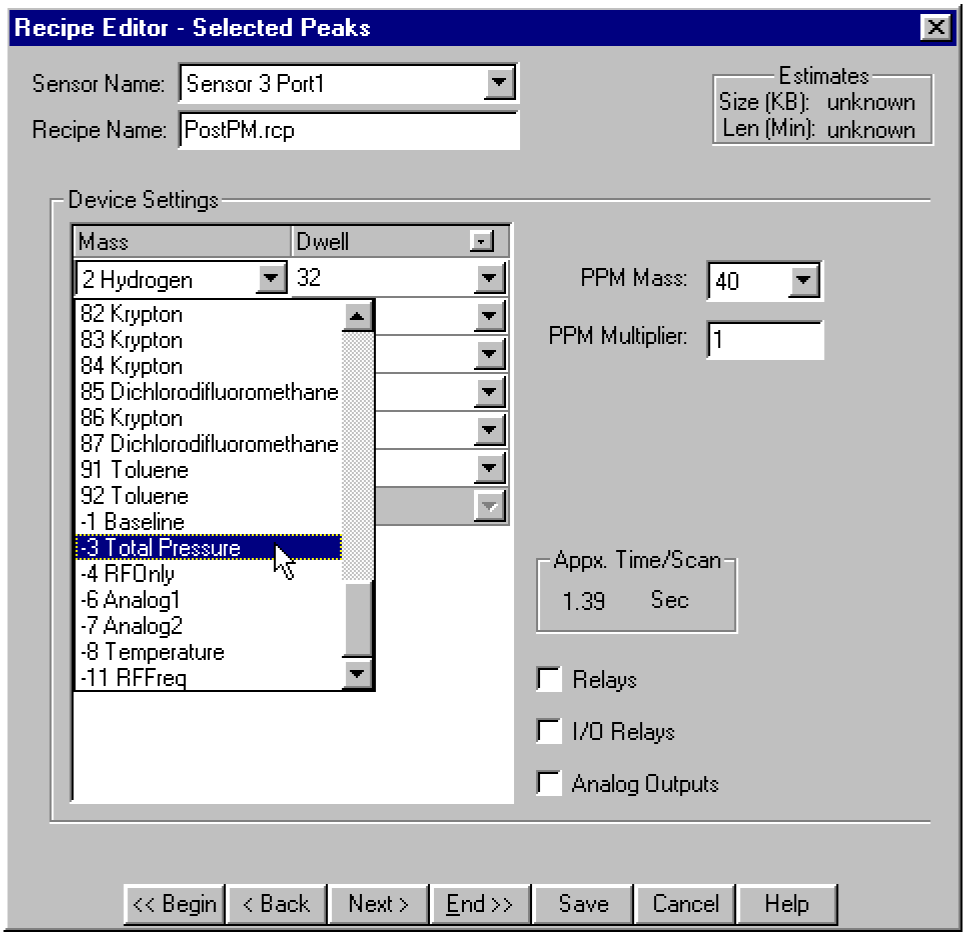


Device Settings

The table contains a list of masses to be measured and some parameters which control the acquisition and display of the data. The first column contains the mass and an optional descriptive string. Masses may be added by typing in the blank line on the bottom of the column, or by using the drop-down list. Existing lines may be edited either by typing or using the drop-down list.

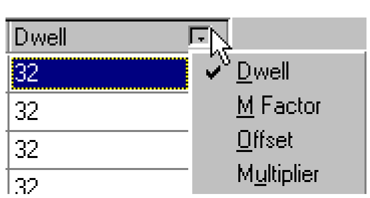
In addition to being able to select any mass within the range of the sensor, there are several **Special Peaks** defined which allow you to collect data on instrumental parameters — like baseline, total pressure, or temperature — and display them in the **Trend Graph** along with the other masses. If you scroll to the bottom of the drop-down list you will see several items with “negative masses.” These are the **Special Peaks**. If you select one of these, you will also want to specify an **Offset** and/or a **Multiplier** to scale the readings to be visible on the same scale as the other masses. Figure 5-11 illustrates how to select a **Special Peak**.

Figure 5-11 Selecting Special Peaks



The second column is used to display or edit the **Dwell**, **M**aterial **Factor**, **Offset**, and **Multiplier**. Clicking on the title bar of this column displays a list from which one of the four parameters can be selected. The item selected will be displayed and can be modified in this column (see Figure 5-12).

Figure 5-12 Viewing Dwell, Material Factor, Offset, or Multiplier



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By default the **Dwell** is displayed. Click on the triangle to the right of the value for a list of valid dwells. Select the desired dwell from this list. A shorter dwell time will yield a shorter cycle time, sampling each mass more frequently. However, the signal-to-noise will decrease. Longer dwells will have a better signal-to-noise, but a longer cycle time.

Selecting **M Factor** will display the **Material Factor** column. The material factor is the rate at which this species ionizes in comparison to Nitrogen, which has a material factor of 1.000. If no material factor exists in the internal tables for a selected mass, a default value of 1.000 is used. This can be changed if a better value is known. These values are used to calculate **Partial Pressures** in **Selected Peak** mode.

Selecting **Offset** will display the **Offset** column. This is a value which is added to the measured value of the channel before displaying it on the **Spectrum** or **Trend** graphs. It is only used for display and does not change the internal values of the data. It can be used to bring a **Special Peak** or other mass into the range of the rest of the data for display.

Selecting **Multiplier** will display the **Multiplier** column. This value is multiplied by the raw data before displaying them on the **Spectrum** or **Trend** graphs. It is only used for display and does not change the internal value of the data. It can be used to bring a special peak or other mass into the range of the rest of the data for display.

PPM Mass . . . . Mass to be used as the reference for displaying intensities as parts per million. A mass can be selected from the drop-down list. The list contains only the masses currently defined in the mass table.

PPM Multiplier . . . . Enter a multiplier to be applied to the PPM mass intensity before the PPM ratio is calculated.

Relays . . . . Checking the **Relays** box will enable display of the Recipe Editor Relays page. Leaving this box unchecked, if Relays are not being used, is a convenient way of reducing the number of pages viewed in the Recipe Editor.

I/O Relays . . . . Checking the **I/O Relays** box will enable display of the Recipe Editor I/O Relays page. Leaving this box unchecked, if I/O Relays are not being used, is a convenient way of reducing the number of pages viewed in the Recipe Editor.

NOTE: If a Digital I/O board is installed then the **I/O Relays** box is checked as a default.

Analog Outputs . . . . Checking the **Analog Outputs** box will enable display of the Recipe Editor Analog Outputs page. Leaving this box unchecked, if Analog Outputs are not being used, is a convenient way of reducing the number of pages viewed in the Recipe Editor.

NOTE: The Analog Outputs selection will be disabled if the Transpector firmware version does not provide this capability, or if the Analog Output board is not installed.

Approximate Time/Scan

The approximate time from the start of one scan to the start of the next scan is shown here.

Depending on the selections made on the Selected Peaks page, clicking on **Next>** will display one of the following pages:

Relays Setup page . . . . described in section 5.7 on page 5-17.

I/O Relays page . . . . described in section 5.8 on page 5-20.

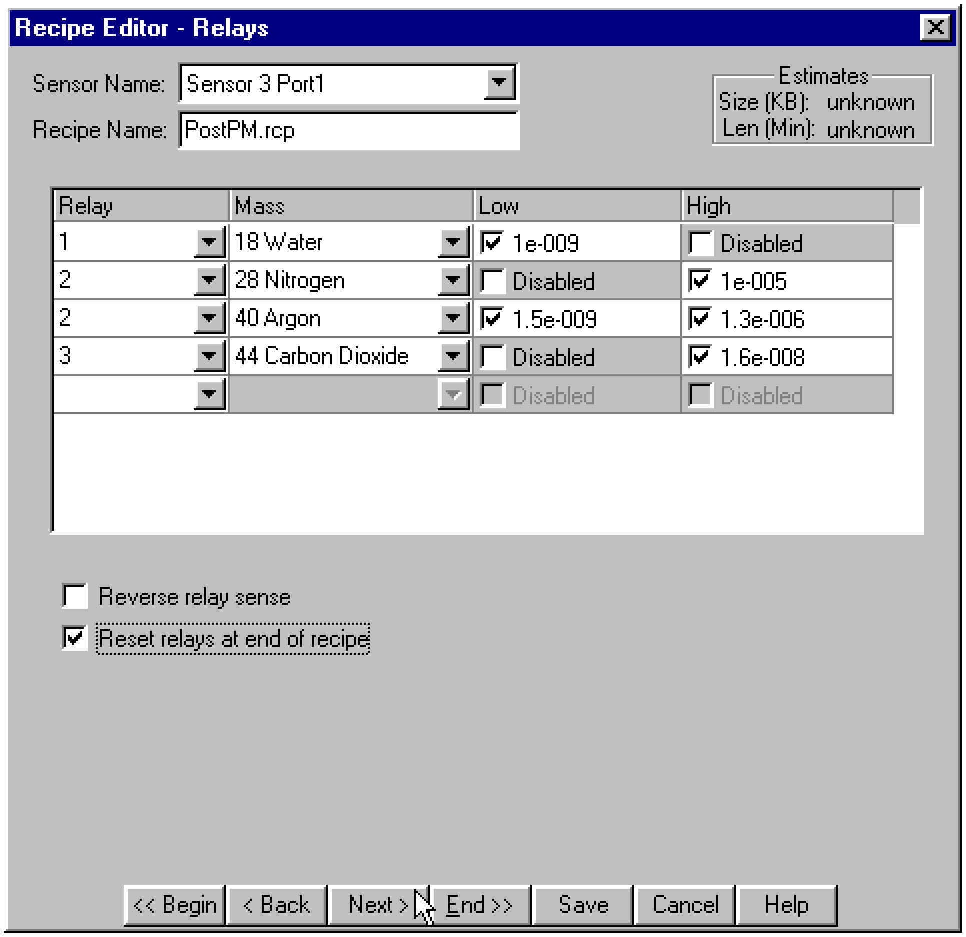
Analog Outputs page . . . . described in section 5.9 on page 5-22.

Collection Parameters page . . . . described in section 5.10 on page 5-24.

5.7 Relays Setup Page

Figure 5-13 shows the **Relays** setup page of the **Recipe Editor** Wizard. This page specifies how the relays will be controlled. Each of the three relays may be associated with zero or more masses, can have a high and a low trip point specified and enabled independently. The sense of the relays can also be specified.

Figure 5-13 Recipe Editor: Relays Setup Page



The behavior of the relays is described in the table on the **Relay** setup page. It is allowable to have one relay controlled by more than one mass. In this case the relay state is a logical OR of the specified conditions. Each of the columns in the table is described below:

Relay . . . . Select which relay (1, 2, or 3) will be controlled by the mass on this line. Select the relay number from the pull-down list.

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Mass . . . . Masses whose intensities will control the relays. Select a mass from the drop-down list. Possible masses are limited to masses selected in the **Device Settings Grid** on the **Selected Peaks** page. Click **<Back** to go back and add a mass if the mass needed is not in the list.

Low Setpoint . . . . Lower limit (in Amps) for this channel. When the intensity for a mass drops below this value the relay will be tripped. The box must be checked to enable this limit, otherwise it is disabled.

High Setpoint . . . . Upper limit (in Amps) for this channel. When the intensity for a mass rises above this value, the relay will be tripped. The box must be checked to enable this limit, otherwise it is disabled.

Reverse Relay Sense . . . . When selected, the tripped condition of the relays will be the same as the setting in the **Transpector Properties, TSP User Settings** tab, for the **Relay Sense.** The normal (idle) condition will be the opposite of this setting.

NOTE: With the recent addition of **Relay Sense** in the **Transpector Properties, TSP User Settings** tab it should no longer be necessary to set the **Reverse Relay Sense** in most recipes. The **Relay Sense** can now be set as **Reversed** when it is required to have the **Transpector Relays** closed during normal, non-alarm conditions. This **Relay Sense** setting (see section 3.3.2, Configuring the Sensors, on page 3-11) allows the **Transpector Relays** to be closed at the start of the program and remain closed (provided an alarm does not occur during a recipe). In past TWare32 versions, this "closed relay" was only possible when running a recipe. The net effect of setting the **Relay Sense** as **Reversed** and then programming a recipe for **Reverse Relay Sense** is that the relay will be open for normal condition and closed for the tripped (alarm) condition.

Reset relays at end of recipe . . . If checked, when a recipe is finished all relays will be disabled and set to their original position as specified in the **Relay Sense** setting in the **Transpector Properties, TSP User Settings** tab. If not checked, the relays will continue to hold their setting until they are reset by another recipe or the Transpector is turned off.

Depending on the selections made on the Selected Peaks page, clicking on **Next>** will display one of the following pages:

I/O Relays page . . . . described in section 5.8 on page 5-20.

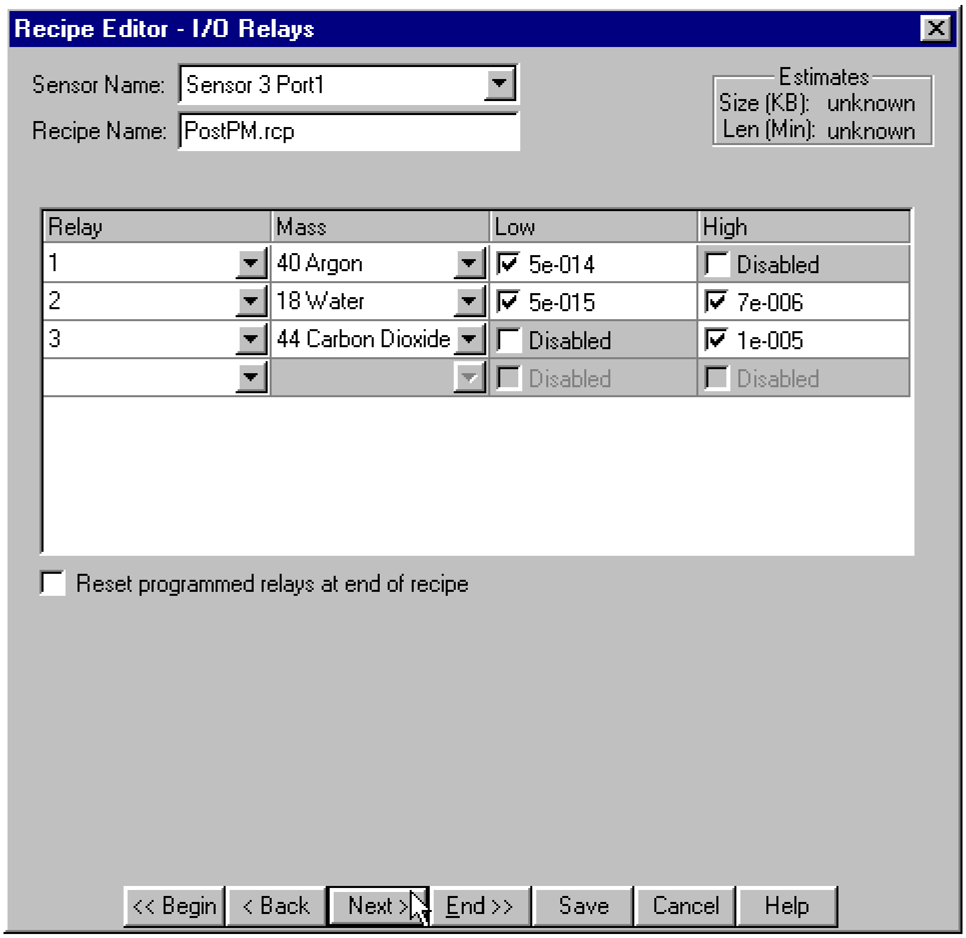
Analog Outputs page . . . . described in section 5.9 on page 5-22.

Collection Parameters page . . . . described in section 5.10 on page 5-24.

5.8 I/O Relays Setup Page

Figure 5-14 shows the **I/O Relays** setup page of the **Recipe Editor** Wizard. This page specifies how the relays will be controlled. It is allowable to have one relay controlled by more than one mass. In this case the relay state is a logical OR of the specified conditions.

Figure 5-14 Recipe Editor I/O Relays Page



Each column in the table is described below:

Relay . . . . Select which relay (1, 2, ...16) will be controlled by the mass on this line. Select the relay number from the pull-down list.

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Mass . . . . Masses for which intensities will be measured to control the relays. Select a mass from the drop-down list. Possible masses are limited to masses selected in the **Device Settings Grid** on the **Selected Peaks** page. Click **<Back** to go back and add a mass if the mass needed is not in the list.

Low Setpoint . . . . Lower limit (in Amps) for this channel. When the intensity for a mass drops below this value the relay will be set to the active state. The box must be checked to enable this limit, otherwise the limit is disabled. The default value is 1E-15.

High Setpoint . . . . Upper limit (in Amps) for this channel. When the intensity for a mass rises above this value the relay will be set to the active state. The box must be checked to enable this limit, otherwise the limit is disabled. The default value is 1E-5.

Reset Programmed Relays . . . . . Select this if it is desired to reset all relays to the non-alarm state when the recipe terminates. Do not check this box if it is desired to have relays remain activated after the recipe ends.

NOTE: If the installed Digital I/O board only provides eight outputs then do not select any output 9-16 as a setpoint relay.

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Depending on the selections made on the Selected Peaks page, clicking on **Next>** will display one of the following pages:

Analog Outputs page . . . . described in section 5.9 on page 5-22.

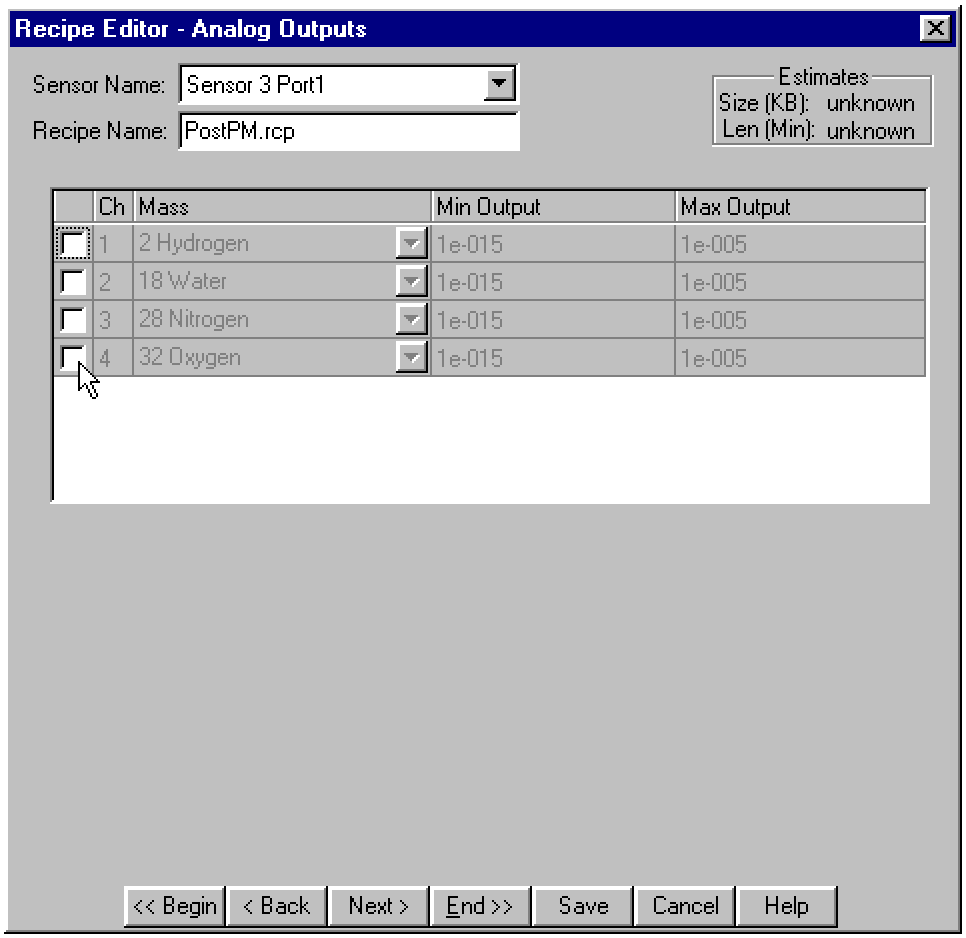
Collection Parameters page . . . . described in section 5.10 on page 5-24.

5.9 Analog Outputs Setup Page

Figure 5-15 shows the **Analog Outputs** setup page of the **Recipe Editor** Wizard. This page allows an analog output to be enabled and configured for any of the first four masses in the mass list. The Analog Outputs are available for the first four mass channels in the Transpector2 family of sensors. The recipe Collection Mode must be Selected Peaks to use the Analog Outputs option.

For a description of the Analog Outputs function and connector pinout, refer to section 3.7, Analog Outputs Option, on page 3-32.

Figure 5-15 Recipe Editor: Analog Outputs Setup Page



Enable . . . . If the checkbox is checked, the corresponding output will be active. Clicking on the checkbox toggles the selection on and off.

Channel . . . . Corresponds to channels 1 through 4 as set in the **Device Setting Grid** on the **Selected Peaks** page. These numbers cannot be changed.

Mass . . . . The mass and optional substance name as selected in the **Device Setting Grid** on the **Selected Peaks** page. Selecting a mass from the drop-down list for any channel will move the former mass to a channel not used for Analog Outputs. Masses can be duplicated for two different channels if different outputs are desired for a single mass. Possible masses are limited to masses selected on the **Selected Peaks** page.

NOTE: Changes made to the **Analog Outputs Mass** list will automatically be made to the **Device Setting Grid** on the **Selected Peaks** page.

Min Output. . . . . The minimum ion current of the mass, in Amps, which corresponds to the zero volt output of the channel.

Max Output . . . . The maximum ion current of the mass, in Amps, which corresponds to the maximum voltage output of the channel. The maximum voltage output of the channel can be 5.0 V(dc) or 10.0 V(dc) depending on the voltage range of the unit.

NOTE: If a channel is not enabled, the corresponding output will be set to zero volts.

NOTE: For a recipe created in **Spectrum** Mode (not **Selected Peaks** Mode), the Analog Outputs will all be set to zero volts.

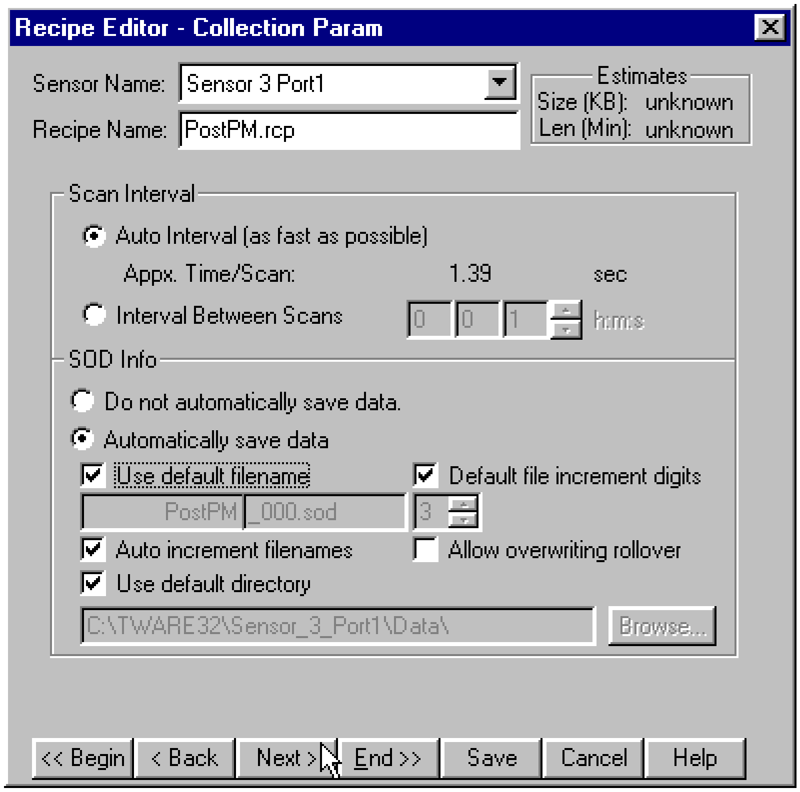
Selecting **Next>** will display the **Collection Parameters** page described in section 5.10 on page 5-24.

NOTE: For more information concerning the Analog Outputs, please refer to the *Transpector2 Operating Manual* (IPN 074-276).

5.10 Collection Parameters Page

Figure 5-16 shows the **Collection Parameters** page of the **Recipe Editor** Wizard. This page specifies how often the data will be collected and how it will be saved.

Figure 5-16 Recipe Editor: Collection Parameters Page



Scan Interval

Auto Interval . . . . If selected, each scan will begin as soon as the previous scan finishes — data will be collected as fast as possible. An approximate time per scan is shown.

Interval Between Scans . . . . If selected, the start of a scan will wait the specified interval after the previous scan ended. Specify a time in hours, minutes, and seconds.

SOD Info

Do not automatically save data . . If selected, data are acquired into RAM and not saved to disk unless a **Snapshot** is taken. When this is selected, parameters may be changed at any time in **Monitor**.

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Automatically save data . . . . If selected, data are automatically saved, to the specified file, at the end of the recipe or when the recipe is stopped manually. The number of digits entered after the underscore will determine the maximum number of files collected if **Auto Increment Filenames** is selected.

Use default filename . . . . If selected, the **SOD** filename will be based on the **Recipe** filename. If not selected, either a base filename can be entered or the filename **Default** will be used.

Default file increment digits . . . . This selection uses the **SOD file increment digits** setting (see section 3.5.2 on page 3-26) as the number of numerical places in the file name index for the SOD files. If this is not selected, the number of digits can be changed for this specific recipe.

Auto Increment Filenames . . . . . If selected, then each time the recipe is run the SOD file name is incremented, resulting in a series of filenames in the data directory. The extension remains `.sod`, however, the digits before the extension are incremented. The maximum number of files in the series is determined by either the number of digits entered after the underscore (in the **Automatically save data** entry) or the **SOD file increment digits** setting (see section 3.5.2 on page 3-26). For example: Data_000.sod will allow 1000 files to be saved (Data_000.sod through Data_999.sod).

Allow Overwriting Rollover . . . . If selected, when the maximum number of files in the series is reached, the file storage will automatically start over again at the lowest index. Existing files will be overwritten. For example, if Data_000.sod through Data_999.sod have been saved, then the next SOD file saved will be named Data_000.sod and will overwrite the first file saved. If not selected, data collection will automatically stop at the maximum file index and issue a warning message.

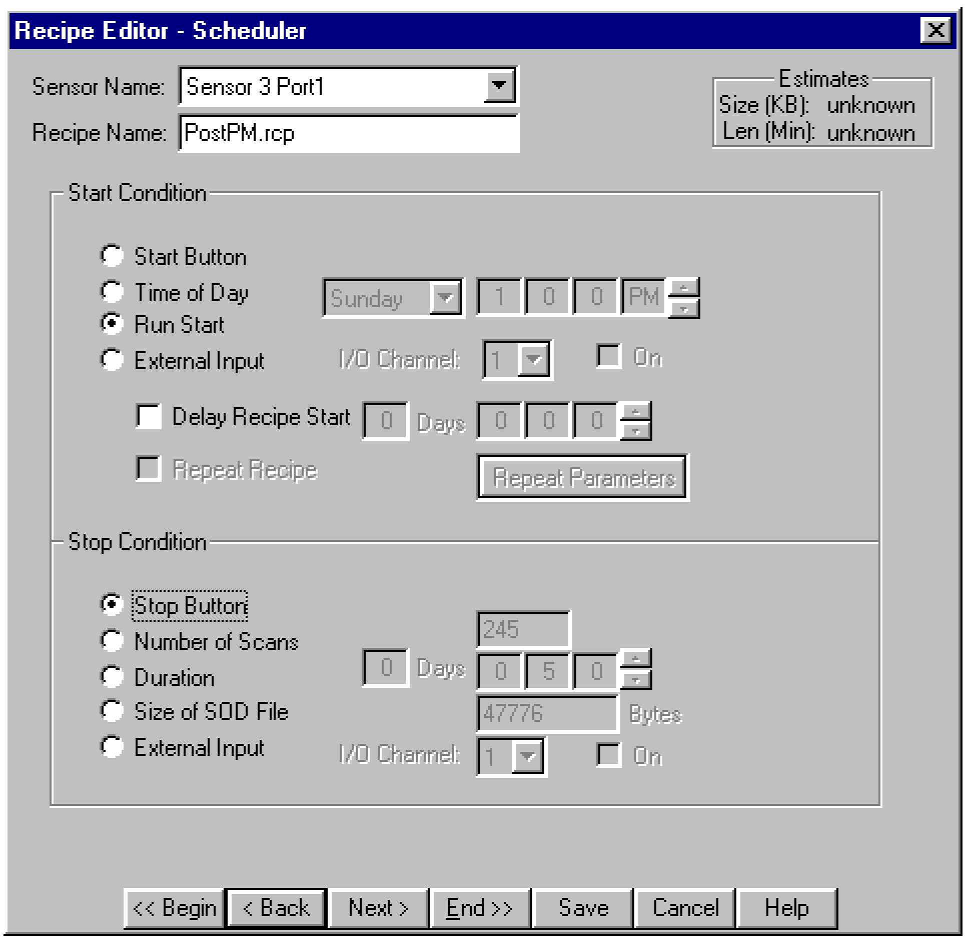
Use default directory . . . . If checked, the data will be stored in the default directory set up in the property pages for this sensor. Otherwise, it will be stored in the specified directory.

Selecting **Next>** on the **Collection Parameters Page** will display the **Scheduler Page** described in section 5.11.

5.11 Scheduler Page

Figure 5-17 shows the **Scheduler** page of the **Recipe Editor** Wizard. Parameters on this page determine when the scanning will start and stop.

Figure 5-17 Recipe Editor: Scheduler Page



Start Condition

Specify the condition or conditions which starts the data collection after the recipe is loaded from **Run Recipe**.

Start Button . . . . Start scanning only when the **Start** button is clicked.

Time of Day . . . . Start scanning at the specified time of day. It can be set to run on a specified day of the week.

Run Start . . . . Start scanning as soon as **Monitor** is started with this recipe.

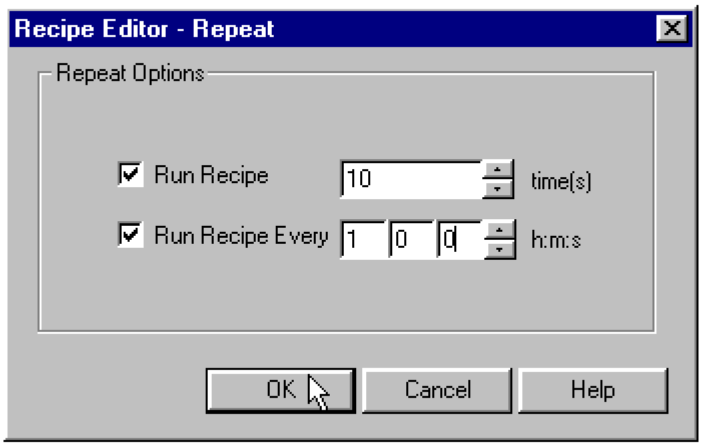
External Input . . . . Start scanning as soon as the specified input is set to the active state specified in the **Input Configuration** column of the **System Properties Input/Output** tab. If **External Input** is selected, then an **I/O Channel** (Input) must be selected and the **On** state can be checked if desired. With the **On** state checked, the scanning will start when the Input switches to the active state. With the **On** state unchecked, the scanning will start when the Input switches to the inactive state. See section 12.5.1, Programming Digital Inputs as Start and Stop Conditions, on page 12-14.

Delay Recipe Start . . . . Specify the delay between when the selected start condition is met and when scanning starts. Note that this only delays data collection — all other recipe functions (for example, emission on) are performed as soon as the recipe is loaded.

Repeat Recipe . . . . When the recipe is done, restart it according to the **Repeat Parameters**. Clicking on the **Repeat Parameters** button displays the dialog shown in Figure 5-18 which allows the repeat conditions to be specified.

NOTE: **Repeat Recipe** is only available when using a **Stop Condition** other than the **Stop Button**.

Figure 5-18 Repeat Parameters



Run Recipe . . . . If checked, the recipe will be repeated the specified number of times.

Run recipe Every (H:M:S) . . . . . . If checked, the recipe will be repeated according to the specified frequency. Enter a time in hours, minutes, and seconds. For example the settings in Figure 5-18 would run the recipe every hour, 10 times, then stop. Entering zero for the time would restart the recipe as soon as the previous run is finished. If the **Run Recipe Every** option is checked but the **Run Recipe** is not, it will repeat indefinitely.

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Stop Condition

Stop button . . . . Stop scanning only when the **Stop** button is clicked.

Number of Scans . . . . Stop scanning when the specified number of scans have been acquired.

Duration. Stop scanning after the specified time has elapsed.

Size of SOD file . . . . Stop scanning when the file reaches the specified size.

External Input . . . . Stop scanning as soon as the specified input is set to the inactive state, opposite of the active state specified in the **Input Configuration** column of the **System Properties Input/Output** tab. If **External Input** is selected, then an **I/O Channel** (Input) must be selected and the **On** state can be checked if desired. With the **On** state checked, the scanning will stop when the Input switches to the active state. With the **On** state unchecked, the scanning will stop when the Input switches to the inactive state. See section 12.5.1, Programming Digital Inputs as Start and Stop Conditions, on page 12-14.

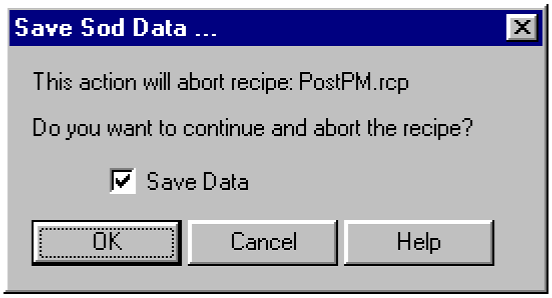
NOTE: The Start and Stop Conditions, when using External Inputs, cannot be the same for a recipe. For example, a recipe can not be programmed to Start and Stop based on Channel 1 turning On.

NOTE: The maximum size for an SOD file is 10Mb. If the file reaches the maximum size before the stop condition is met, the file will be saved, a new file opened, and the data will continue to be collected in the new file until the stop condition is met.

If a stop condition other than **Stop** button is selected and the **Stop** button is clicked, the warning shown in Figure 5-19 will be displayed before stopping the recipe.

NOTE: If the computer hard drive reaches its capacity, a message will inform the user that the hard drive is full.

Figure 5-19 Warning When Stopping Recipe



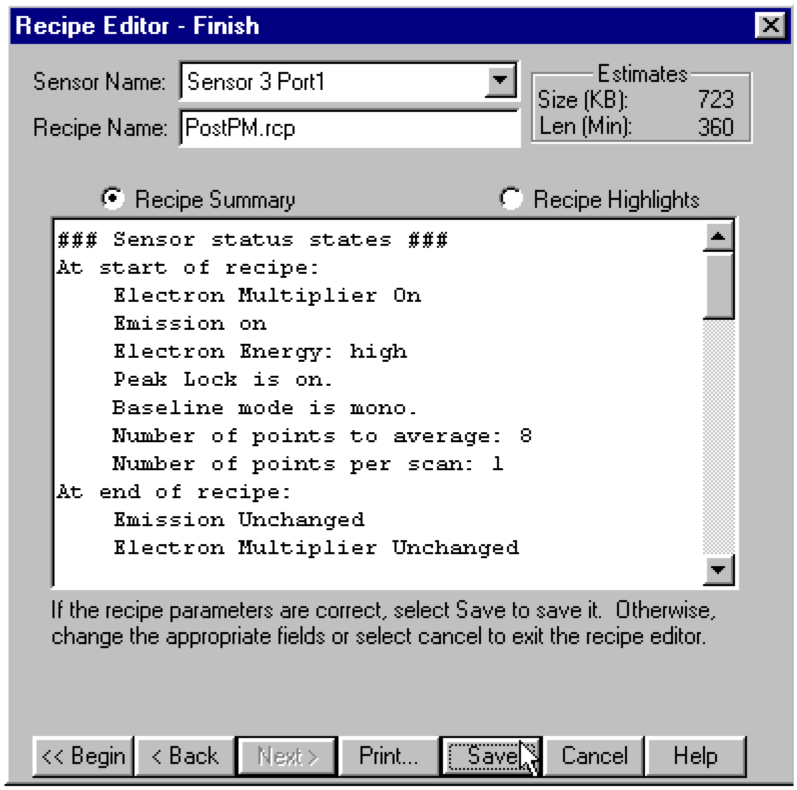
Clicking **OK** will stop the current recipe. If the **Save Data** is checked, the data will be saved before aborting the run. If the **Save Data** is unchecked, the data will be discarded. Clicking **Cancel** will ignore the **Stop** command and continue running the recipe.

Clicking **Next>** in the **Scheduler** page will bring up the **Finish** page as shown in Figure 5-20 on page 5-31.

5.12 Finish Page

Figure 5-20 shows the **Finish** page of the **Recipe Editor** Wizard. This page displays a summary of the recipe for verifying that the correct parameters have been set up. The recipe may be printed or saved from this page, or you can go back to a previous page to correct a parameter.

Figure 5-20 Recipe Editor: Finish Page



Recipe Summary . . . . When selected, the text window shows all the parameters which have been set in this recipe.

Recipe Highlights . . . . When selected, the text window shows only selected highlights of the recipe for a quick check of the settings.

<<Begin . . . . Return to the first page of the **Recipe Editor** Wizard to change some parameters or start over. This does not discard previous changes made to the recipe.

<Back . . . . Step back to previous page.

Print . . . . Print a hard copy of the recipe. If **Recipe Highlights** is selected then only the highlights will be printed. Otherwise, the **Recipe Summary** will be printed.

Save . . . . Save the recipe to a disk file and exit the **Recipe Editor**. A file dialog will be displayed allowing the user to select a directory and/or change the filename.

Cancel. . . . . Discard changes to the recipe and exit the **Recipe Editor**.

5.13 Recipe Groups

TWare32 has the ability to create a group of recipes from the Recipe Editor. A group of recipes can be created for a single sensor or multiple sensors. The **Recipe Group** can be programmed with **Start** and **Stop Conditions** that are the conditions used to load and unload the individual recipes, respectively. The individual start and stop conditions of the recipes are still used to start and stop data collection for each recipe. The **Recipe Group**, when run, will load and unload individual recipes based on a list order created when the group is created.

Figure 5-21 shows the starting point when creating a group of recipes for a group of sensors. With the blank line in the sensor list highlighted, press the **Recipe Group** button.

Figure 5-21 Creating a Recipe Group

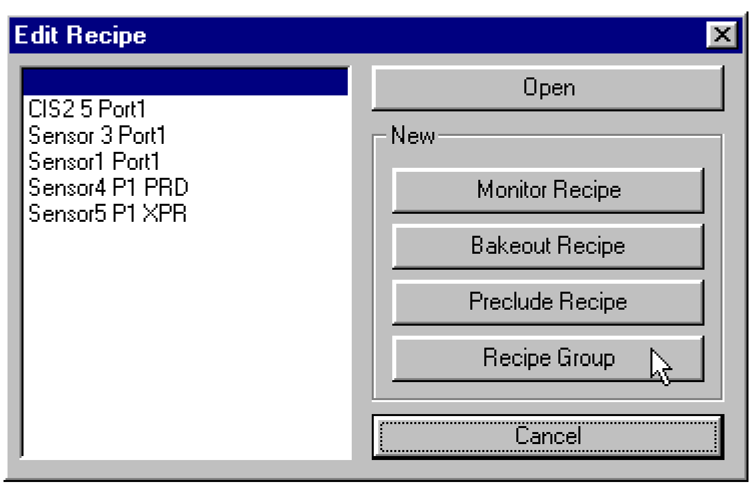


Figure 5-22 shows the **Description** page for the **Recipe Group**. A text description can be entered in the dialog box and the recipe name can be changed if desired.

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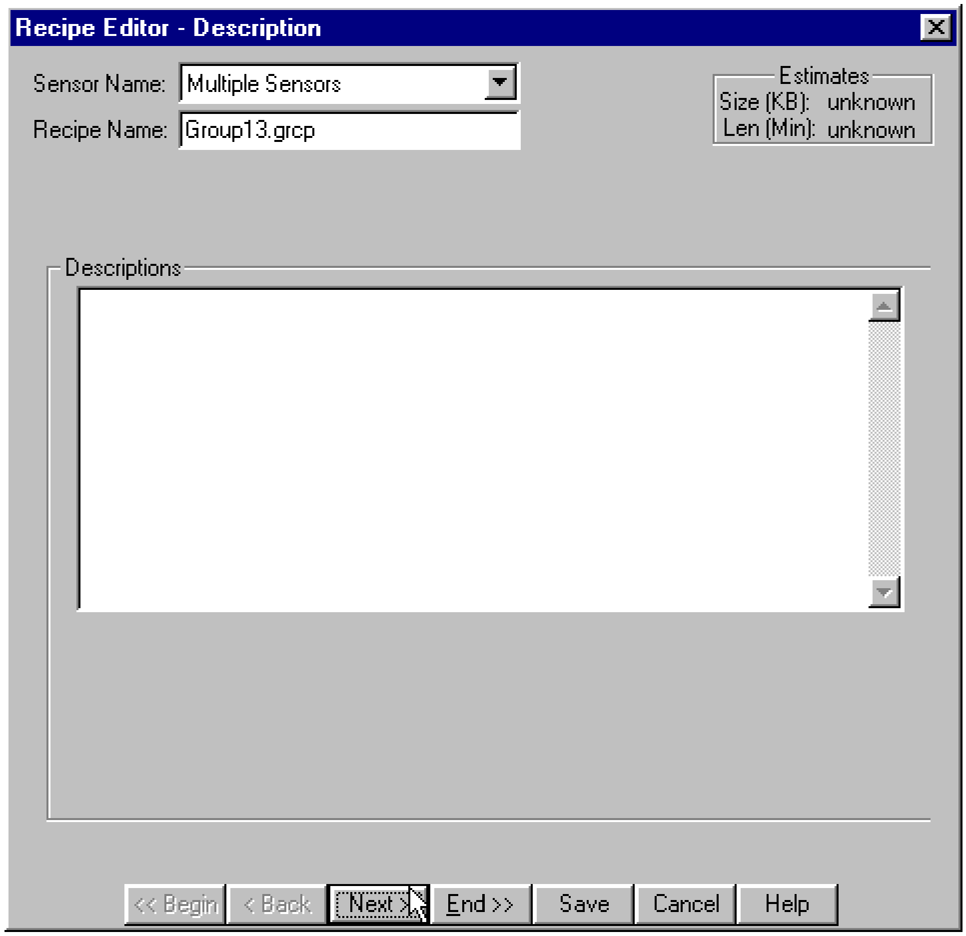
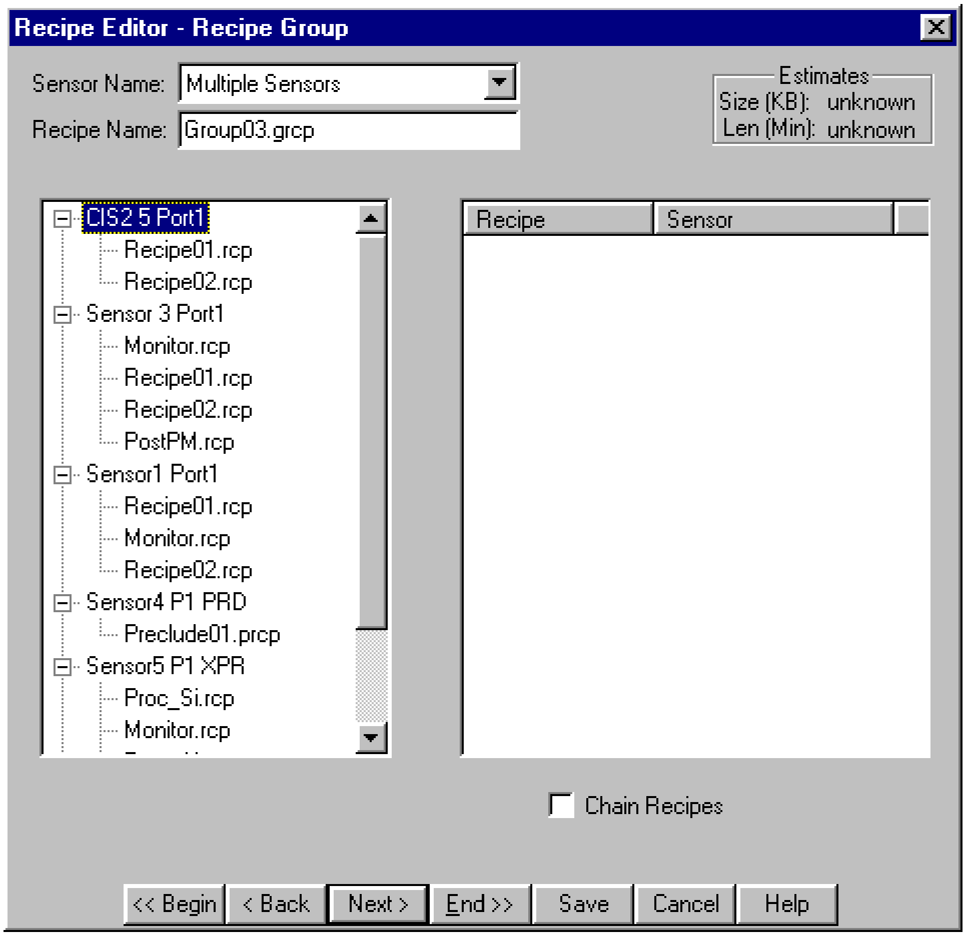
Figure 5-22 Recipe Group Description Page



Clicking **Next>** in the **Description** page will bring up the **Recipe Group** page as shown in Figure 5-23 on page 5-34.

Figure 5-23 Recipe Group Page Listing Sensors and Recipes



The **Sensor Name** shown for a **Recipe Group** is "Multiple Sensors" when the group is in fact for a group of sensors.

The panel on the left side of the dialog in Figure 5-23 lists all available sensors and the recipes associated with each sensor. From this panel, the individual recipes can be double-clicked (or "dragged and dropped") to be placed in the panel on the right side. The panel on the right side is the list of recipes that will be loaded and run when the **Recipe Group** is run.

A **Chain Recipes** checkbox is available that will, when checked, force the recipes in the right panel to be run sequentially. If the **Chain Recipes** checkbox is unchecked then all recipes in the right panel are loaded at the same time.

NOTE: If more than one recipe is listed for a sensor, and the **Chain Recipes** checkbox is unchecked, then all recipes for the sensor will be loaded when the group is loaded. This effect will cause only the last recipe in the list to run for that sensor.

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Figure 5-24 Recipe Group Page Showing a Programmed Group

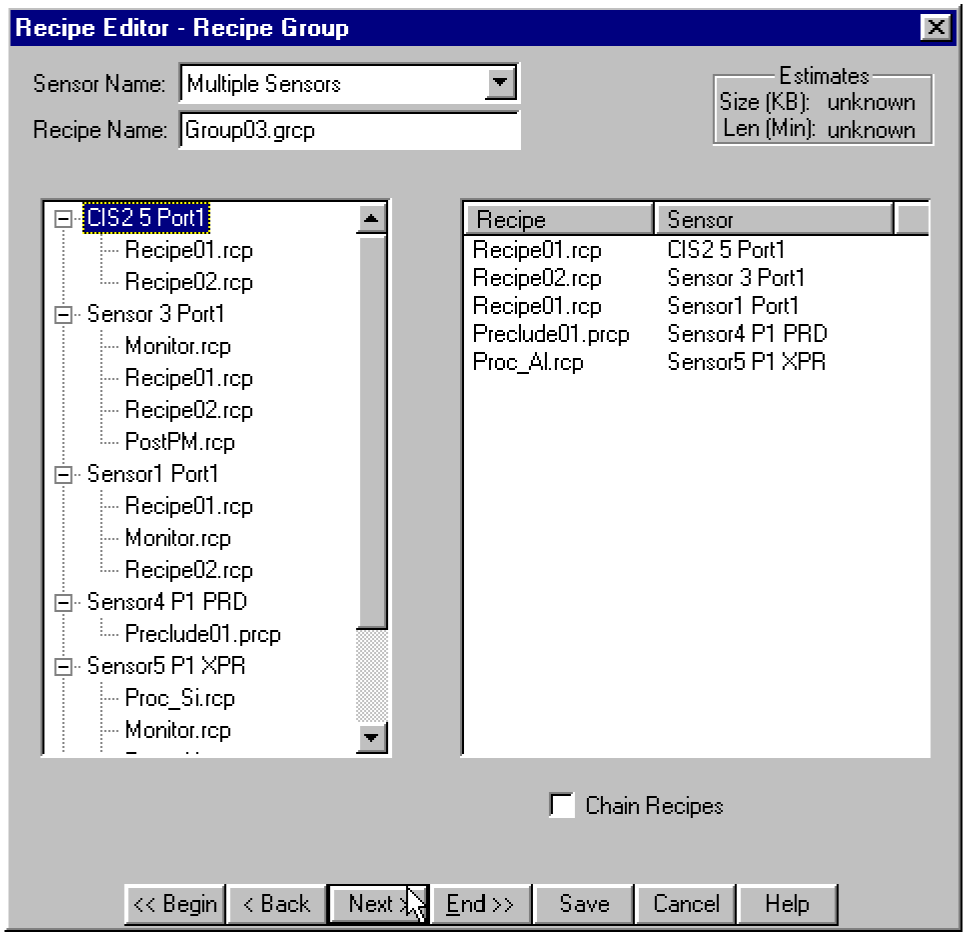

Figure 5-24 shows a **Recipe Group** programmed to run one recipe simultaneously on each of five sensors. Each recipe has been specifically programmed for a sensor prior to creating this group. This allows for a virtually synchronized start of data collection on five separate sensors provided each of the individual recipes are set to the **Start Condition** of **Run Start**.

NOTE: The list order in the right panel is entirely based on the selection order in the left panel. The first selection will be listed first, the second selection will be listed second, and so on. If an undesired selection is added to the right panel it can be deleted from the list by highlighting it in the right panel and pressing the **Delete** key.

Clicking **Next>** in the **Recipe Group** page will bring up the **Scheduler** page for the Recipe Group as shown in Figure 5-25 on page 5-36.

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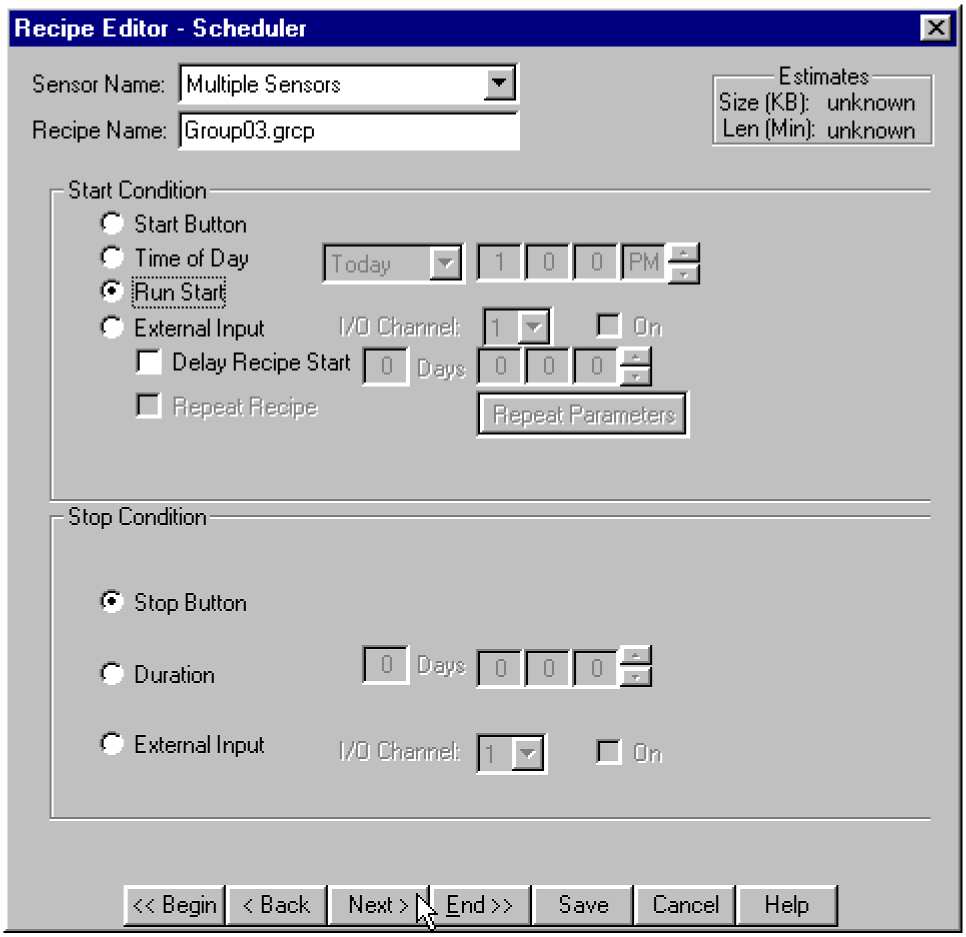
Figure 5-25 Recipe Group Scheduler Page



All of the **Start** and **Stop Conditions** have been described in an earlier section of this manual (see section 5.11, Scheduler Page, on page 5-26).

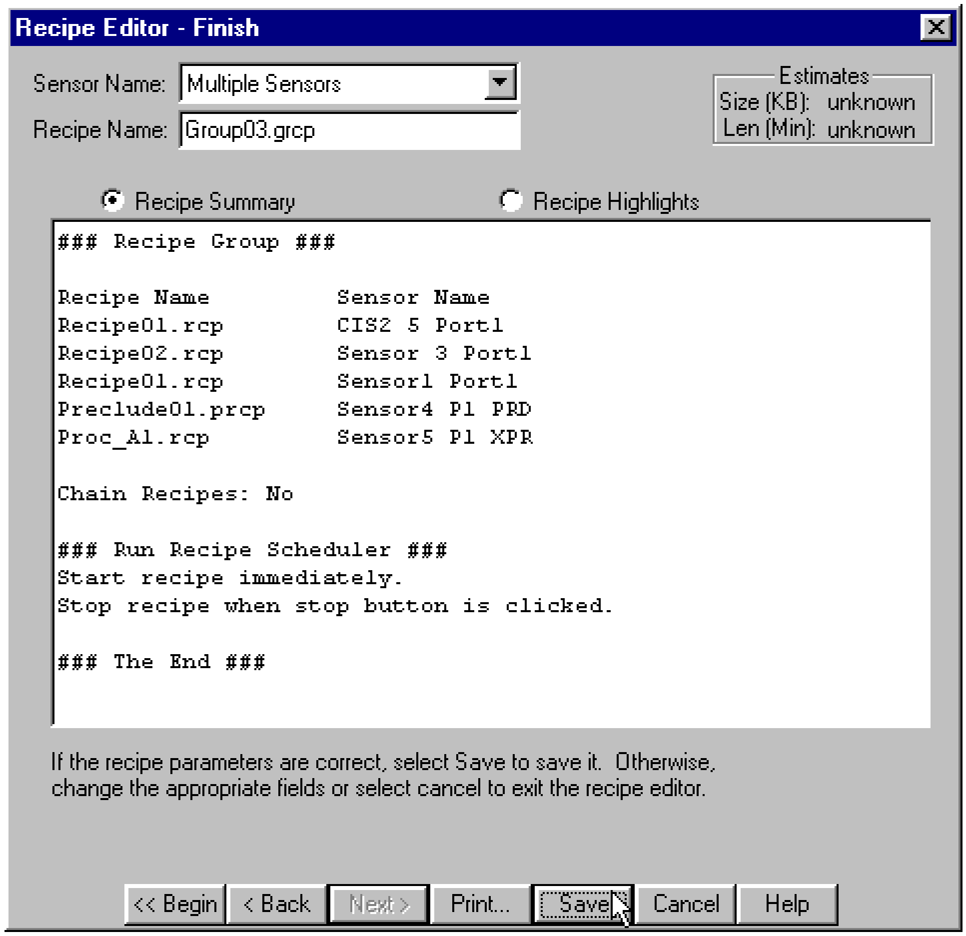
HINT: The **Start Condition** of **Run Start** works best for a Recipe Group Start Condition. Though **Start Button** can be used to start a Group, it is not recommended as a Start Condition for Groups contained within a Group.

NOTE: **Number of Scans** and **Size of SOD File** are not available as Stop Conditions for the Recipe Group.

NOTE: **External Inputs** can be used to start and stop a Recipe Group. However, it is strongly recommended that use of the same **External Input** as a Recipe Group **Start Condition** and a Recipe **Start Condition** be avoided. The same recommendation is made for the **Stop Conditions**. The simplest solution, for the **Start Condition**, is to have the group **Start Condition** set to **Run Start** and the individual recipe **Start Conditions** set to use the **External Input**.

Clicking **Next>** in the **Scheduler** page will bring up the **Finish** page for the Recipe Group as shown in Figure 5-26.

Figure 5-26 Recipe Group, Finish page



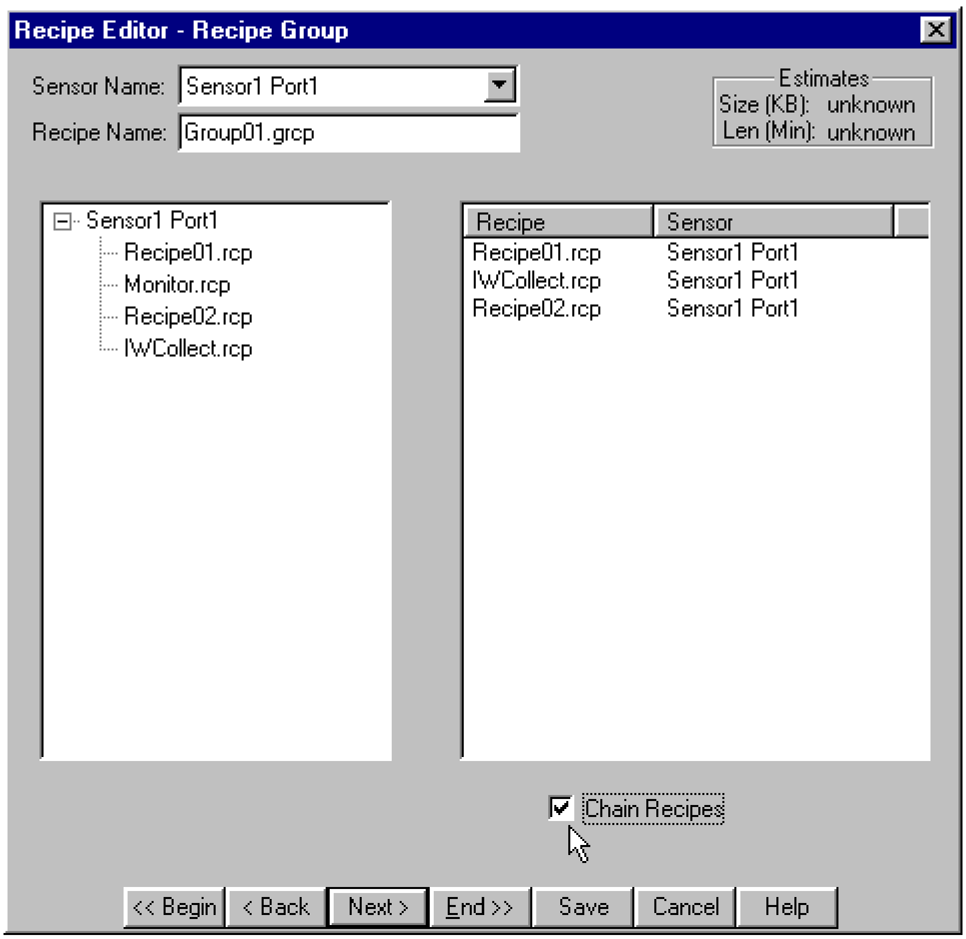
From this page the finalized **Group Recipe** can be printed and saved.

5.14 Recipe Group Examples

5.14.1 Single Sensor, Multiple Recipes

The following example (Figure 5-27 on page 5-38) shows a Recipe Group programmed to run three recipes, in order, on a single sensor. Each recipe has been specifically programmed for this sensor prior to creating this group. In the example, *Recipe01* will start and run until its individual stop condition is met. When *Recipe01* stops, the *IWCollect* recipe will be loaded and start data collection based on its Start Condition. When the *IWCollect* recipe stops, the *Recipe02* recipe will be loaded and start data collection based on its Start Condition. This entire sequence is controlled by the fact that the **Chain Recipes** checkbox is checked.

Figure 5-27 Single Sensor, Multiple Recipe Group



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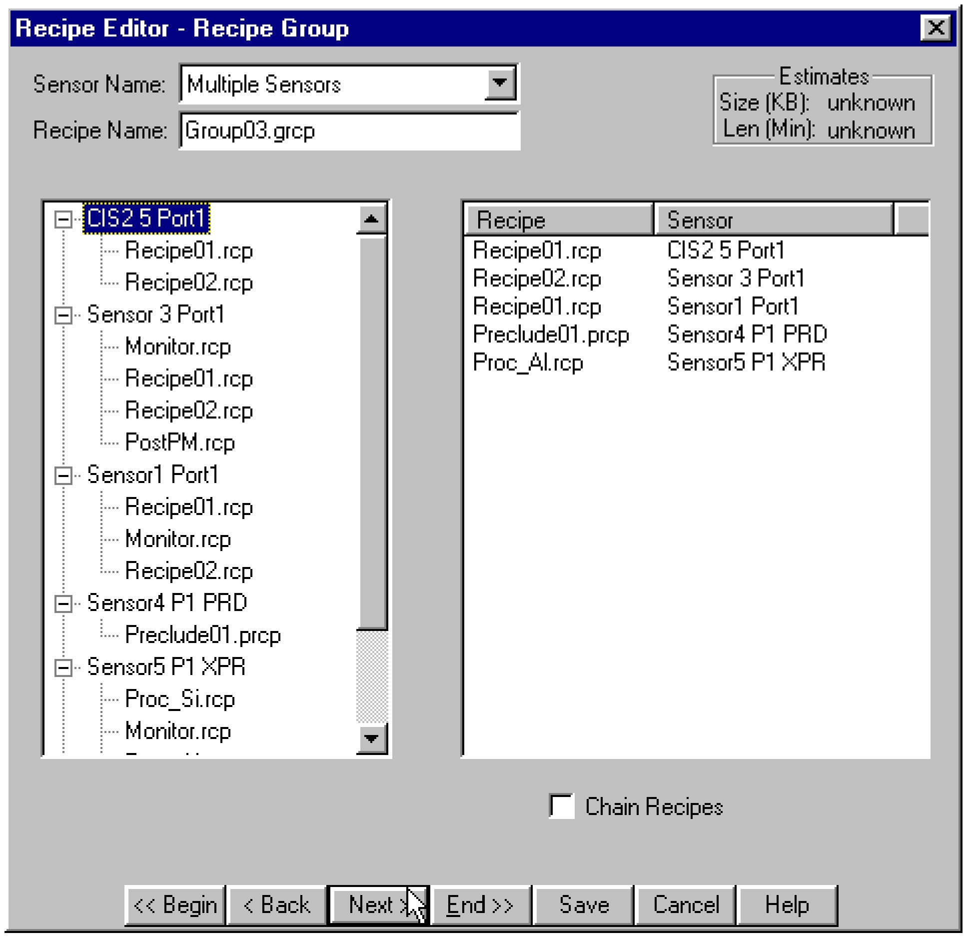
5.14.2 Multiple Sensors, Single Recipes

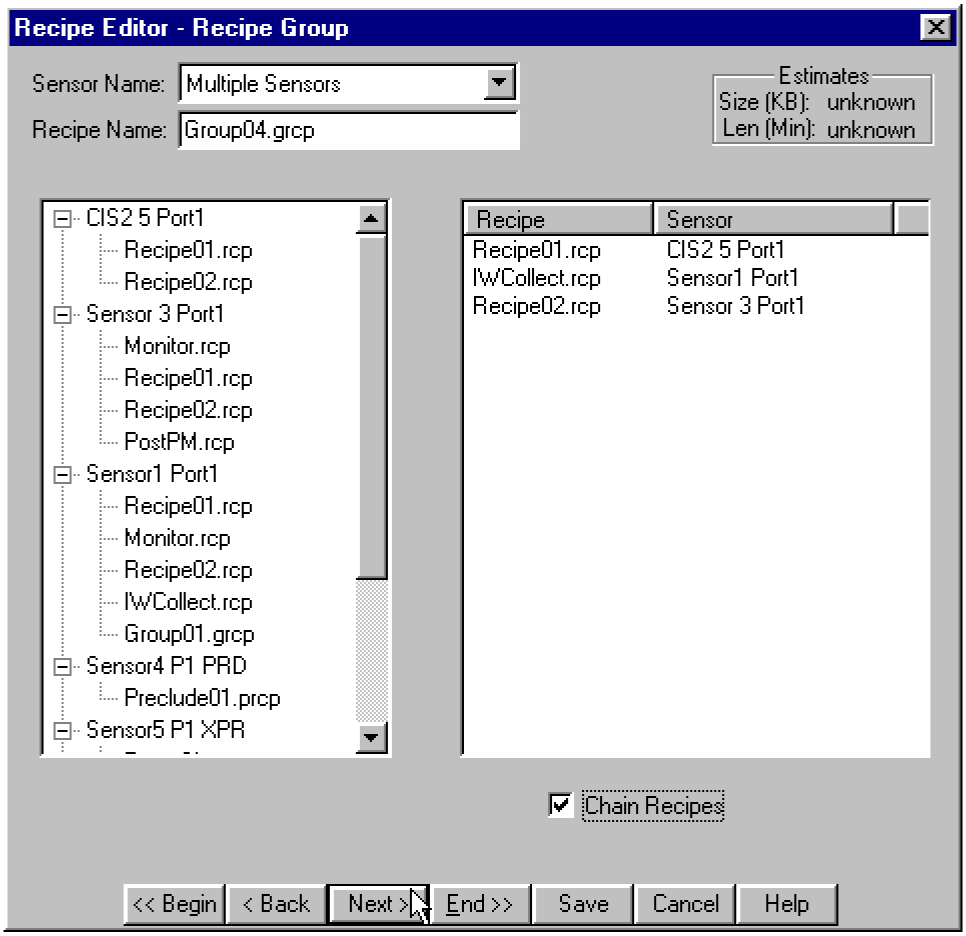
The following example (Figure 5-28 on page 5-39) shows a Recipe Group programmed to run a single recipe simultaneously on multiple sensors. Each recipe has been specifically programmed for a sensor prior to creating this group. All recipes will be loaded at the start of the **Recipe Group** because the **Chain Recipes** checkbox is unchecked. Data collection on any sensor will start only when the individual recipe **Start Condition** is met.

Figure 5-28 Multiple Sensors, Single Recipes simultaneous Group



The following example (Figure 5-29 on page 5-40) shows a Recipe Group programmed to run a single recipe consecutively on multiple sensors. Each recipe has been specifically programmed for this sensor prior to creating this group. In the example, *Recipe01* will start on sensor *CIS2 5 Port1* and run until its individual stop condition is met. When *Recipe01* stops, the *IWCollect* recipe will be loaded and start data collection on sensor *Sensor1 Port1* based on its Start Condition. When the *IWCollect* recipe stops, the *Recipe02* recipe will be loaded and start data collection on sensor *Sensor3 Port1* based on its Start Condition. This entire sequence is controlled by the fact that the **Chain Recipes** checkbox is checked.

Figure 5-29 Multiple Sensors, Single Recipes consecutive Group



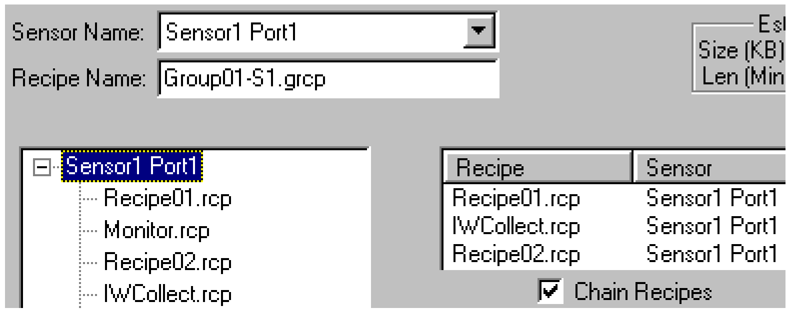
5.14.3 Multiple Sensors, Multiple Recipes

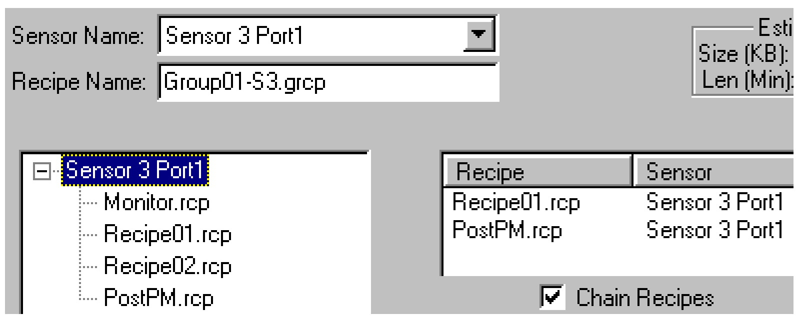
The following example shows a Recipe Group programmed to run multiple recipes on multiple sensors. This is done by creating a **Recipe Group of Recipe Groups** in which the individual recipes in the groups are chained.

Figure 5-30 on page 5-41 shows three different groups being created. Each group has been created for a single sensor with multiple recipes chained together.

Figure 5-31 on page 5-42 shows the creation of a group consisting of the three different groups. In this example, when the group recipe *GroupA.grcp* is run the effect will be to load each of the individual groups. Each individual group will then load the first recipe in its list and await the individual start conditions to start data collection. As each individual recipe stops, the next recipe in the list is loaded to run.

Figure 5-30 Single Sensor, Multiple Recipe Groups (3 Groups shown)





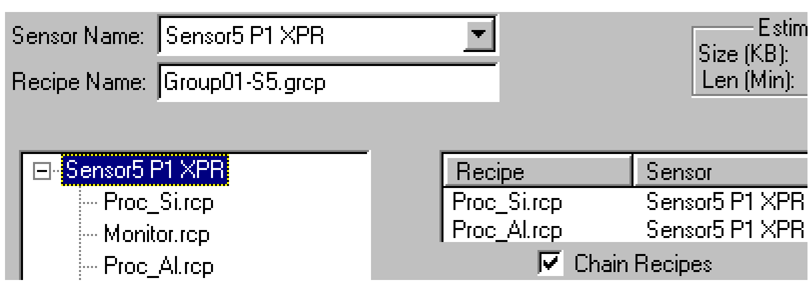
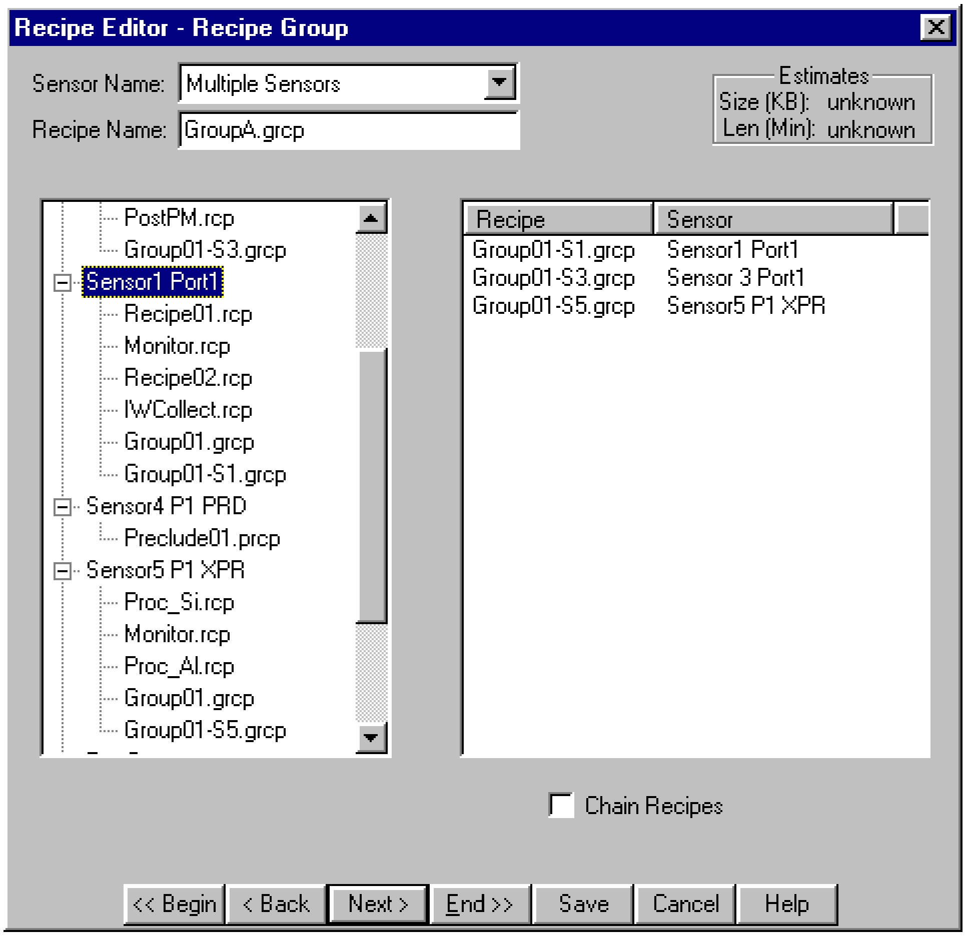


Figure 5-31 Group of Recipe Groups



For information on how to run a **Recipe Group**, see section 4.5, Running a Group Recipe, on page 4-28.

NOTE: If a problem exists, in a Recipe Group, for which Technical Support is required, please be sure to send all individual recipes (.rcp files) and the Group Recipes (.grcp files) related to the problem.

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Chapter 6
Locating Leaks

6.1 Introduction

Leaks are the mortal enemy of vacuum systems. Usually, they are detected by either an increase in pressure within the chamber or a slower pump-down rate. If monitoring the system with an RGA, it is even possible to distinguish between air leaks and leaks of gasses within the tool, such as Argon or Nitrogen, by looking at the relative intensities of various peaks.

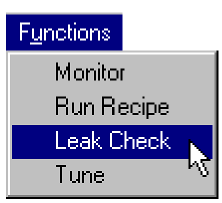
Once it is determined that there is a leak, the task becomes locating it. A common method used is to spray a gas (usually Helium) at various points around the vacuum system and monitor the ion current at the mass of the gas (4 for Helium). When spraying near the leak, a sharp increase in the intensity of the observed peak will be observed.

While this could be done in normal **Monitor** mode (selecting a single peak to observe and watching the output) a special **Leak Check** mode was added to TWare32 to facilitate this operation. This chapter describes the use of the **Leak Check** mode.

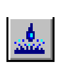
6.2 Invoking Leak Check

Leak Check can be invoked in several ways:

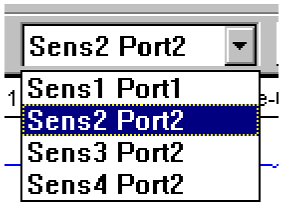
- through the **Functions >> Leak Check** menu item



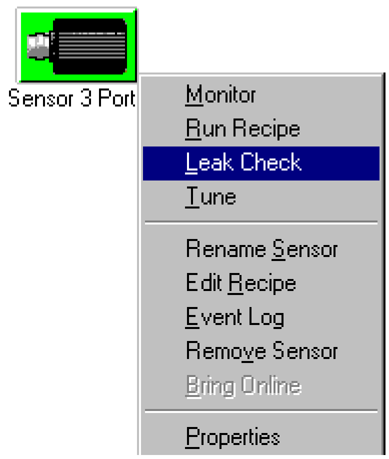
- by clicking on the **Leak Check Icon**



- by selecting a sensor from the **Sensor Toolbar**, which is not currently running a process, and then selecting **Leak Check** from the list of functions.



- by selecting **Leak Check** from the context menu when the cursor is on a sensor in the **System Setup Screen**.



- by selecting **Leak Check** from the **Functions** tab of the Transpector **Properties Page**.

6.3 The Leak Check Screen

Once invoked, **Leak Check** will display a screen consisting of a **Trend** display, a **Total Pressure** display, a **Gas Gauge** display, and a **Control Panel** (see Figure 6-1 on page 6-3). Scanning starts immediately on entry to the **Leak Check** mode. The **Trend** display shows a history of the data sampling over time and the **Gas Gauge** display shows the instantaneous level of the observed mass. A yellow and a red horizontal line in the **Trend** display indicate warning and alarm levels respectively. These limits are set automatically when scanning starts and can be changed at any time.

The four main parts of the display, **Total Pressure**, **Trend**, **Gas Gauge**, and **Control Panel**, can be individually displayed or hidden by selecting or de-selecting the corresponding item from the context menu (see Figure 6-2).

Figure 6-1 The Leak Check Display

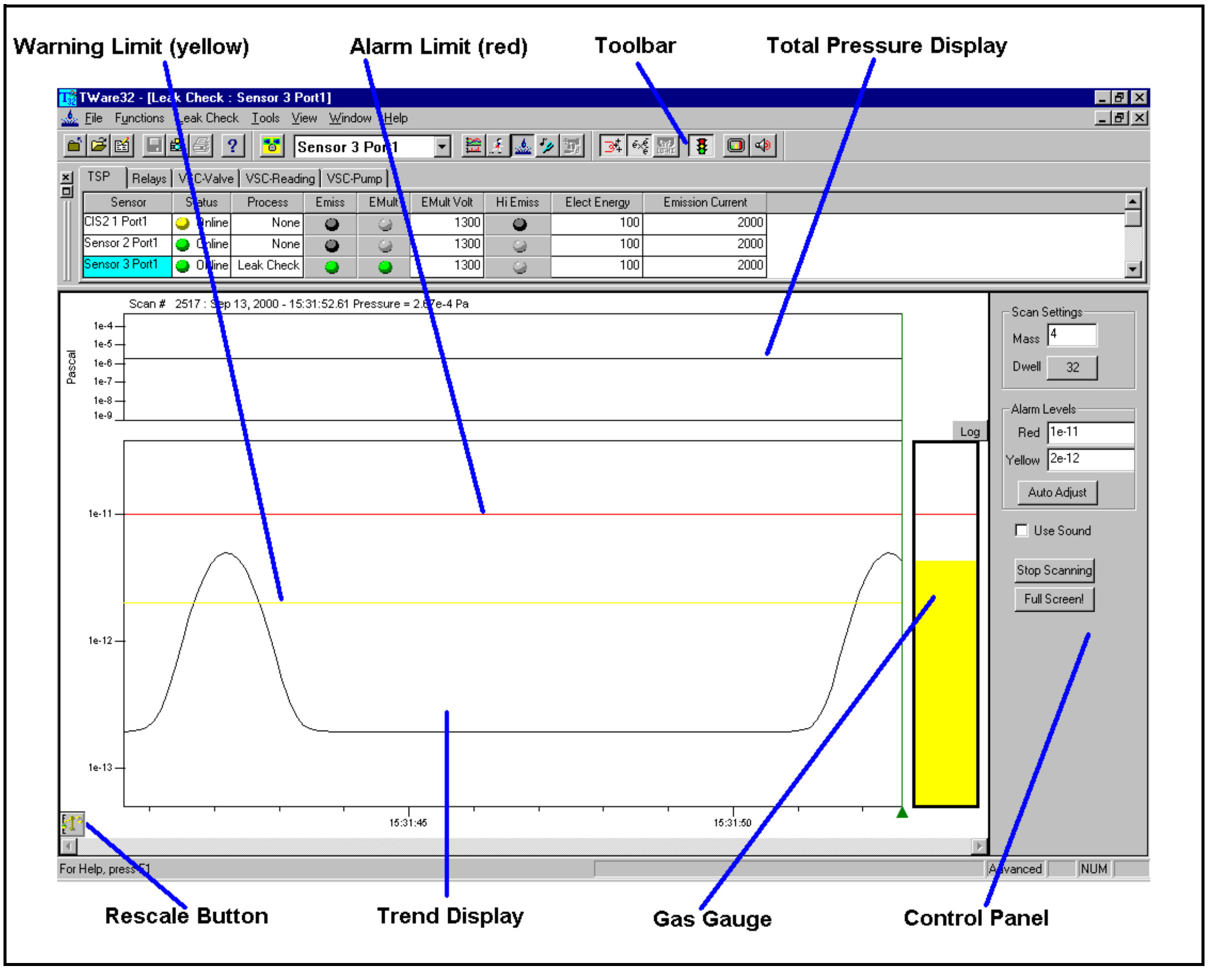
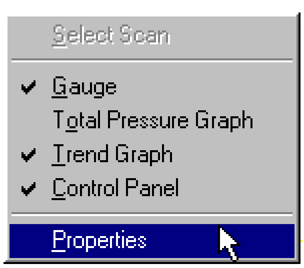


Figure 6-2 Leak Check Context Menu

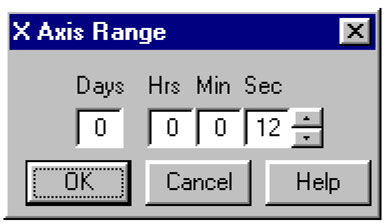


6.3.1 The Trend Display

The **Trend** display in **Leak Check** mode is much like that of **Monitor**, with a few added features. In **Leak Check** there are two horizontal lines on the **Trend** display — a yellow line to indicate a warning threshold and a red line to indicate an alarm threshold. These levels are set automatically on entry to **Leak Check** and can be changed using the **Control Panel** (see section 6.3.4 on page 6-5).

As in **Monitor,** the Y-axis can be rescaled by clicking on the **Rescale** button. The vertical scaling can also be adjusted manually by clicking near the top or bottom of the Y-axis and either entering a new limit, or by clicking the up and down arrows. The scale of the Y-axis can be toggled between a logarithmic and a linear display as with the **Monitor Trend** (refer to page 4-11). However, the units are always Amps and cannot be changed to partial pressure or PPM. The width of the X-axis can be changed by clicking on the X-axis. This displays the dialog shown in Figure 6-3. Enter the desired width and click **OK**.

Figure 6-3 Changing the Width of the Trend Display



6.3.2 The Total Pressure Display

As in **Monitor**, an optional **Total Pressure Graph** can be displayed above the **Trend**. The horizontal scale of the **Total Pressure** display is the same as the **Trend** display, but the Y-axis can be scaled independently by clicking near the top or bottom of the axis as with the **Trend** display.

6.3.3 The "Gas Gauge" Display

To the right of the **Trend** display is a vertical bar, called the **Gas Gauge**, which indicates the instantaneous amplitude of the signal. This is designed to be visible from a distance while checking for leaks. The bar is green when below the warning limit, yellow when between the warning and the alarm limit, and red when above the alarm limit. If the warning limit is above the alarm limit then the warning limit is ignored.

6.3.4 The Control Panel and Toolbar

The **Control Panel** and **Leak Check Toolbar** provide a means of controlling the data acquisition and alarming during leak checking operations. Changes to parameters take effect as soon as they are confirmed (select **Enter** or click in another control). Some controls are on both the **Control Panel** and the **Toolbar**. They may be used interchangeably.

<u>**Scan Settings**</u>

Mass. . . . . The mass to observe while checking for leaks.

Dwell . . . . The dwell or integration time to use when measuring that mass.

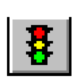
<u>**Alarm Levels**</u>

Red. . . . . The ion current above which an alarm condition occurs (**Gas Gauge** turns red). A value can be typed in, or it can be set automatically by clicking on **Auto Adjust**.

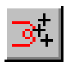
Yellow . . . . The ion current above which a warning condition occurs (**Gas Gauge** turns yellow). A value can be typed in, or it can be set automatically by clicking on **Auto Adjust**.

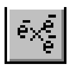
Auto Adjust . . . . Selecting this button calculates the average of the previous five scans and multiplies that value by factors to determine the warning and alarm levels. The factors default to 10 for the warning level and 20 for the alarm level. These factors can be changed in the **Leak Check Properties Page**. See Figure 6-5 on page 6-7

Use Sound  . . . . When selected, a continuous tone is generated, the frequency of which is proportional to the amplitude of the signal. The frequency range can be adjusted on the **Leak Check Properties** page. This can also be toggled from the **Leak Check** menu by selecting **Leak Check >> Enable Sound**.

Stop/Start Scanning  . . . . Use to stop and restart scanning.

Full Screen  . . . . Switch to full screen display for a *very* visual indication of the process. See section 6.4 on page 6-9 for details. Pressing any keyboard key or mouse button will return to the normal display. This button is disabled when not scanning. This can also be selected from the **Leak Check** menu by selecting **Leak Check >> Full Screen**.

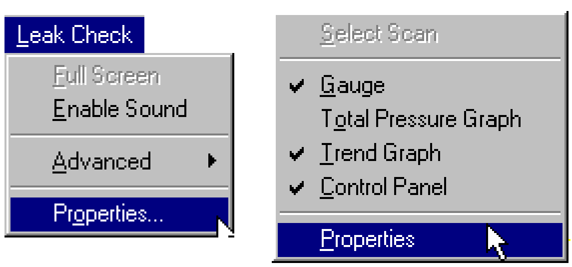
 . . . . Select to toggle emission on (button depressed) and off (button up).

 . . . . Select to toggle electron multiplier on (button depressed) and off (button up). This button is disabled if no EM is available for this sensor, or if the emission is not on.

6.3.5 Property Sheets

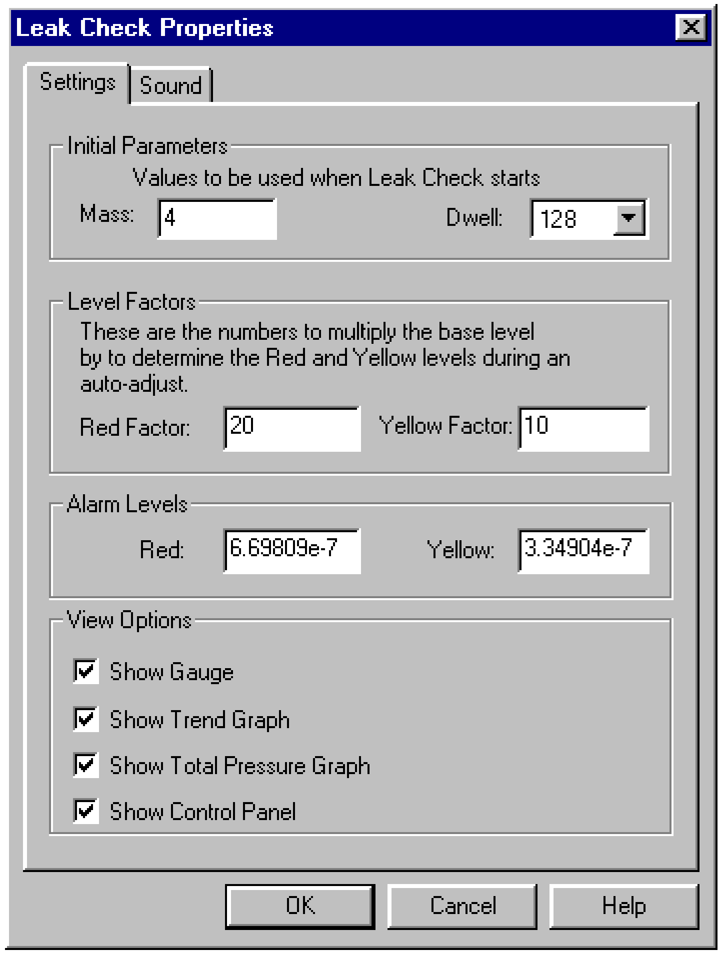
The **Leak Check Properties** can be displayed and modified by selecting **Leak Check >> Properties** or selecting **Properties** from the context menu (see Figure 6-4).

Figure 6-4 Displaying Leak Check Properties



The **Properties** pages are divided into two categories: **Settings** and **Sound**. The **Settings** page is shown in Figure 6-5 on page 6-7 and the **Sound Page** is shown in Figure 6-6 on page 6-8.

Figure 6-5 Leak Check Properties, Settings Page



Initial Parameters

Mass . . . . Initial mass to use when first entering **Leak Check** mode.

Dwell . . . . Initial dwell to use when first entering **Leak Check** mode.

Level Factors

These are the factors to use when selecting **Auto Adjust** on the **Control Panel**. These factors are multiplied by the average of the previous five readings to determine the respective alarm levels.

Red Factor . . . . Determines alarm level.

Yellow Factor . . . . Determines warning level.

Alarm Levels

These are the ion currents above which an alarm or warning condition occurs.

Red . . . . Alarm ion current level.

Yellow . . . . Warning ion current level.

View Options

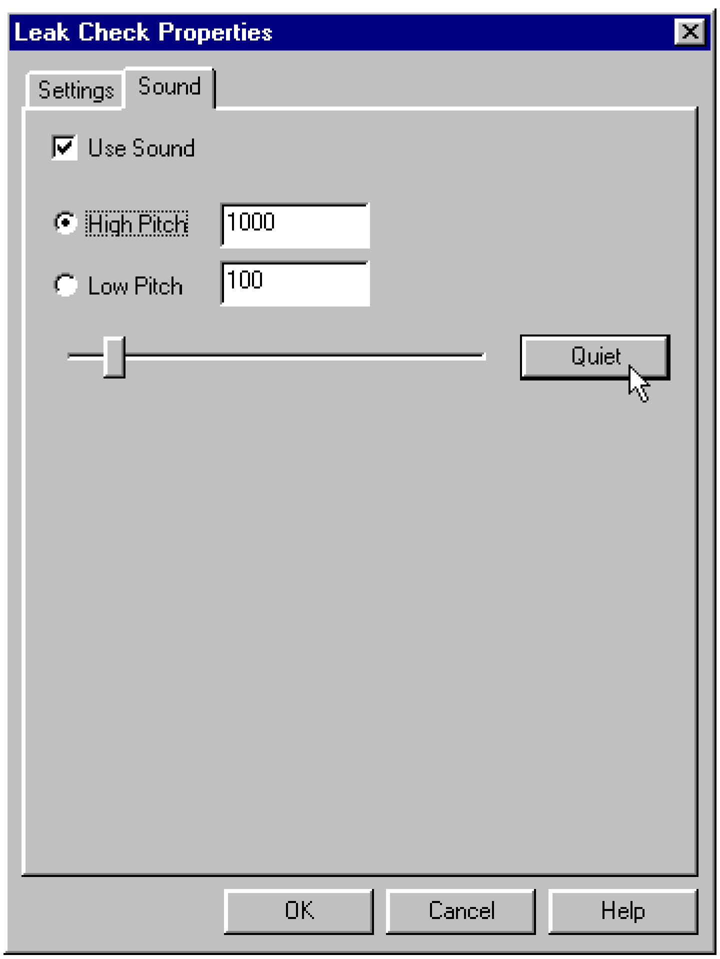
Show Gauge . . . . When selected, the **Gas Gauge** will be displayed on the **Leak Check** screen.

Show Trend Graph . . . . When selected, the **Trend** graph will be displayed on the **Leak Check** screen.

Show Total Pressure Graph. . . . . When selected, the **Total Pressure** graph will be displayed on the **Leak Check** screen.

Show Control Panel . . . . When selected, the **Control Panel** will be displayed on the **Leak Check** screen.

Figure 6-6 Leak Check Properties, Sound Page



IPN 074-334D

Use Sound . . . . When checked, an audio tone will be generated which is proportional to the amplitude of the signal.

High Pitch . . . . Select the radio button to adjust the frequency at the alarm level, then move the slider or type in a value to change the frequency.

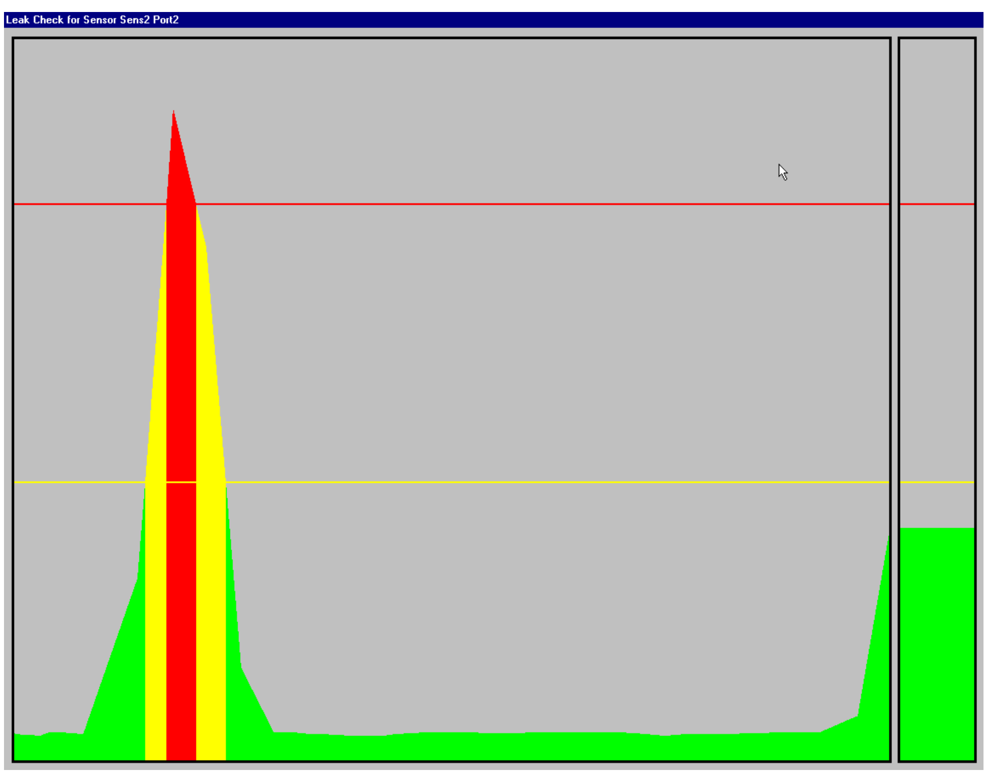
Low Pitch. . . . . Select the radio button to adjust the frequency at baseline conditions, then move the slider or type in a value to change the frequency.

Quiet . . . . Click on this button to end the frequency adjustment and silence the computer.

6.4 Full Screen Display

Selecting the **Full Screen** button on the **Control Panel** or **Toolbar** brings up a full screen display with bright colors (see Figure 6-7). This screen is very visible from a distance and the color feedback makes leak checking from across the room possible. Press any keyboard key or mouse button to return to the normal display.

Figure 6-7 Full Screen Display



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Chapter 7
Tuning the Sensor

7.1 Introduction

CAUTION

Only qualified personnel should perform Tune adjustments. Improper adjustment can significantly degrade instrument performance.

TWare32 includes a **Tune** program for the adjustment and calibration of the sensor. However, frequent **Tune** adjustments are not necessary or desirable. Tuning is ordinarily performed when the sensing head has been serviced or replaced. Periodic tuning to compensate for sensor head aging may be done if necessary, depending on the instrument application.

The instrument must be operating with the emission on (and the Electron Multiplier on, if desired).

Prior to tuning, a warm-up period of at least one hour with emission on is *necessary*.

If the sensor has been baked, it should be allowed to come to normal operating temperature, a process requiring at least four hours.

Mass Tuning

Mass Tuning is used for the adjustment of **Mass Peak Position** and **Resolution**. See section 7.4 on page 7-12 for instructions on how to perform **Mass Tuning**.

Electron Multiplier Tuning

Electron Multiplier Tuning is used for the adjustment of **Electron Multiplier Gain**. See section 7.8 on page 7-19 for instructions on how to perform **Electron Multiplier Tuning**.

Sensitivity Calibration

Sensitivity Calibration is used for the adjustment of the **Partial Pressure** calculation. See section 7.8 on page 7-19 for instructions on how to perform **Sensitivity Calibration**.

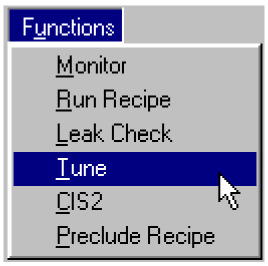
Total Pressure Calibration

Total Pressure Calibration is the calibration of the internal **Total Pressure** gauge. See section 7.8 on page 7-19 for instructions on how to perform **Total Pressure Calibration**.

7.2 Invoking Tune

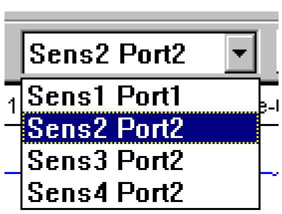
Tune can be invoked in several ways. Invoking **Tune** in any of these ways will bring up the **Tune** display similar to that in Figure 7-1 on page 7-4. **Tune** will turn on the emission and start scanning immediately; however, the electron multiplier will not be turned on. If the electron multiplier was already on it will remain on, otherwise it must be manually turned on when entering **Tune**. **Tune** can be invoked:

- through the **Functions >> Tune** menu item

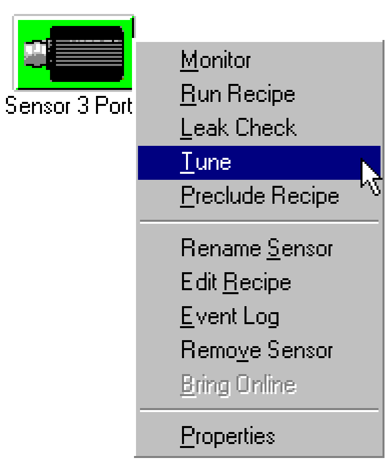


- by clicking on the **Tune Icon**

- by selecting a sensor from the **Sensor Toolbar**, which is not currently running a process, and then selecting **Tune** from the list of functions.

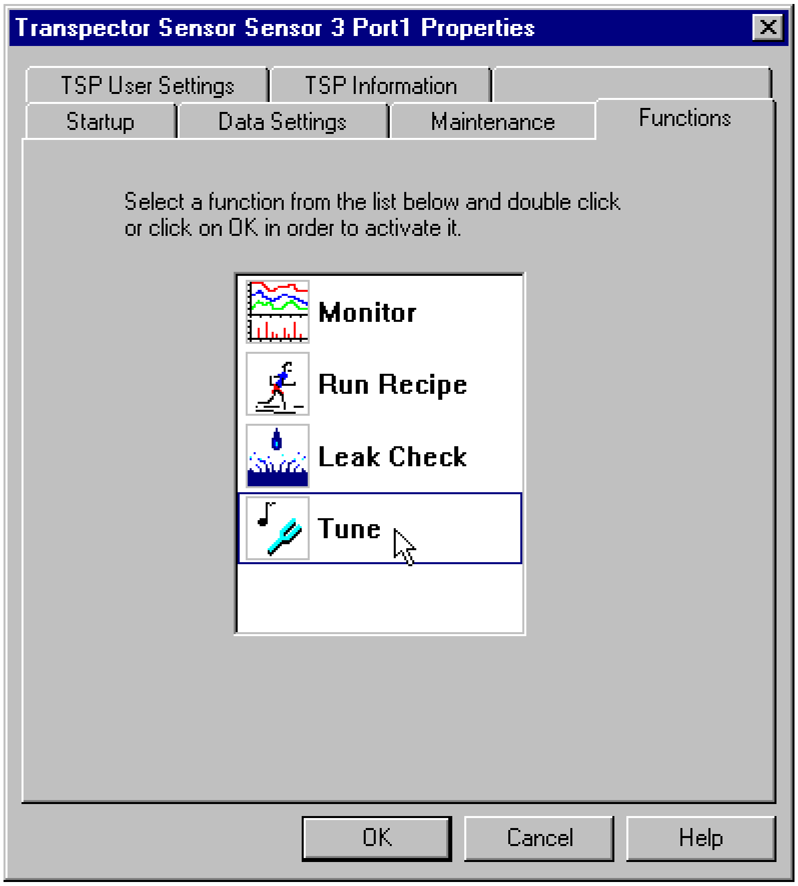


- by selecting **Tune** from the context menu when the cursor is on a sensor in the **System Setup Screen**.



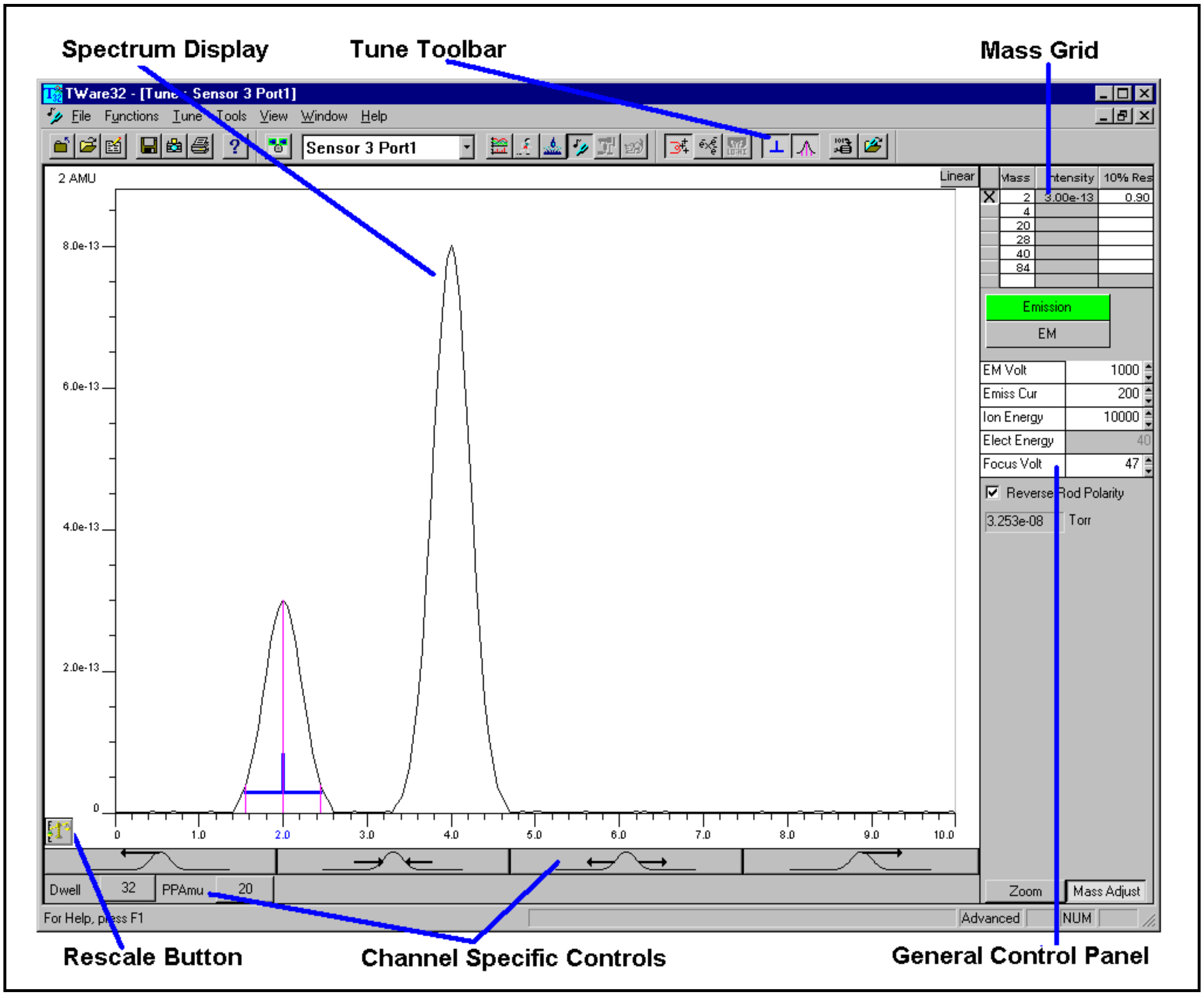
IPN 074-334D

- by selecting **Tune** from the Functions tab of the sensor properties sheets.



7.3 The Tune Display

Figure 7-1 Typical Tune Display



7.3.1 The Spectrum Display

The **Spectrum Display** consists of a plot of ion current vs. mass. The default scan width of the display is 10 AMU, but this can be changed by clicking on the x-axis and entering a new scan width in the dialog box. The one restriction is that the width *must be an even number of AMU wide*. The nominal value of the Tune mass is displayed in the upper left corner of the display and is shown in blue on the x-axis. Usually the Tune mass will be in the center of the display; however, when the Tune mass is too close to the end of the sensor range it may be off center.

During the first scan after starting **Tune**, after switching masses, or after turning on the emission or multiplier, an automatic re-scaling will be performed. During this time **AUTO-SCALE** is displayed on the screen. This feature can be disabled in **Tools >> System Properties >> Miscellaneous**. Selecting the **Rescale** button at any time will force a re-scaling of the display.

The icons under the **Spectrum Display** are buttons for adjusting the **Peak Position** and **Resolution**. See section 7.4 on page 7-12 for details on how these buttons operate.

Each channel has its own dwell time and points per AMU, which is displayed under the row of adjustment buttons. These buttons can be used to change these values. See section 7.5 on page 7-15 for details.

7.3.2 The Mass Grid

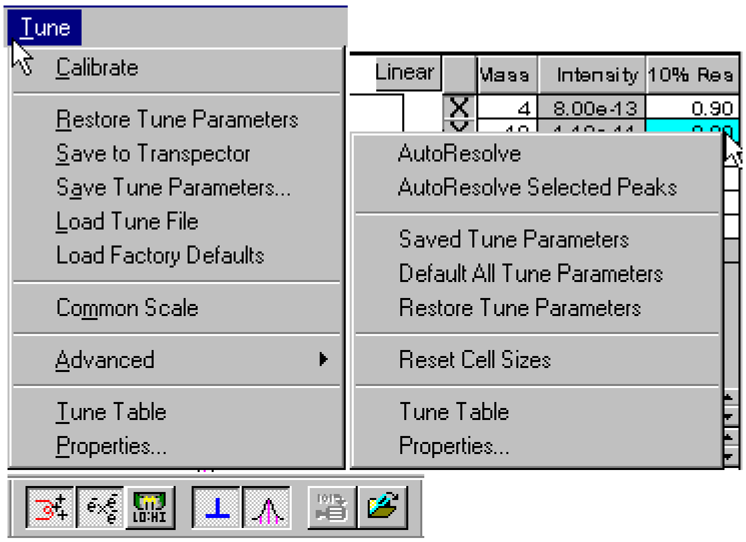
There is a grid of Tune masses, referred to as the **Tune Mass Grid**, on the right of the screen. Masses may be changed by clicking in the cell and typing a new mass. A new mass may be added by clicking in a blank cell and typing in the new mass. A mass may be deleted by clicking on that mass and pressing the **Delete** key. Masses can also be edited in the **Tune Table** of the **Properties Pages** (Figure 7-8 on page 7-18).

When **Tune** is first started, it will begin scanning and will display the first mass in the list. There will be a ✔ (checkmark) in the box to the left of this mass. Selecting another box will start scanning for that mass and split the **Spectrum** screen to show both channels. Clicking on a selected box (one already displaying a ✔) will stop scanning for that channel and remove it from the screen. Clicking in the box on the upper left corner of the grid (in the column with the ✔) will enable all the tune masses. This is convenient for plotting the tune channels to record the affects of tuning.

7.3.3 The Control Panel, Tune Menu, and Toolbar

Below the mass grid is a panel of buttons and controls (**Control Panel**), which is used to adjust some instrument parameters and control some display behaviors. Access to additional functions is available via the **Tune Menu, Tune Grid Context Menu** (right-click on the Grid), and **Tune Toolbar** (see Figure 7-2 on page 7-6).

Figure 7-2 Tune Menu, Tune Grid Context Menu and Toolbar

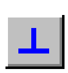


. . . . Toggles the **Emission** on and off. If the button is green the **Emission** is on, gray is off, and yellow is in the process of turning on. Clicking the button toggles its state.

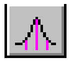
. . . . Toggles the **Electron Multiplier** on and off. If the button is green the multiplier is on, gray is off, and yellow is in the process of turning on. Clicking the button toggles its state. These buttons are disabled if the sensor is not equipped with an electron multiplier or if the emission is not on.

Electron Energy 

. . . . Toggles the **Electron Energy** between high and low energy.



. . . . Displays an inverted “T” on the **Spectrum** display as a guide in adjusting the **Mass Position** and **Resolution** as described in the next section. The vertical bar is positioned on the tuning mass and the horizontal bar is positioned at 10% of peak height and has a default width of 0.9 AMU. The target width may be set in the **Tune Table**.

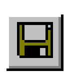
 Displays vertical lines at the peak start, end, and maximum as an aid in tuning.

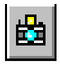
Save to Transpector  This is enabled when some tune parameters have been changed. Clicking this button or selecting this menu item will save the current tune parameters in the non-volatile memory of the Transpector to be used each time the unit is turned on. When you exit **Tune** with some parameters that have been changed and not saved, you will be prompted to save them.

Load Tune File  Reads the Tune parameters from a disk file, that has been previously saved, and downloads them to the Transpector. These changes are not saved to the NVRAM of the Transpector until either the **Save to Transpector** function is executed or the Tune function is exited and the choice is made to save the changes to the Transpector.

Restore Tune Parameters Selecting this menu item will restore Tune parameters to what they were when **Tune** was entered, discarding any changes made during this session.

NOTE: If, anytime during the Tune session, the **Save to Transpector** function has been executed, the **Restore Tune Parameters** function cannot undo those changes. **Restore Tune Parameters** can only undo changes that were not saved to the Transpector.

Save Tune Parameters  Saves the current tune parameters to a disk file. This file can be recalled at any time, using **Load Tune File**, and sent to the Transpector.

Snapshot  . . . . Selecting **File >> Snapshot** or clicking on the **Snapshot** icon will save the portion of data *currently being displayed* in a SOD file. The name of the file will be **Tun*yymmdd-nn*.sod**, where ***yy*** is the year, ***mm*** is the month, ***dd*** is the day, and ***nn*** is a count within each day to keep the filenames unique. The data will be stored in the default data directory for the current sensor. **Snapshot** saves the graphical data of the Tune in process but does not save the Tune Parameters as a recallable Tune file.

Load Factory Defaults . . . . Reads the file **`factory.tun`** from disk and sends the parameters to the Transpector. This file, **`factory.tun`**, was automatically read from the Transpector and stored on disk *the first time Tune was run from TWare32 on this Transpector.*

NOTE: The Transpector was tuned at the factory. However, if the Transpector was tuned in the field using a different computer or program, then the file **`factory.tun`** does not necessarily contain the original factory Tune parameters.

The parameters sent to the Transpector by this function are not saved to the NVRAM of the Transpector until either the **Save to Transpector** function is executed or the Tune function is exited and the choice is made to save the changes to the Transpector.

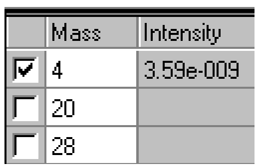
Common Scale . . . . When multiple channels are displayed on the same screen, normally each channel is scaled independently. Selecting this option scales them all the same, on the Y-axis, to facilitate comparison of absolute intensities. This function is available from the **Tune** menu or the **Tune** context menu.

AutoResolve . . . . Automatically tunes the peak selected for Tuning. See section 7.4.1, Adjusting Peak Resolution (Width), on page 7-13 for a description of the function.

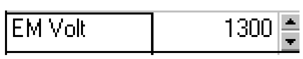
AutoResolve Selected Peaks . . . Performs AutoResolve on all peaks selected, with the ✔ box, for tuning. See section 7.4.1, Adjusting Peak Resolution (Width), on page 7-13 for a description of the function.

Saved Tune Parameters . . . . Reads the Tune parameters most recently saved to the Transpector and redisplays them to the Tune grid and Tune Table.

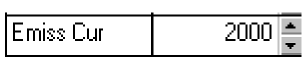
Default All Tune Parameters. . . . This function is expected to be used only when the Tune parameters and sensor tune appear to be beyond tuning. This function reads the Transpector firmware default Tune parameters.



. . . . Clicking once will select and add the corresponding mass for tuning.



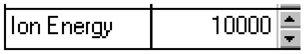
. . . . Sets the voltage of the **Electron Multiplier**. Normally this is set via the EM calibration, however, a value can be entered directly here.



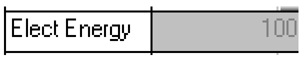
. . . . The **Emission Current** is the current passed through the filament to generate electrons, which collide with gas molecules to form ions.

The normal **Emission Current** for a High Performance or Compact sensor is 2000 μA and for the XPR is 400 μA for the **High Emission** mode and 200 μA for the **Low Emission** mode. Reducing the **Emission Current** decreases the sensor output, but may reduce space-charge effects in the ion source at high pressures.

CIS and XPR sensors have a selectable **Low Emission** mode which operates at 200 μA to reduce background gas desorption which interferes with detection of trace level impurities. Other instruments have this parameter disabled.



Normal **Ion Energy** is 10000 mV for a High Performance or Compact sensor and 8000 mV for XPR sensors, within a range of 5000 to 15000 mV. Changing the **Ion Energy** may improve peak shape, but may also result in a decrease in sensitivity. The sensor's ion energy is calibrated to its optimum value at the factory and should not be changed from the factory setting unless absolutely necessary.

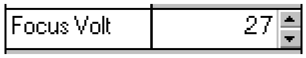


Electron Energy is the energy with which an electron will strike a molecule and fragment it. Changing the **Electron Energy** affects the relative quantity of doubly-charged and fragment ions in the spectrum.

The normal **Electron Energy** for High Performance and Compact sensors is 102 volts. Due to the electron optics in the open ion source, this voltage *should not be changed*. These sensors are subject to emission saturation at low energy and the filaments will be damaged by such operation.

For CIS sensors the normal **Electron Energy** is 70 volts. A selectable low ionization energy mode provides 35 volts of **Electron Energy** to suppress the formation of the Ar^{++} ions which interfere with detection of trace levels of water vapor. If the **Emission Current** is reduced to 200 µA, the Electron Energy may safely be reduced to 10 volts.

For XPR sensors, the normal **Electron Energy** is 70 volts. The voltage can be safely reduced to approximately 40 volts.



. . . . The **Focus Voltage** is the voltage used to accelerate ions out of the ion source**.** Adjustment of this parameter will affect peak shape. The voltage range is 0 to 100 volts. For High Performance or Compact sensors, the normal **Focus Voltage** is 27 volts. For the XPR, the normal **Focus Voltage** is 10 volts.

. . . . Changing the **Rod Polarity** may, in some cases, improve the peak shape. The sensor's **Rod Polarity** is calibrated to its optimum value at the factory and should not be changed from the factory setting unless absolutely necessary.

Calibrate . . . . Displays a dialog allowing the **Electron Multiplier**, **Sensitivity**, and **Total Pressure** to be calibrated. This function is available from the **Tune** menu only. See section 7.8 on page 7-19 for more details.

Advanced . . . . Accesses submenus for setting the sensitivity, degassing the sensor, and selecting the high or low emission range. This function is available from the **Tune** menu only. See section 4.4.3 on page 4-24 and section 4.4.1.1 on page 4-19 for more details.

. . . . Shows the pressure during Tune.

. . . . Enables the cursor to change the **Tune** display focus. Once the **Zoom** button is selected, the left mouse button can be pressed and held, dragged across the display to draw a rectangle, and released. When the desired display area is within the rectangle and the cursor has changed to a quad-arrow, the left-mouse button can be clicked within the rectangle to zoom in on the display. A single left-click on the zoomed display will return the display back to normal.

. . . . Enables the cursor for **Mass Adjustment** during Tune. See section 7.4.2, Adjusting Peak Position, on page 7-14.

7.4 Mass Tuning

NOTE: Emission must be turned on for at least one hour prior to performing Mass Tuning.

Mass Tuning requires that gases be available to provide test peaks in the high, low, and middle gas ranges. Xenon is often used at high mass for 200 AMU and Krypton for 100 AMU units, but other materials can be used as long as they don't exceed the maximum scan range of the unit. Helium should be used for low mass (4 AMU). The middle mass adjustment should be done at about 28 AMU; Nitrogen is a convenient gas in this range. Suitable test gas pressures are in the range from 1e-5 and 1e-7 Torr.

HINT: Peak resolution (width) should be adjusted before the peak position is set because adjusting peak resolution may create the need to adjust peak position.

7.4.1 Adjusting Peak Resolution (Width)

The Transpector's correct resolution adjustment for a mass peak is 0.9 AMU wide at 10% of the peak height.

HINT: For best results, select peaks with no adjacent peaks.

To use an automated routine to perform the resolution adjustment, locate the Tune mass on the grid (refer to Figure 7-1 on page 7-4). If the desired mass is not currently being scanned, double-click on the box to the left of the mass that you want to Tune. Click on the 10% resolution field in the grid. A value will be displayed, which is the resolution of that peak at 10% of the peak height. If the mass is currently being monitored and the value in the **10% Res** field is less than 0.50, you will have to adjust the resolution manually to get close enough for the automated routine to work. If the current resolution is greater than 0.50, you can type in a new value and the resolution will be adjusted until the specified peak width is attained.

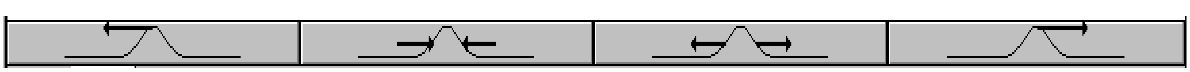
The message **Auto-resolving peak** will be displayed under the **Spectrum** display along with progress information. After a few scans, the resolution should converge on the desired value and the process will stop.

The resolution may also be adjusted manually. This may be necessary if the automated routine did not get the resolution close enough or was unable to find a peak. The **Peak Width Buttons** (Figure 7-3 on page 7-13) under the **Spectrum** are used to manually adjust the peak width. The button with both arrow heads pointing outward increases the peak width. The button with both arrow heads pointing inward reduces the peak width. Each click of the button applies a very small incremental adjustment to the resolution. Holding down the left mouse button with the cursor on one of these buttons will repeatedly apply the increment.

HINT: Holding down the **Shift** key while clicking the button will increase the increment by a factor of 10.

HINT: Holding down the **Ctrl** key while clicking the button will increase the increment by a factor of 100.

Figure 7-3 Peak Position and Width Buttons



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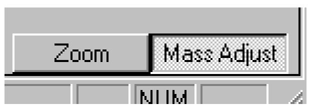
7.4.2 Adjusting Peak Position

For fine tuning a well tuned sensor, more than three masses are desirable. For badly tuned sensors, it is advisable to start with just three masses: a low mass (4), a middle mass (28), and a high mass (either mass 84 for 100 AMU sensors or mass 134 for 200 and 300 AMU sensors).

HINT: For best results, tune the low mass first, then the high mass, then the middle mass.

Before adjusting the peak position, the Cursor function must be set to **Mass Adjust**, the default function, which will turn off **Zoom**. To enable **Mass Adjust** select the **Mass Adjust** button (See Figure 7-4) in the lower right corner of the display.

Figure 7-4 Cursor Function Buttons



Suppose that Helium, mass 4, is the mass of interest. First, be sure that TWare32 is currently scanning over mass 4 and, if not, double-click on the box next to mass 4. Suppose the peak for mass 4 is not located at mass 4, but is instead located at mass 5. Therefore, the position of mass 4 must be corrected. To do this simply place the mouse cursor over the center of the peak (at mass 5), press and hold the left mouse button, and drag the Cursor line to the mass 4 position. The peak should move to the nominal mass for the display (mass 4) on the next scan.

Further fine adjustment may be made using the **Peak Position** buttons (refer to Figure 7-3 on page 7-13) under the **Spectrum** display. Clicking on the left arrow moves the peak to the left; clicking on the right arrow moves the peak to the right. As with the resolution buttons, holding the **Shift** key down while clicking the button increases the increment by a factor of 10 and holding the **Ctrl** key down while clicking the button increases the increment by a factor of 100.

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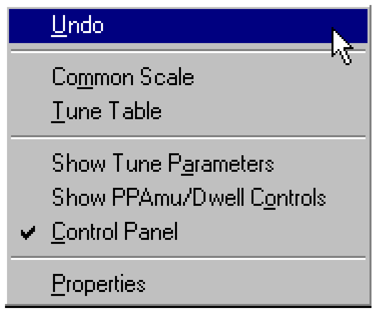
7.4.3 Undoing Mistakes

If an adjustment is made by mistake or the resulting Tune is worse than it was, it can be undone using the **Undo** command on the **Tune** context menu (see Figure 7-5). Only changes in peak position by the mouse can be undone in this way.

Figure 7-5 Tune Context Menu



If the tuning operation has yielded results which are worse than those before tuning, it is possible to revert to the values used before entering **Tune**. Selecting **Tune >> Restore Tune Parameters** from the **Tune Menu** will restore all tune parameters to the values they had before the current **Tune** session started.

7.5 Adjusting Measurement Parameters

The dwell and points per AMU can be selected independently for each **Tune** channel. Clicking on the **Dwell** box under the spectrum display will display a list of possible dwells. Select the desired time and it will be changed for that mass only and the scanning will be restarted. The points per AMU can be changed in the same manner.

It is also possible to set the parameters for all the channels of interest at once by using the **Tune Table**. This is described in the following section.

7.6 The Tune Properties Sheet

The **Tune Properties** dialog can be displayed either by selecting **Tune >> Properties** or **Properties** from the **Tune** context menu (see Figure 7-6).

The **Tune Properties** dialog is shown in Figure 7-7.

Figure 7-6 Tune Properties: From Tune Menu or Tune Context Menu

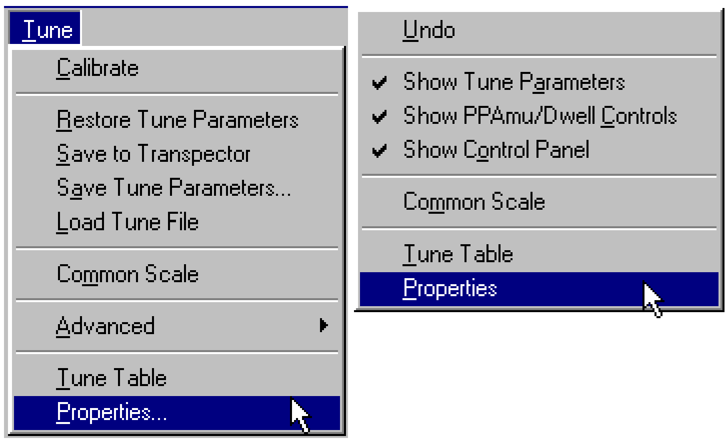
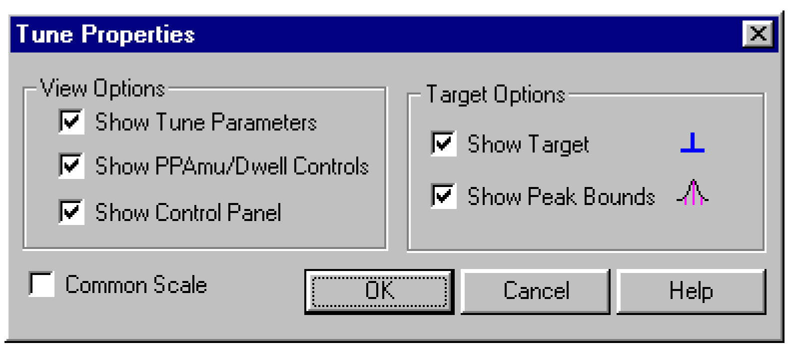


Figure 7-7 Tune Properties: Tune Settings



View Options

Show Tune Parameters . . . . When checked, a grid showing some Tune parameters is displayed. These include: **Em Voltage** (if installed), **Emission Current**, **Ion Energy**, **Electron Energy**, and **Focus Voltage**. On certain sensors some of these parameters can be modified by entering new values in the grid. This option is disabled if the **Control Panel** is not displayed.

Show PPAmu/Dwell Controls . . . When checked, the **Points Per AMU**, **Dwell**, **Resolution**, and **Mass Position** controls are displayed on the bottom of the **Tune** display. They can be hidden to increase the size of the **Spectrum** display or unclutter the screen.

Show Control Panel . . . . When checked, the **Control Panel** is displayed to the right of the **Spectrum** display. It can be hidden to increase the size of the **Spectrum** display.

<u>**Target Options**</u>

Show Target . . . . When checked, the **Target** (inverted T) is displayed, otherwise it is not.

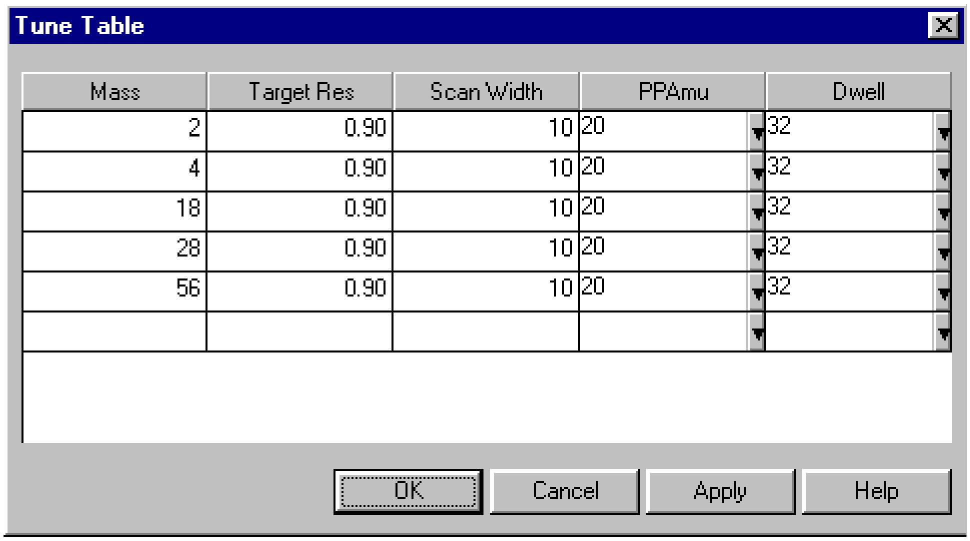
Show Peak Bounds. . . . . When checked, the **Peak Bounds** (vertical lines) are displayed, otherwise they are not.

Common Scale . . . . When checked, all displayed channels will be scaled to a **Common Scale** thus facilitating the comparison of peak amplitudes.

7.7 The Tune Table

Selecting **Tune >> Tune Table** or **Tune Table** from the **Tune** context menu displays a table of the Tune masses and their respective parameters. See Figure 7-8.

Figure 7-8 Tune Table



The **Tune Table** is a live reflection of the **Tune Mass Grid** that allows for many changes to be made from one interface and then sent to the Transpector for tuning. The **Apply** button will send the changes and keep the **Tune Table** open; the **OK** button will send the changes and close the **Tune Table**.

Parameters for the current tune channels may be edited in the **Tune Table**. New values may be typed in or selected from the pull-down lists. New masses can be added by entering the appropriate information in a blank line on the grid. Masses can be removed from the table by highlighting the mass and pressing the **Delete** key. Each column has the following meanings:

Mass . . . . The nominal mass of the tune channel.

Target Res . . . . Also known as "10%R". Target resolution at 10%. This is the width of the target when displayed.

Scan Width . . . . The width in AMU of the scan for this channel. If possible, the nominal mass will be centered in the scan window. Width can only be an even number.

PPAmu . . . . The number of points per AMU for this channel.

Dwell . . . . The dwell or integration time for this channel.

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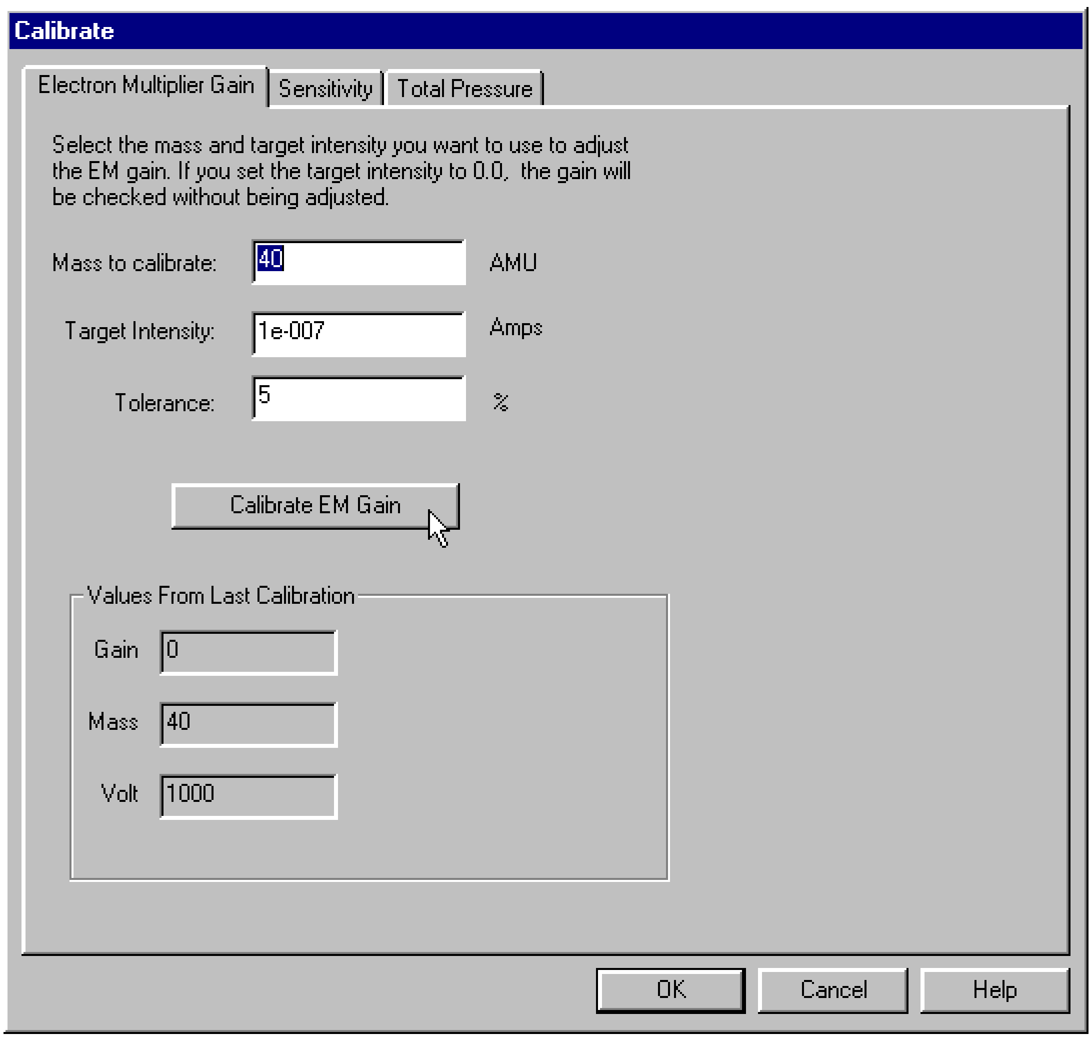
7.8 Calibrating The Instrument

Selecting **Tune >> Calibrate** (see Figure 7-9) will display the **Calibration** dialogs shown in Figures 7-10, 7-15, and 7-17. The following sections describe the individual calibration procedures.

Figure 7-9 Displaying Calibration Dialog

7.8.1 Calibrating The Electron Multiplier

Figure 7-10 Electron Multiplier Calibration Dialog



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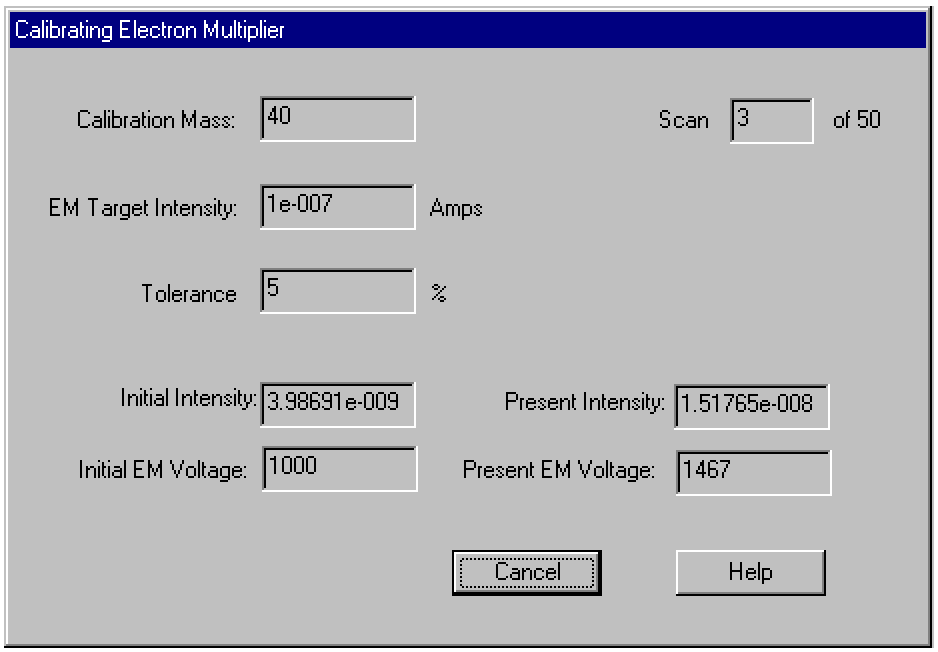
The dialog shown in Figure 7-10 is used to calibrate the **Electron Multiplier**. Enter the mass to be used to calibrate the multiplier voltage in the box labeled **Mass to calibrate** and the desired intensity of that mass in the box labeled **Target intensity**. Enter the desired tolerance for the calibration in the box labeled **Tolerance**.

For example, suppose you want mass 40 to read 1e-7 amps ±5%. First enter 40 in the **Mass to calibrate** box, then 1e-7 in the **Target intensity** box, and 5 in the **Tolerance** box. Select the **Calibrate EM Gain** button to start the calibration procedure. The calibration is done in two steps: first the EM voltage is adjusted until the desired signal intensity is obtained, then the gain is measured. The dialog shown in Figure 7-11 displays the progress of the first step of the calibration.

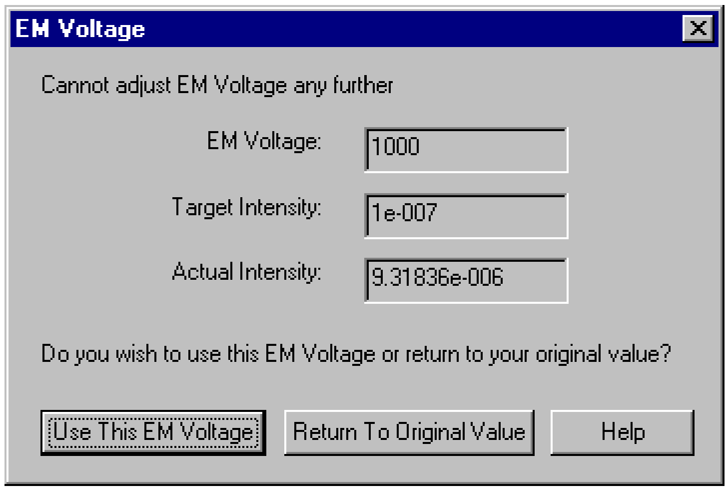
Figure 7-11 Calibrating the Electron Multiplier Progress Dialog



The program will adjust the voltage until either the measured intensity is within the tolerance of the target intensity, 50 scans have been measured, or an error occurs.

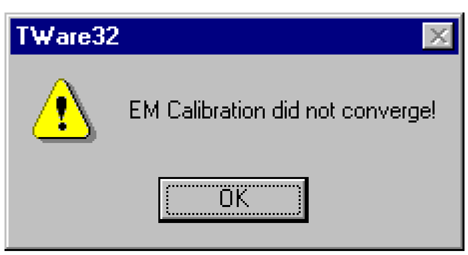
If the voltage reaches its limit (maximum or minimum) before the target current is achieved, an error message is displayed (see Figure 7-12 on page 7-21). Selecting **Use This EM Voltage** will continue with the calibration process using the last voltage tried. Selecting **Return To Original Value** will abort the EM calibration routine and restore the previous voltage and gain values.

Figure 7-12 Cannot adjust EM voltage further error box



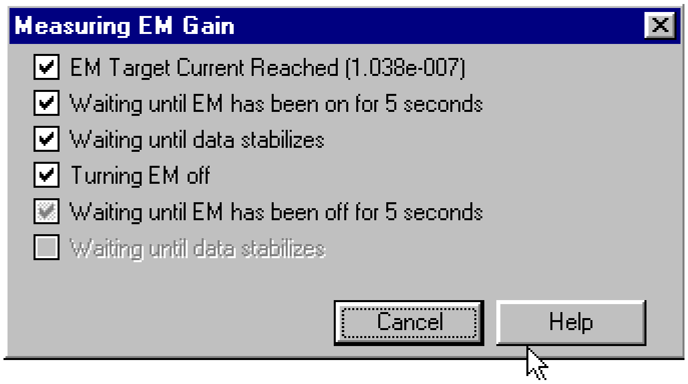
If 50 scans have been measured and the target intensity cannot be achieved within the specified tolerance, an error message is displayed (Figure 7-13). This is usually due to a noisy signal or a tolerance which is too small. The value for the tolerance can be increased and the procedure repeated.

Figure 7-13 Cannot Adjust Gain within Tolerance Error Box



Once an acceptable signal intensity is achieved the second step begins. The progress of this step is tracked in Figure 7-14. As each step is completed, it is checked off. When the last step is completed, the new value of the **Gain** is displayed in the **Calibration** dialog.

Figure 7-14 Measuring the Gain of the Electron Multiplier

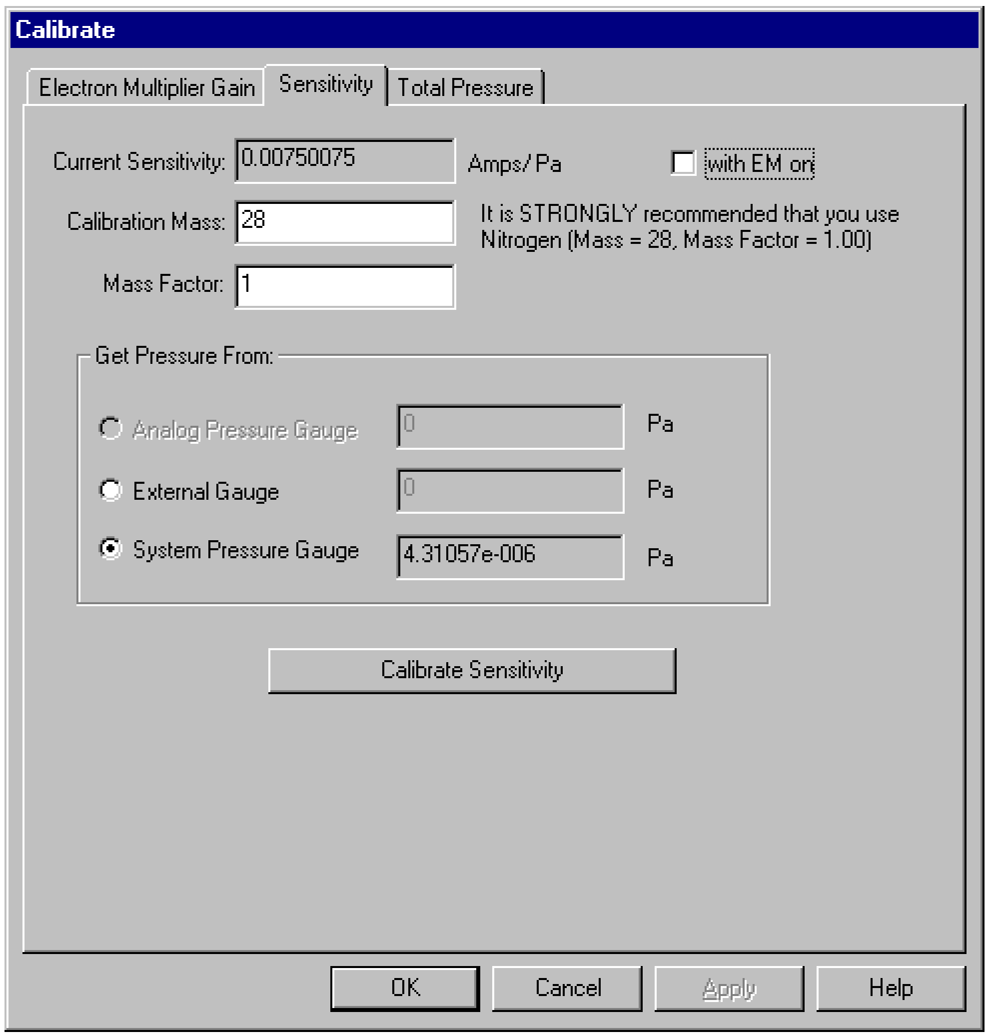


NOTE: The **Measuring EM Gain** dialog will automatically close after all steps have been successfully completed.

7.8.2 Calibrating the Sensitivity

Selecting the **Sensitivity** tab in the **Calibrate** dialog will display the **Sensitivity Calibration** page (see Figure 7-15). The sensitivity can be calibrated with or without the electron multiplier. The value shown in the **Current Sensitivity** box is the effective sensitivity. That is, if the **with EM on** box is checked, it is the product of the multiplier gain and the sensitivity to Nitrogen, otherwise it is simply the sensitivity to Nitrogen in Amps/pressure units. By separating the sensitivity and gain it is possible to obtain reasonable partial pressure values with and without the multiplier on, without re-calibrating the sensitivity.

Figure 7-15 Sensitivity Calibration Dialog



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Sensitivity Calibration requires a calibrated total pressure vacuum gauge in operation on the vacuum system in which the sensor is operating. It is necessary to supply a controlled level of gas to the vacuum system. The calibration gas pressure should be at least 100 times greater than the residual gas background in the vacuum system, but not more than 5 x 10^{-5} Torr. For true partial pressures, Nitrogen (28) should be used. A gas other than Nitrogen (28) may be used, but the material factors should be adjusted accordingly. The file **`matfact.txt`** contains a list of material factors for the more common species found in vacuum systems.

HINT: It is *strongly* recommended that Nitrogen gas be used as the calibration gas, however, if this is not practical then another gas can be used.

This function is used to obtain the instrument sensitivity so that partial pressures can be calculated by the instrument. The **Partial Pressure** mode converts the sensor output currents at specified masses to partial pressures based on the absolute sensitivity of the instrument to Nitrogen and the specific mass's sensitivity relative to Nitrogen. These are expressed as the Instrument Sensitivity Factor and Material Factor, respectively.

To calibrate the sensitivity, enter the mass of the gas used in the **Calibration Mass** box and the material factor for that gas in the **Mass Factor** box. If you want to calibrate the sensitivity with the EM on, check the **with EM on** box (the EM must have been already calibrated as described in section 7.8.1 on page 7-19). Select the source of the total pressure reading — use **External Gauge** if you have an accurate pressure gauge that you can read manually and enter the pressure in the appropriate box, or use **System Pressure Gauge** to have the program read the pressure gauge specified in the **System Property Pages**. Select **Calibrate Sensitivity** when you are ready to measure. The dialog shown in Figure 7-16 is displayed to show the progress of the calibration process.

Figure 7-16 Sensitivity Calibration Progress

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The partial pressure calculations of TWare32 take into account the sensitivity of the sensor, the gain of the electron multiplier, the relative ability of various masses to ionize, and instrumental factors. The formula used to calculate the sensitivity is given in Equation 1 and the formula used to calculate the partial pressures is given in Equation 2.

$$\text{Sensitivity} = \frac{\text{Intensity} \times \text{Gain(voltage)}}{\text{TotalPressure}} \quad [1]$$

$$\text{PP} = \frac{\text{Intensity} \times \text{Gain(voltage)} \times \text{TFactor} \times \text{MaterialFactor}}{\text{Sensitivity} \times \text{Gain(Mass)}} \quad [2]$$

Where:

Sensitivity . . . . is the Nitrogen equivalent sensitivity of the sensor.

Intensity. . . . . is the ion current measured.

Total Pressure . . . . is the measured or entered total pressure of the vacuum system.

Gain(Voltage) . . . . is the voltage dependant gain, automatically calculated by the EM Calibration routine, or 1.00 if EM is off.

PP . . . . is the calculated partial pressure.

Mass . . . . is the mass of the point being converted.

TFactor . . . . is the transmission factor equal to (Mass+k)/(28+K), where K is a constant characteristic of the sensor design. Ideally K=0.0, however, in reality for the Transpector it is 0.5.

Material Factor . . . . is the material factor for the species being measured. In Spectrum mode this is 1.00 to give Nitrogen equivalents of partial pressure.

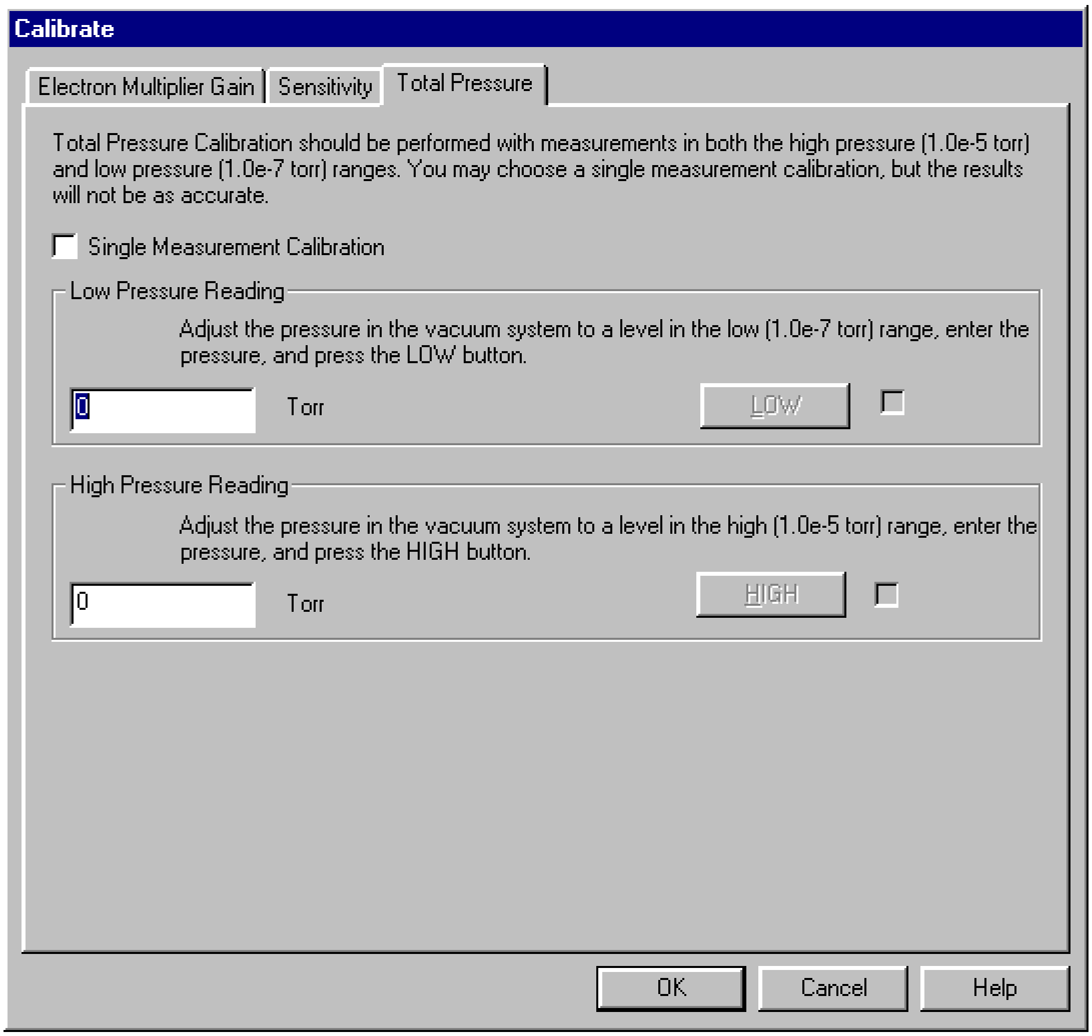
Gain(Mass) . . . . is the mass dependant component of the multiplier gain. It is (28/(Mass)) if the EM is on or 1.00 otherwise.

NOTE: Refer to the *Transpector Operating Manual* (IPN 074-276) for more details.

7.8.3 Calibrating the Total Pressure

The Transpector is capable of measuring the total ion current before passing through the mass filter, thus giving a reasonably accurate reading of the total pressure in the vacuum system. The sensitivity of this internal pressure gauge needs to be calibrated in order to convert the ion current to a total pressure reading. The following procedure performs this calibration.

Figure 7-17 Total Pressure Calibration Dialog



Calibration of the total pressure requires a calibrated total pressure vacuum gauge in operation on the vacuum system in which the sensing head is operating. It is also necessary to supply a controlled level of Nitrogen gas to the vacuum system. The gas pressure must be adjustable from approximately $5x10^{-5}$ to approximately $5x10^{-7}$ Torr. The residual gas background in the vacuum system should not be more than $1x10^{-7}$ Torr. Selecting the **Total Pressure** tab of the **Calibrate** dialog displays the **Total Pressure Calibration** page (shown in Figure 7-17 above).

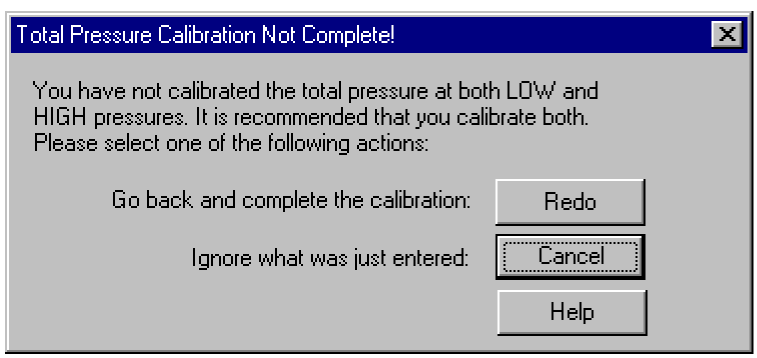
For the Compact and High Performance Transpectors, calibration is best performed by taking a measurement in both the high pressure (10^{-5} Torr) and the low pressure (10^{-7} Torr) ranges. For the XPR Transpector, calibration is best performed by taking a measurement in the high pressure (3.0e-3 Torr) and the low pressure (10^{-5} Torr) ranges. If it is not possible to calibrate at two pressures then a single point calibration is available (although not recommended - see section 7.8.4 on page 7-28).

To calibrate the **Total Pressure** adjust the pressure in the vacuum system to a level in the 10^{-7} Torr range (10^{-5} Torr for XPR), enter the pressure read from the calibrated gauge in the **Low Pressure Reading** box, and select **LOW**. Increase the pressure to the 10^{-5} Torr range (3.0e-3 Torr for XPR), enter the pressure from the gauge in the **High Pressure Reading** box, and press **HIGH**. Select **OK** to save the calibration values and dismiss the dialog.

NOTE: Two points are required to calibrate the total pressure gauge using this dialog. If only a single point is possible see section 7.8.4.

If the **OK** button is clicked before both the **LOW** and the **HIGH** calibrations are done, the error shown in Figure 7-18 will be displayed. Selecting **Cancel** will abort the calibration procedure. Selecting **Redo** will go back to the total pressure calibration dialog and allow the other pressure to be calibrated.

Figure 7-18 Incomplete Total Pressure Calibration

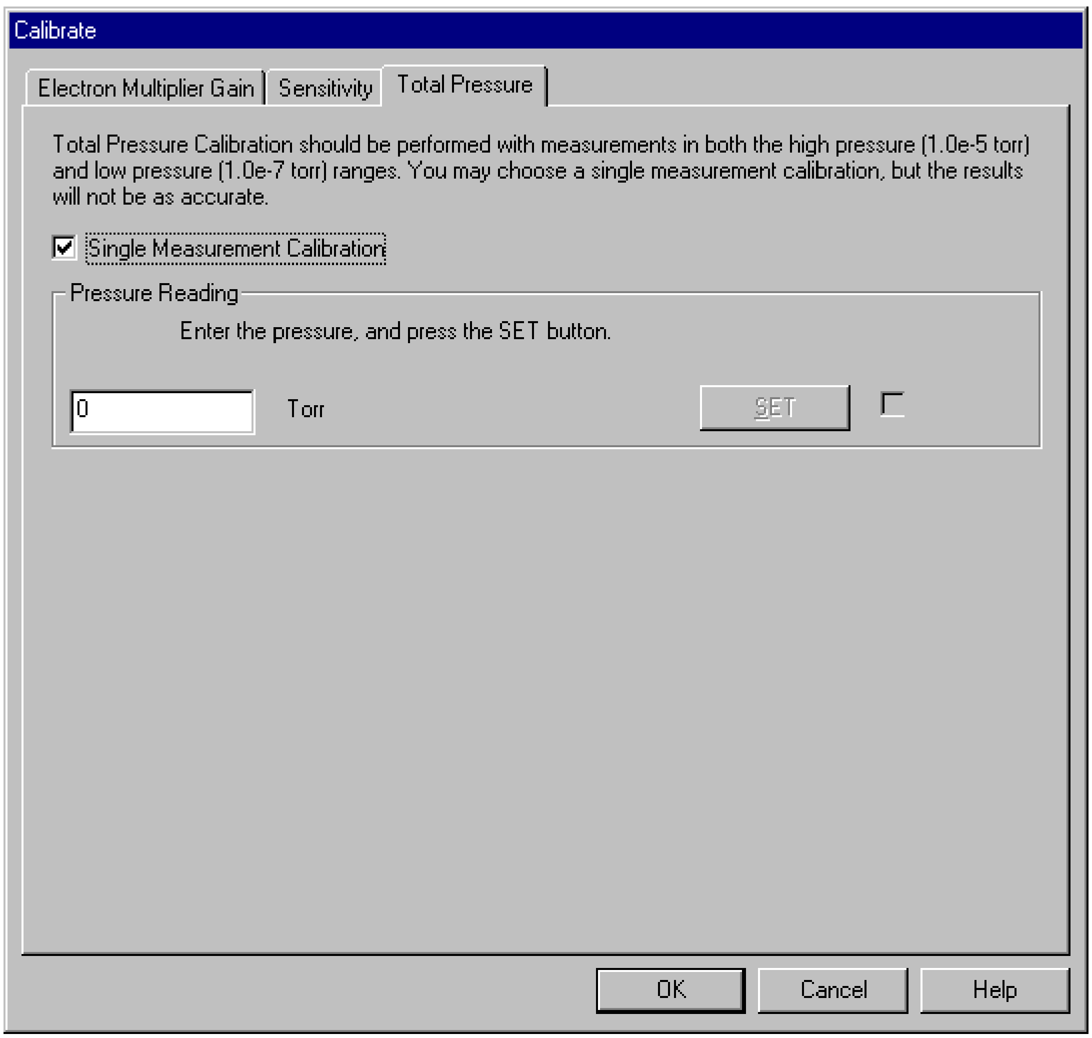


7.8.4 Single Point Total Pressure Calibration

Under certain circumstances, it may be necessary to calibrate the total pressure gauge with only one pressure reading. In this case the low point is set to the previous calibration setting, if available; otherwise, it is assumed to be (0.0,0.0). In either case only the high point is measured. The results are not as accurate as a two point calibration and it is *strongly* recommended that the two point calibration be used if at all possible.

If the **Single Measurement Calibration** box is checked, the dialog changes to look like the dialog shown in Figure 7-19.

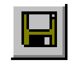
Figure 7-19 Single Point Calibration Dialog

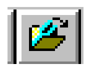


Raise the pressure as much as possible (within the range of the sensor) and read the actual pressure from the calibrated gauge. Enter the pressure into the box on the dialog and click **SET**. Clicking **OK** will save this calibration and use it in all total pressure measurements in the program.

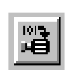
7.9 Saving and Recalling Tune Parameters

There are basically four commands to save and restore tune parameters to and from disk or to and from the Transpector's nonvolatile memory. These are described here.

File >> Save As, Tune >> Save Tune Parameters  . . . . . Save the current tune parameters to a Tune file on disk. A standard TWare32 file dialog will be displayed allowing a filename and folder to be selected. A default Tune folder is created the first time a Tune file is saved. It is recommended that the tune parameters for a sensor be stored in that sensor's Tune folder.

Tune >> Load Tune File  . . . Read a Tune file from disk and load into the Transpector. Note that these parameters are not loaded into the Transpector's nonvolatile memory. The next time the Transpector is powered off the parameters will be lost *unless* the **Save To Transpector** command is given prior to power turning off.

HINT: Loading a set of Tune Parameters and not saving them to nonvolatile memory allows the parameters to be tested for results without committing them to future Transpector operation.

Tune >> Save To Transpector  . . . . . . Saves the current Tune parameters in the nonvolatile memory of the Transpector to be used the next time the Transpector is powered on. If any Tune parameters were changed during the current session, including reading in a Tune file, and this command is not issued, you will be prompted to save the parameters when **Tune** is closed.

NOTE: There is no confirmation dialog for this command. Executing this command or clicking on the icon results in immediate action. **Restore Tune Parameters** will not undo this action.

Tune >> Restore Tune Parameters . . . . . .Restores the Tune parameters to the values which were valid when **Tune** was last entered or last saved to the Transpector.

NOTE: **Snapshot** is not a technique for saving **Tune** Parameters. **Snapshot** simply saves the data, displayed in **Tune**, for future visual recall. See section 8.3, Saving a Snapshot, on page 8-1.

Chapter 8
Saving and Recalling Data

8.1 Introduction

Although several maintenance functions of the Transpector, such as locating leaks and identifying a contaminant in the chamber, can be performed in “real time” without saving the data, the value of the instrument is enhanced by the ability to save snapshots of data for later analysis, or saving a complete history of a process. In TWare32 there are two ways in which the data can be saved: as a **Snapshot** only when something of interest is on the screen, or continuously for maintaining a complete history. These two methods and the means of recalling and viewing the saved data will be discussed in this chapter.

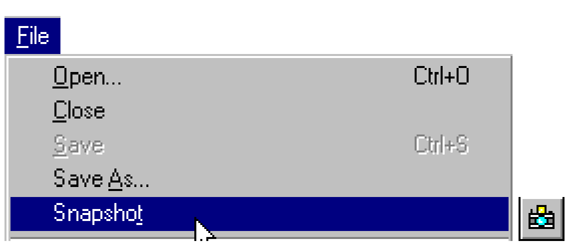
8.2 The Sea of Data File

The basic file format of the spectral and trend data acquired on the Transpector is referred to as the “Sea of Data” or SOD. It contains a series of spectra (or selected peaks) over a period of time and can be viewed either as individual spectra or as trends of selected masses. In addition to the spectral data, the SOD file contains header information that completely describes how and when the data were acquired, and additional information which can be added as commentaries or annotations to better describe the data.

8.3 Saving a Snapshot

In most modes where data are being acquired and displayed, it is possible to save a **Snapshot** of the currently viewed data. Selecting **Snapshot** from the file menu or clicking on the **Snapshot Icon** (see Figure 8-1) will save the data currently being displayed on the **Trend** display. If data are being acquired, it may be necessary to freeze the display and/or scroll back to include the region of interest. The trend width can also be changed by clicking near the end of the X-axis and entering a new value.

Figure 8-1 Taking a Snapshot



A name is automatically generated in the format of *Modyymmdd-nn* where *Mod* is an abbreviation of the modules (for example, Mon for Monitor or Tun for Tune), *yy* is the year, *mm* is the month, *dd* is the day, and *nn* is a count to keep the name unique when multiple snapshots are taken the same day.

The **Snapshot** is in the SOD format and can be read back in with the **File >> Open** command.

NOTE: **Snapshot** only saves the data displayed at the moment it is performed. If one hour of data has been collected, and the X axis width is set to ten minutes, the **Snapshot** will save only the ten minutes of data displayed. Changing the X axis width will allow more data to be saved per snapshot.

NOTE: No dialog or visual prompt is shown when a **Snapshot** is saved. However, the destination path and filename are displayed in the **Status Bar** at the bottom of the screen.

NOTE: A **Snapshot** can be taken of both Live and Recalled data.

8.4 Automatically Saving Data

When a recipe is set up to automatically save data (see section 5.10, Collection Parameters Page, on page 5-24) the data will be saved to the SOD file specified in the recipe each time the recipe stops. If **Autoincrement Filenames** is selected, the name will be incremented and a series of files will be created. Otherwise, the files will be overwritten each time. Unlike TransspectorWare, the extension is not incremented, it is always `.sod`. The numeric portion of the filename preceding the extension is incremented. For example, if the file name specified in the recipe is CVD_000.sod then files CVD_000.sod through CVD_999.sod will be saved.

There are two ways in which the handling of the series of files can be programmed.

- **Allow overwriting rollover** (refer to Figure 5-16 on page 5-24), when checked, will automatically start the series again at 000 after the maximum file in the series has been created. This automatic rollover will overwrite existing data.
- If **Allow overwriting rollover** is unchecked, the last file in a series is written, a warning is issued and data collection is halted. The number of digits in the initial filename (refer to page 5-25) or the **SOD file increment digits** setting (refer to Figure 3-23 on page 3-26) determines how many files can be acquired before the rollover or warning occurs.

8.5 Recalling Data from Disk

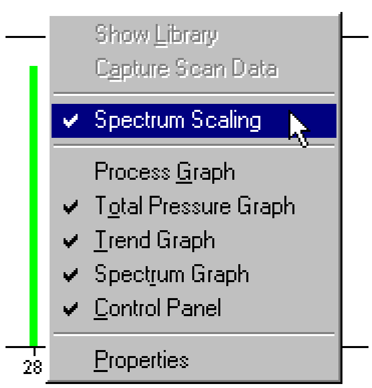
Selecting **File >> Open** or clicking on the file **Open** icon (Figure 8-2) displays the TWare32 file **Open** dialog. Refer to section 2.6, Opening Files In TWare32, on page 2-9 for details on how to preview and select a file.

Figure 8-2 Opening a File

Information on how the data were acquired and how it was being viewed is stored with the data. This information allows the program to display the data in the same way it was being displayed when it was saved. **Monitor** (including **Run**) data, **Tune Snapshot**s, and **Leak Check Snapshot**s can be recalled. Each file type will be displayed in the view in which it was collected. For example, when a Monitor file is opened it will be displayed in **Monitor** and when a Tune data file is opened it will be displayed in **Tune**.

Viewing recalled **Monitor** data looks the same as viewing live **Monitor** data except that the **Sensor Toolbar** doesn't display a sensor name and the sensor and data acquisition controls are disabled. There is also a specific Scaling function on the Spectrum graph, accessible from the context-menu, that allows the scaling to be either continuous or turned off. **Spectrum Scaling**, when checked, will operate in a continuous scaling mode when using the cursor to move through data. See Figure 8-3.

Figure 8-3 Spectrum Scaling for Recalled Data



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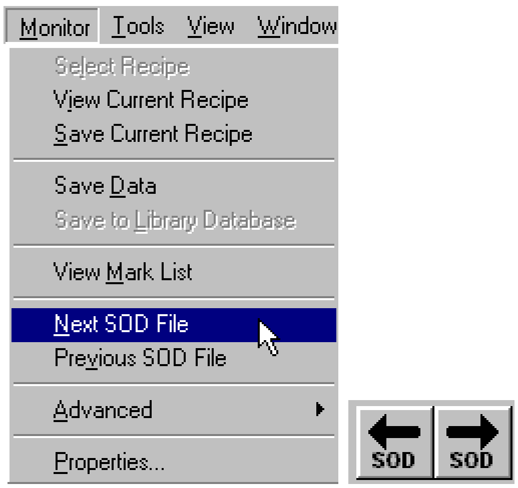
Two menu items and buttons are enabled to facilitate examining a series of data files. These are the **Next SOD File** and **Previous SOD File** commands (see Figure 8-4).

NOTE: Recall and manipulation of very large data files, while collecting data, may cause the system to slow down. It is advisable to recall very large data files only when data collection is idle to lessen the impact on the system performance.

Figure 8-4 Viewing a Series of SOD files



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8.6 Using the Subtract Feature

A **Subtract** feature is part of the context menu for **Monitor** and for files that have been opened for review with the **File >> Open** menu selection. The **Subtract** feature allows for subtraction of a scan, at the Cursor location, from all other collected scans. To select the scan to be subtracted, locate the Cursor at the desired scan, right-click over the **Trend Mass Graph**, and select **Scan Subtract**. A red Cursor will be located at that scan and remain with that scan until either the **Subtract** is turned off or a different scan is selected with **Scan Subtract**.

NOTE: The scan Subtract feature is not the same as the Library Subtract feature. For information on Library Subtract, see Chapter 11, Library.

8.7 Printing Data

In most modes, it is possible to print the data on the screen by selecting **File >> Print...** or by clicking on the **Print** icon (see Figure 8-5). The standard print dialog for your computer will be displayed, allowing the printer and other options to be selected. Selecting **File >> Print Setup...** will display the dialog in Figure 8-6 which allows selection of the various parts of the data to be printed and setting of margins (see Figure 8-7 on page 8-6).

Figure 8-5 Printing Data

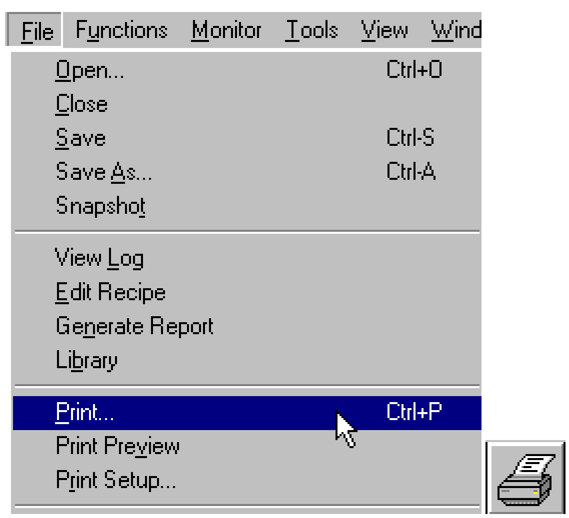


Figure 8-6 Print Setup Dialog - Items to Print

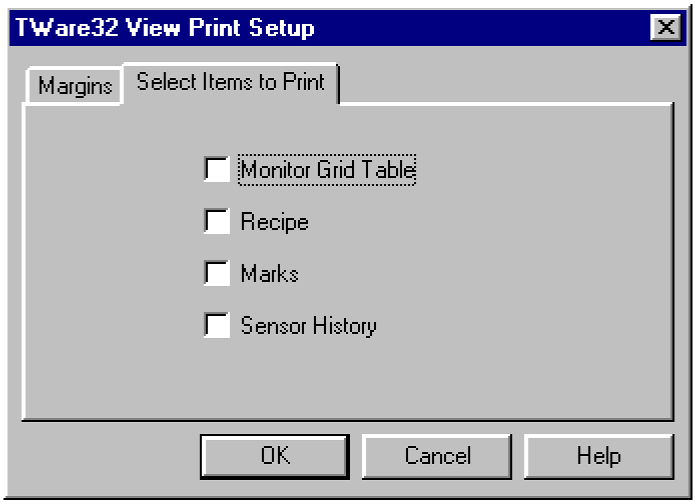
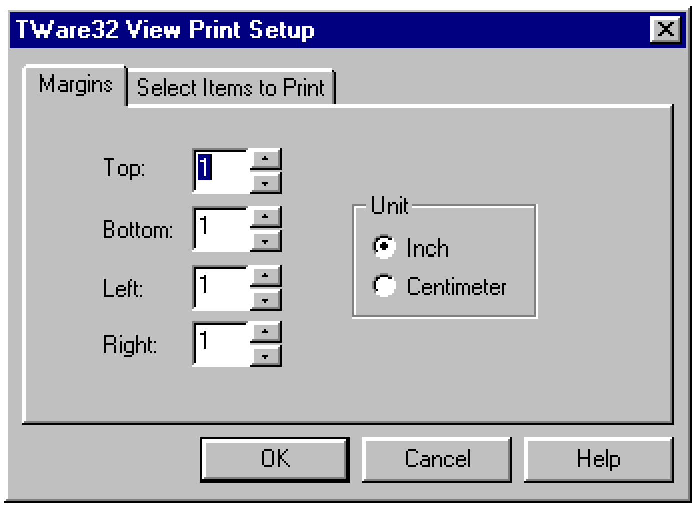


Figure 8-7 Print Setup Dialog - Margins



The data displays that are currently visible (**Total Pressure**, **Trend**, and/or **Spectrum**) are automatically printed by the Print function. In addition the information in the **Monitor Grid Table**, the **Recipe** used to acquire the data, any **Marks** in the data set, and/or the **Sensor History** can be printed with the data by checking the boxes in this dialog.

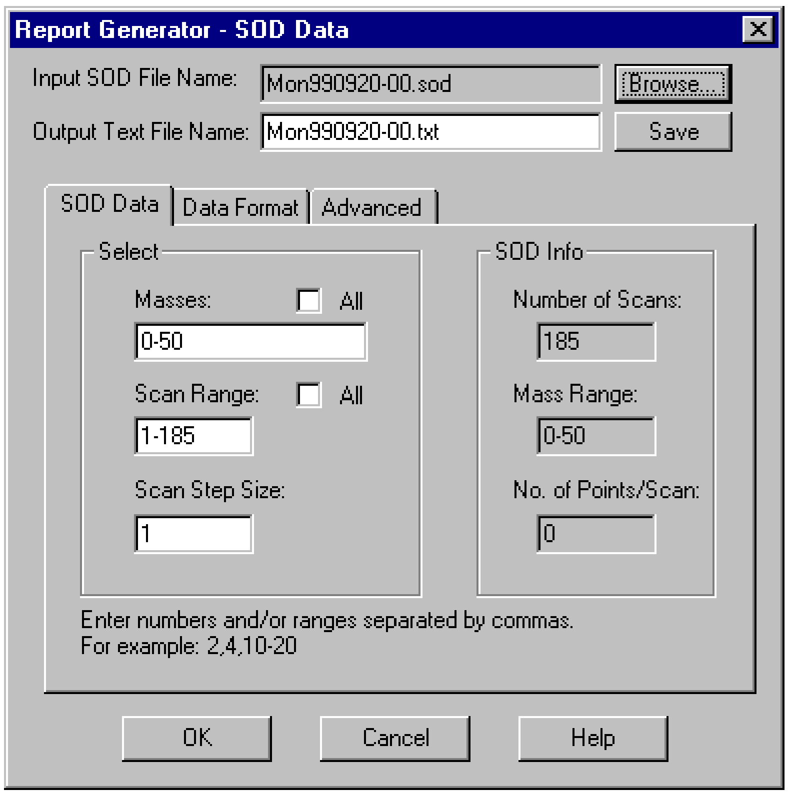
NOTE: Printers that are set up to print using a Graphics Mode of Vector Graphics will often encounter problems printing data that contains steep slopes. It is strongly recommended that a printer set to a Graphics Mode of Raster Graphics be used for printing TWare32 data.

8.8 Generating Reports

Reports in the form of plain ASCII text files can be generated from SOD files for importing into spreadsheets or other programs. **Reports** can be generated for individual files, live data, or a series of files.

To generate a report, first select **File >> Generate Report**. If live data is being displayed, the dialog in Figure 8-8 on page 8-7 will appear. If generating a report from a saved SOD file, a standard file **Open** dialog will appear.

Figure 8-8 Generate Report Dialog, SOD Data Page



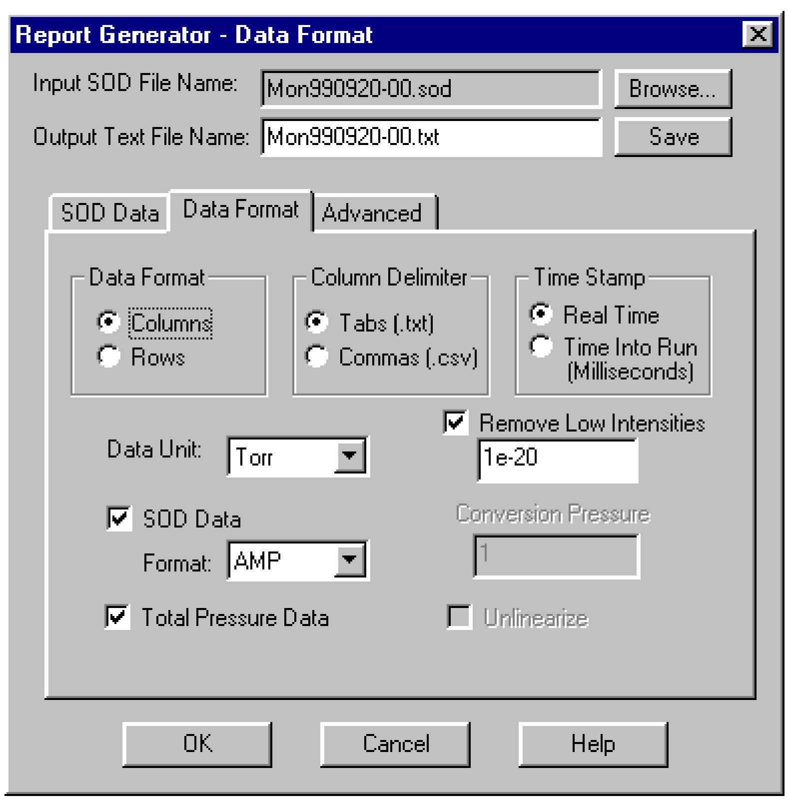
If live data are being displayed, the **Input SOD File Name** box will be blank and the **Number of Scans** will be incrementing. Leaving the **Input SOD File Name** box blank will generate a report for the live data being acquired. If you are generating a report for a recalled data file, that filename will be shown in the **Input SOD File Name** box. If the desired data file is not being displayed in this box, click on the **Browse** button and use the standard TWare32 file **Open** dialog to select the file or files for which to generate a report. To select multiple files highlight the first file, press and hold the control key, click on the other files to select them, and then release the control key. Holding the shift key down and clicking will select all the files between the current selection and where the mouse was clicked.

The output filename, by default, is the same as the input filename but with a `.txt` (tab separated) or `.csv` (comma separated) extension. When reporting a single file, this name can be changed to any valid filename. When reporting multiple files, it is possible, although not recommended, to edit the list of output files.

Enter the desired masses or mass ranges in the **Masses** box or click the **All** check box. Enter the range of scans of interest in the **Scan Range** box or click the **All** check box. Enter the step size in the **Scan Step Size** box. Enter 1 to report every scan, 2 to report every other scan, etc. For single files, the actual limits are displayed in the **SOD Info** box. However, since multiple files may have different limits they are left blank if more than one file is selected. If the ranges selected exceed the actual limits of one of the files in a group, the points that fall within the specified ranges are reported and no error is displayed.

Click on the **Data Format** tab to display the **Data Format** page shown in Figure 8-9, to select the formatting options for the report. The data can be oriented in **Columns** or **Rows**. Selecting **Columns** places all the intensities for each mass in a column with one scan per row. Selecting **Rows** generates a series of mass-intensity pairs, grouped by scan. The delimiter between columns can be selected as either **Tabs** or **Commas**.

Figure 8-9 Generating Reports, Data Format Page



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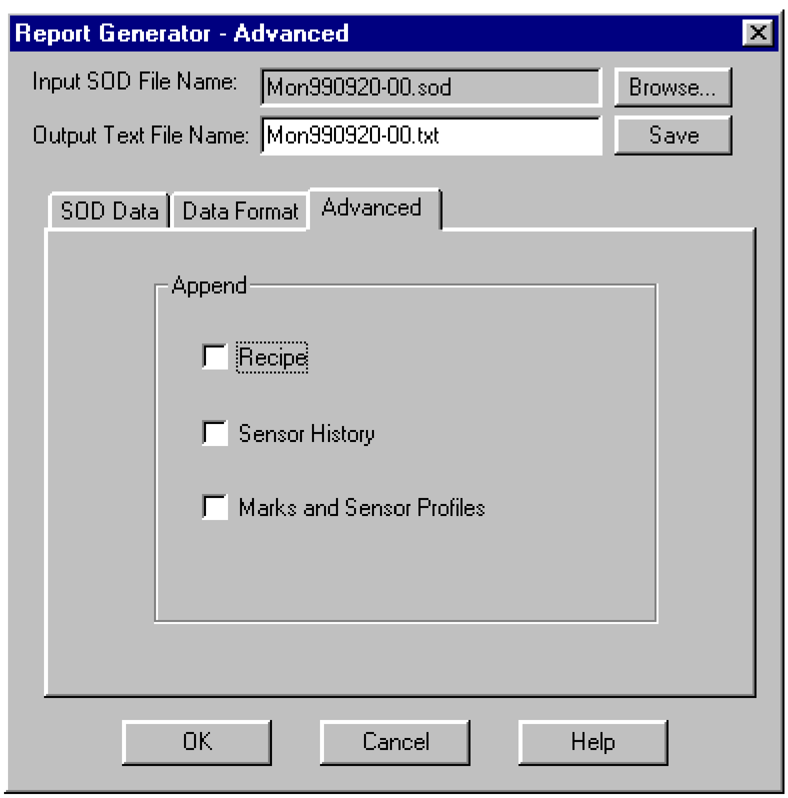
NOTE: The TWare32 Report Generator creates text files, from TWare32 data files, in two possible formats - tab delimited (.TXT) or comma separated variable (.CSV). When a large quantity of data is collected into one file (e.g. an SOD file - Sea of Data file) the resulting text file from the Report Generator will also be large. Files that are too large for the Windows Notepad should be opened from within a program such as Excel for viewing. Both .TXT and .CSV files are able to be opened from within Excel.

The units in which to display the pressure data (including partial pressures) can be selected from the list box. If the **SOD Data** box is checked, the data will be included in the report. If **SOD Data** is not needed in the report (perhaps only total pressure is needed), it can be unchecked. If **SOD Data** is checked, the representation of the data can be selected from the **Format** list box as **Amps**, **PP**, or **PPM**. If **Total Pressure** data is desired, this box should be checked. If the **Remove Low Intensities** box is checked, the values below the specified limit (default 0) will be clipped. If the data were collected as linearized data on an XPR then it can be "**unlinearized**" by checking the corresponding box.

Select the **Advanced** tab to display additional options (see Figure 8-10 on page 8-9). This page allows the recipe, sensor history, and marks to be included in the report. If the report is being generated for live data then the **Sensor Profile** may also be included.

Figure 8-10 Generating Reports, Advanced Options



When the desired options are selected, click **Save** to write the data to the output file. The files generated are plain text files and can be viewed with any text editor, such as Notepad, and imported into other programs such as Excel.

The **Save** button will generate a report for the selected data file(s) but will not close the **Report Generator** dialog. This allows for use of the **Browse** button to select a different input file and continue generating reports. The **OK** button will generate a report for the selected data file(s) and close the **Report Generator** dialog.

8.9 Event Log

NOTE: TWare32 must be running in order to record events in the Event Log.

All Transpector-related Events for a sensor can be logged to an Event Log (based on user selections, refer to Figure 3-15 on page 3-16). The Event Log, a **`.evt`** file, is located in the Sensor folder in a subfolder named Events. When an event happens in the system, a descriptive message about the event is added to the Event Log. Errors, Warnings and Marks can also be logged in the Event Log. A new Event Log is created for each day. To view the contents of the Event Log, select **File >> View Log** and choose the file for a particular day of operation. An example of an Event Log is shown in Figure 8-11. See section 13.3 on page 13-2 for options on viewing the event log.

Figure 8-11 Event Log

Log20010928.evt

```
//////////////////////////////////////////////////////////////////////
//////////    TWare32 Event Log File for Sensor 3 Port1     //////////
//////////////////////////////////////////////////////////////////////
//////////     Log File Created on  09/28/01 08:52:35

Event:    09/28/01 08:52:38 Emult  is unavailable
Event:    09/28/01 08:52:38 Emission is off
Event:    09/28/01 08:52:38 Relay sense is normal
Event:    09/28/01 08:52:38 Emult  is unavailable
Info:     09/28/01 08:52:38 Sensor has been detected and is online
Event:    09/28/01 08:56:54 Peakfind is on
Event:    09/28/01 08:56:54 Baseline subtract is on
Event:    09/28/01 08:56:54 c:\tware32\Sensor_3_Port1\Recipe\Monitor.rcp started
Event:    09/28/01 08:56:54 Emission  is pending
Event:    09/28/01 08:56:54 Emult  is unavailable
Event:    09/28/01 08:56:57 Emission is on
Event:    09/28/01 08:56:57 Emult is on
I/O:      09/28/01 09:32:30 Channel 1 - Mass 32: Alarm on, Relay closed
I/O:      09/28/01 09:32:34 Channel 1 - Mass 32: Alarm off, Relay opened
Event:    09/28/01 09:33:16 c:\tware32\Sensor_3_Port1\Recipe\Monitor.rcp stopped
Event:    09/28/01 11:00:43 C:\tware32\Sensor_3_Port1\Recipe\Recipe03.rcp started
I/O:      09/28/01 11:00:47 Channel 2 - Mass 28: Alarm on, Relay closed
I/O:      09/28/01 11:01:27 Channel 2 - Mass 28: Alarm off, Relay opened
Mark:     09/28/01 11:08:00 User added mark at scan 31: Pumpdown Start
Event:    09/28/01 11:30:34 C:\tware32\Sensor_3_Port1\Recipe\Recipe03.rcp stopped
```

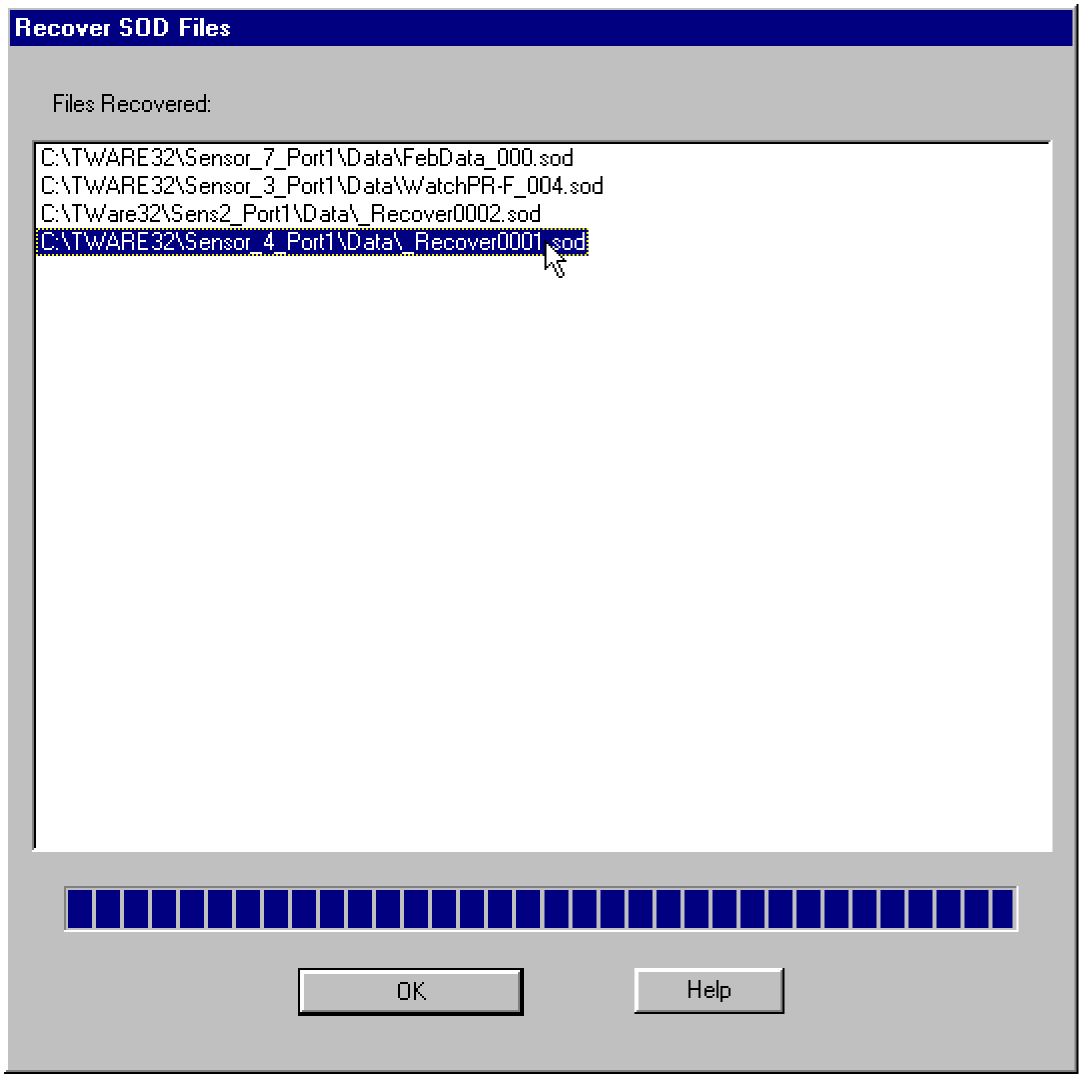
8.10 Recovering Lost Data

In the event of a system crash or loss of power during data collection, the data that were being collected will be recovered. Each function, like Monitor for instance, stores a series of temporary files that are automatically restored when TWare32 starts. These files are destroyed after the collected data are written to disk during normal system operation.

The temporary files, using the same name format as normal SOD files, use a file extension of **`.~od`** while they exist. *It is strongly recommended that these files be left unaltered so that they are available if necessary upon system restart.*

A dialog is displayed, upon system restart, listing any files recovered. These files can be highlighted and automatically opened for review. Files that are not highlighted in the dialog will simply be stored in the proper sensor data folder and not opened. See Figure 8-12 on page 8-13.

Figure 8-12 Automatic Data Recovery at Startup



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Chapter 9
CIS2 and CPM Operation

9.1 Introduction

Much of what is written in the preceding chapters on **Sensor Setup**, **Monitor**, **Tuning the Sensor**, **Locating Leaks**, **Editing Recipes**, and **Saving and Recalling Data** directly applies to the CIS2 and CPM. This chapter provides information specific to the Transpector CIS2 Gas Analysis System and CPM (Compact Process Monitor) that was not covered in the preceding chapters. Some common information is also provided as a basic reminder. Most of this chapter is specific to the CIS2; the CPM is briefly covered at the end of the chapter.

For the CIS2, TWare32 provides automatic valve control through recipes, manual control of all components, and status information on all components.

For the CPM, TWare32 provides automatic valve control through recipes, manual valve control through the Sensor Status Grid, and status information.

This chapter assumes that your Transpector CIS2 Gas Analysis System is properly installed, and that the TWare32 software is installed and running on a computer intended to control the Transpector CIS2 Gas Analysis System.

NOTE: Refer to the *Transpector CIS2 Gas Analysis System Operating Manual* (IPN 074-303) for a detailed description of the CIS2 system.

9.2 System Setup

Select **Tools >> System Setup** (see Figure 9-1) to display the **System Setup** window (see Figure 9-2). The icon displayed for each detected CIS2 system is different than the standard Transpector in that a Vacuum System Controller (VSC) is shown attached to the Transpector. In Figure 9-2, Sensor 1 has an attached VSC and is therefore a CIS2 system. Sensor 2 is shown as a standard Transpector.

Figure 9-1 Tools >> System Setup

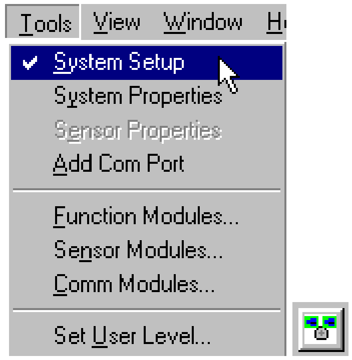
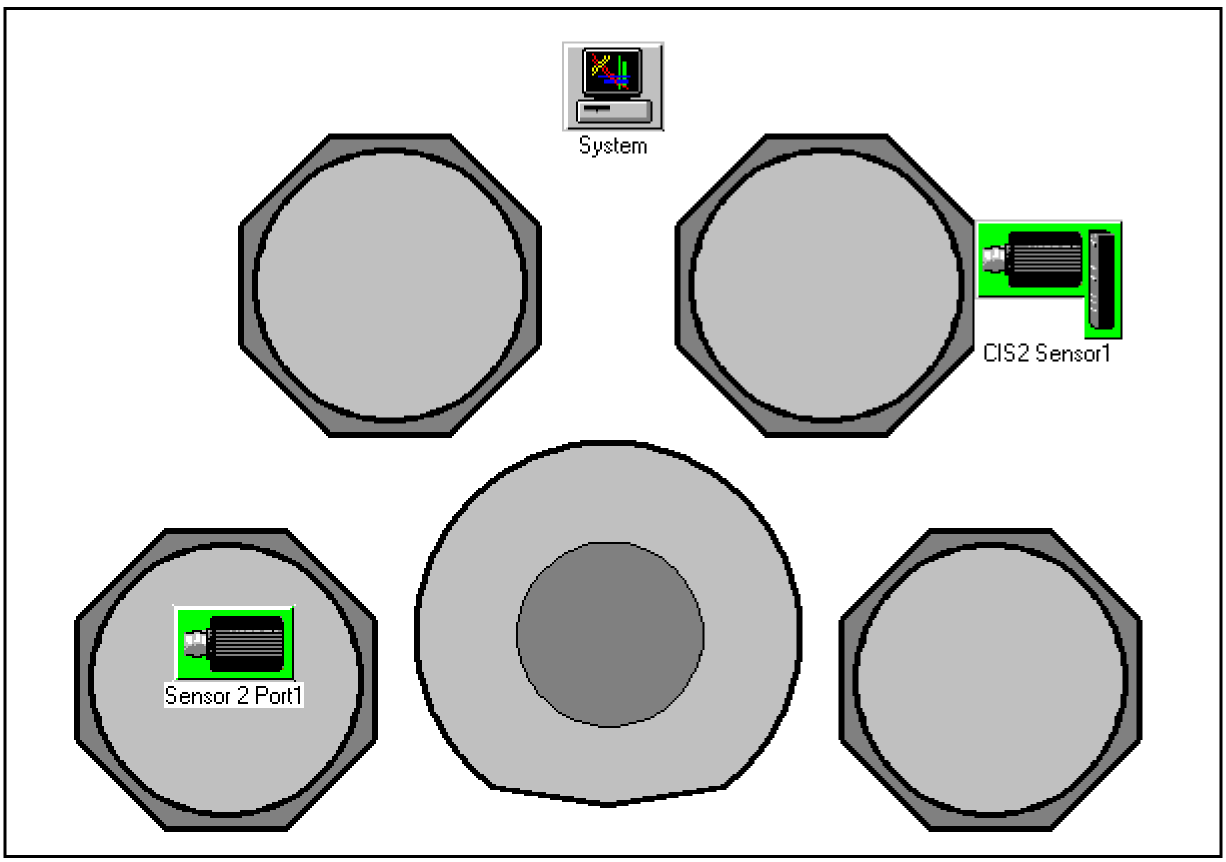
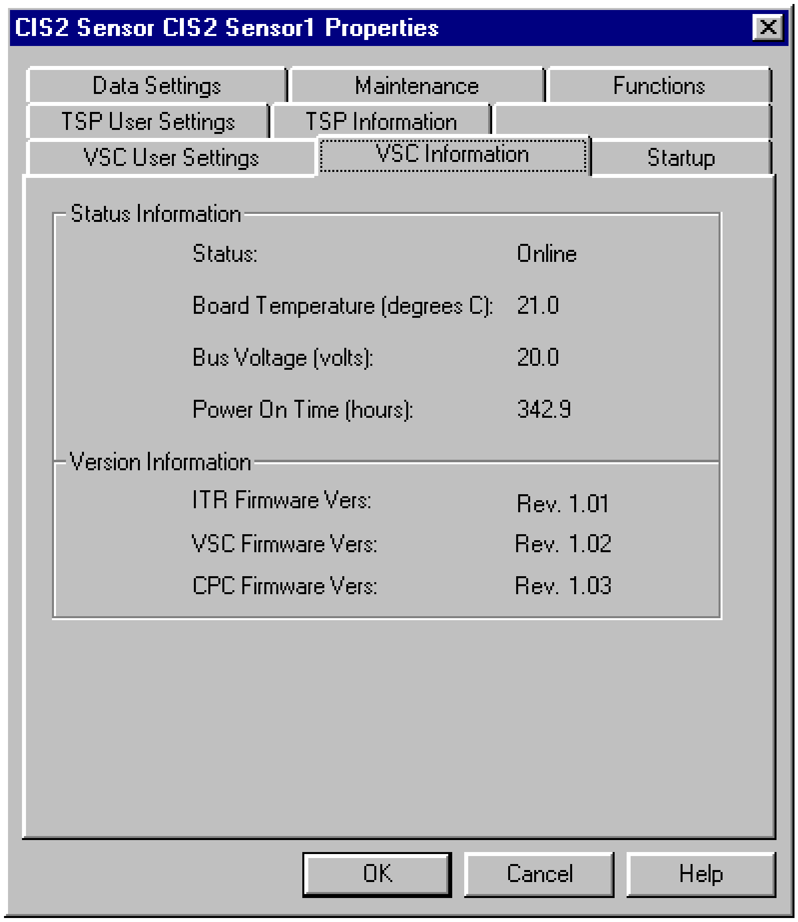


Figure 9-2 System Setup Window



Select a CIS2 sensor icon and click the **VSC Information** tab to display the version and status information for that sensor. For example, selecting **Sensor 1** in Figure 9-2 and clicking the **VSC Information** tab will display the **CIS2 Sensor Properties** dialog shown in Figure 9-3.

Figure 9-3 CIS2 Sensor Properties - VSC Information



9.2.1 VSC Online

Both the Transpector2 and the VSC will come on-line automatically. If a Transpector2 or VSC is taken off-line during normal operation, it will come back on-line after some time if the **AutoDetect** box is checked in the **AutoDetect** tab of the **Com Properties** dialog (refer to Figure 3-10 on page 3-8).

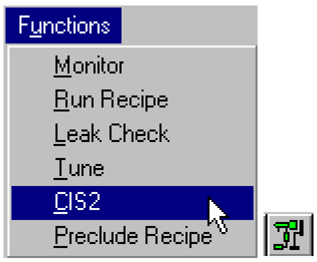
If the **AutoDetect** box is not checked, a sensor can be brought on-line through the **System Setup** window by right-clicking on the sensor icon and selecting **Bring Online** from the context menu.

Other information on this screen is used for troubleshooting any problems with the system.

9.3 CIS2 Configuration Screen

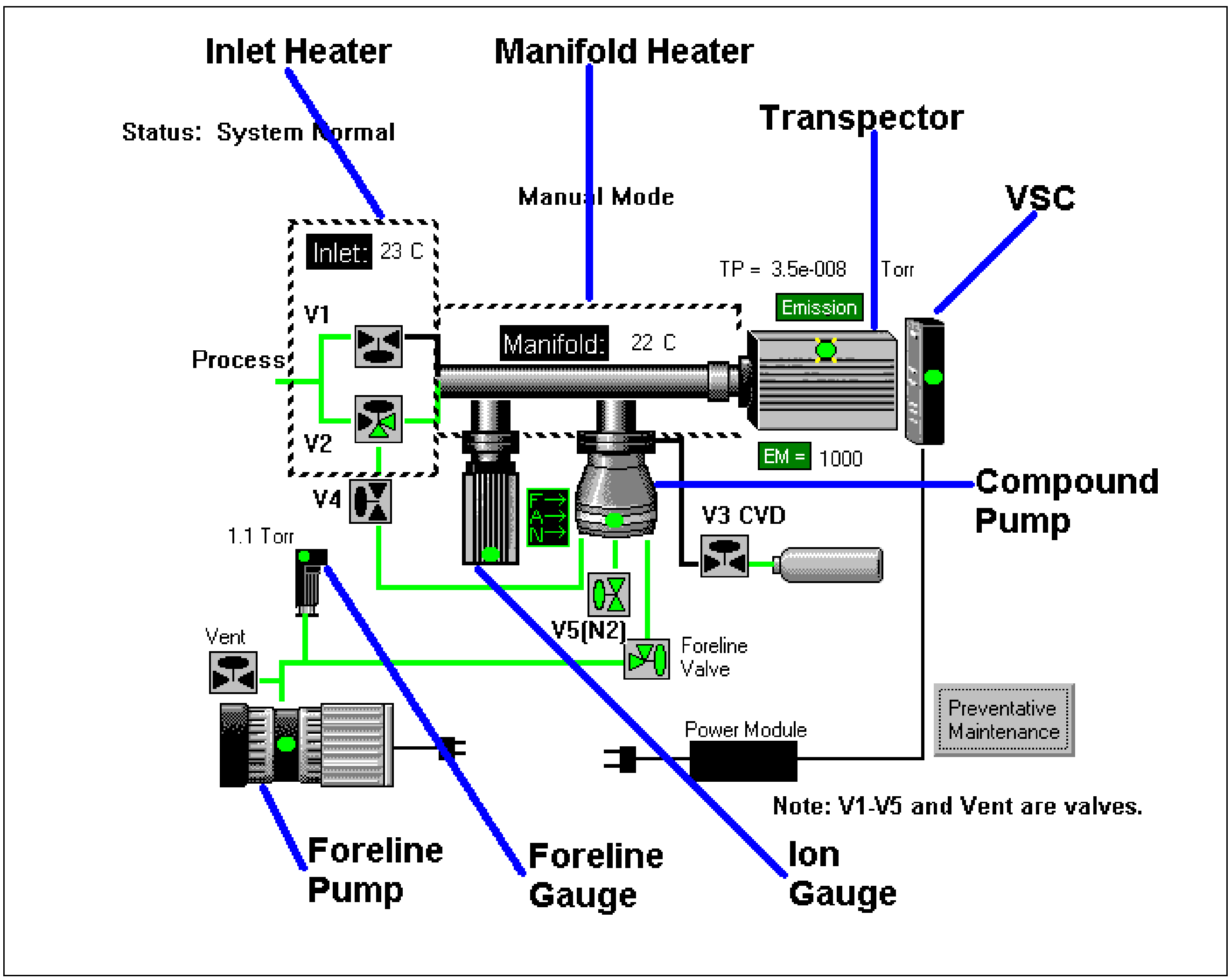
To display the current configuration of the CIS2 system, select **Functions >> CIS2** or click the **CIS2** button (on the sensor tool bar). See Figure 9-4.

Figure 9-4 Functions >> CIS2 and CIS2 Button



The current CIS2 configuration will be displayed. See Figure 9-5. If a control is not displayed, check that all connections are made properly. Then close and open the CIS2 Configuration screen.

Figure 9-5 CIS2 Configuration Screen



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On the CIS2 Configuration screen, each device is color coded to show its status as follows:

Green . . . . Power or function is on. For a valve, green indicates the valve is open.

Black . . . . Power or function is off. For a valve, black indicates the valve is closed.

Yellow . . . . Device is pending. For the Preventative Maintenance button, yellow indicates maintenance is necessary.

Red. . . . . Error state.

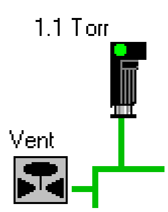
NOTE: For **System Status Colors** refer to Table 2-1 on page 2-7.

NOTE: Each component of the CIS2 Configuration screen has a context menu associated with it. Right-click on any component to access component-specific functions and the capability to add annotations to the screen.

9.3.1 Pressure Readings

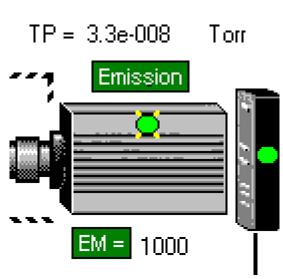
Displayed over the Foreline Gauge is the Foreline Pressure Reading.

Figure 9-6 Foreline Pressure Reading



The Manifold Pressure Reading, from the UHV manifold ITR gauge, is displayed over the Transpector. It is possible to have a Manifold pressure reading when the Transpector emission is off.

Figure 9-7 Manifold Pressure Reading



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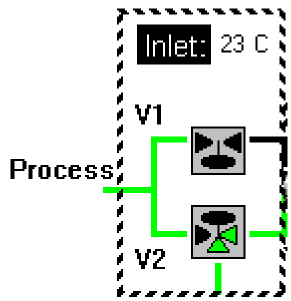
9.3.2 Heater Readings

Temperature for the Inlet Heater is displayed over the inlet valves.

- If the Inlet Heater is not installed, the dashed outline and **Inlet:** label will not be displayed.
- If the Inlet temperature is displayed as **No RTD**, there is either a problem with the heater or with the connection between the heater and VSC.

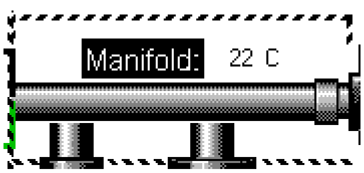
Figure 9-8 Inlet Heater Reading



Temperature for the Manifold Heater is displayed over the manifold.

- If the Manifold Heater is not installed, the dashed outline and **Manifold:** label will not be displayed.
- If the Manifold temperature is displayed as **No RTD**, there is either a problem with the heater or with the connection between the heater and VSC.

Figure 9-9 Manifold Heater Reading



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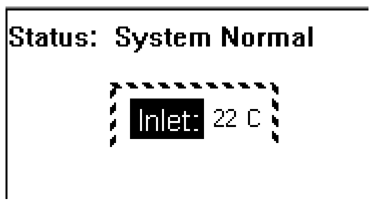
9.3.3 Status Messages

In the upper left corner of the CIS2 Configuration screen is a message that gives the current status of the CIS2 system. See Figure 9-10.

Figure 9-10 CIS2 System Status Message



The status messages that may appear are:

- **System Shut Down**
  All valves are closed and all devices are off except the VSC and the foreline gauge. See section 9.3.7.6, How to Shutdown the System, on page 9-17 for more information.
- **Pumping Down System**
  System is pumping down. See section 9.3.7.5, How to Start Pumpdown, on page 9-16 for more information.
- **System Normal**
  Good vacuum has been attained. System Normal is described as the compound pump reached maximum speed, the foreline pressure is below its fault setpoint, the ITR ion gauge is on and pressure is within the operating setpoints, and the Transpector2 emission is on.
- **...Offline - Last Known State as Displayed**
  The VSC or Transpector (or both) has gone offline. The last known state of each component is displayed.
- **Conditioning - 00:00:44 elapsed time**
  Conditioning is running on the Compound Pump. This is an action started by the user via the Compound Pump menu.
- **Not Ready**
  One of the components is closed or off, but no errors have occurred.
- **System in Sampling mode**
  At least one sampling valve (V1, V2, V3) is open.
- **System Fault**
  There has been a fault. The system has detected a high pressure condition in the foreline and has shutdown as a precaution.

9.3.4 User Level

User Level information is provided within this CIS2 chapter because of the importance of preserving the CIS2 configuration and protecting the CIS2 system from potential damage caused by inexperienced users.

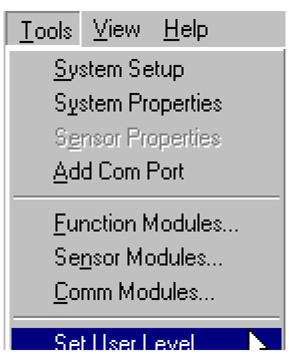
The CIS2 System can be password protected to operate at one of two access levels:

- **Advanced:** All system controls are available. The system may be controlled manually while in **Advanced** mode. See section 9.3.9, Software Operation For Advanced Mode, on page 9-32.
- **Normal**: A limited set of system controls are available. See section 9.3.7, Software Operation For Normal Mode, on page 9-10.

NOTE: The CIS2 System Configuration screen, Manual operation, and Pumpdown parameters are all password protected and can only be accessed through the **Advanced** security level.

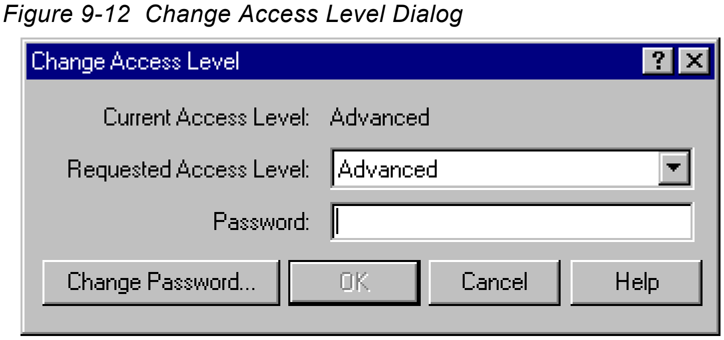
To change the security level, select **Tools >> Set User Level**. See Figure 9-11.

Figure 9-11 Tools >> Set User Level



The **Change Access Level** dialog will display the current security level. In Figure 9-12 the **Current Access Level** is set to **Advanced**.

Figure 9-12 Change Access Level Dialog



When changing from **Normal** level to **Advanced** level, enter the correct password in the **Password** field and click **OK**.

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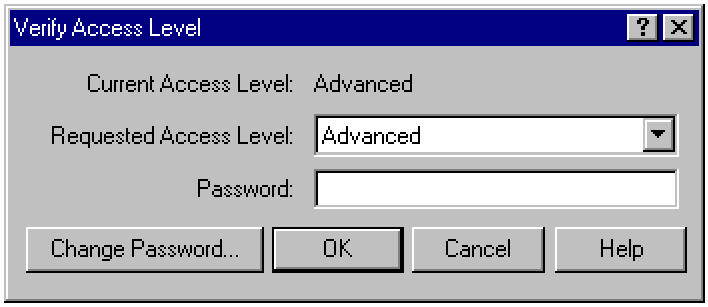
If a password has been set, the **Verify Access Level** dialog will be displayed every time TWare32 is run. You will be prompted to select a **Requested Access Level** and enter the correct password. See Figure 9-13.

Figure 9-13 Verify Access Level Dialog



9.3.5 Normal Level Functions, CIS2

The following is a list of the functions that can be performed while at the **Normal** level.

NOTE: These functions can also be performed in **Advanced** mode.

- Change Temperature Setpoints
- Start Bakeout
- Start Pumpdown
- Shutdown System
- Edit Bakeout Parameters
- View Shut Down Parameters
- Set Pressure Units For Displays
- View Status Dialogs

9.3.6 Advanced Level Functions, CIS2

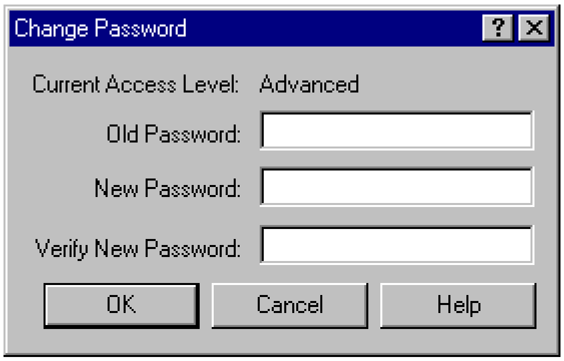
The following is a list of the functions that can be performed while in **Advanced** mode.

- All Normal level functions (refer to section 9.3.5 above)
- Edit Pumpdown Parameters
- CIS2 Configuration Screen
- Manual Mode
- Reset Component Times

9.3.6.1 How to Change the Security Password

Select **Tools >> Set User Level** to display the **Change Access Level** dialog. See Figure 9-12 on page 9-8. Select **Change Password**. The **Change Password** dialog will be displayed. See Figure 9-14.

Figure 9-14 Change Password Dialog



In the **Old Password** field, enter the current password or leave it blank if no password was previously set. Enter the desired password into the **New Password** field and then confirm the entry.

9.3.7 Software Operation For Normal Mode

The following sections describe the activities that are authorized in **Normal** mode.

9.3.7.1 How to Change Temperature Setpoints

Select **CIS2 >> Set Temperatures** (see Figure 9-15) to display the **Heaters** tab of the **CIS2 System Configurations** dialog (see Figure 9-16).

Figure 9-15 CIS2 >> Set Temperatures

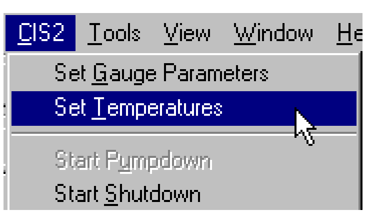


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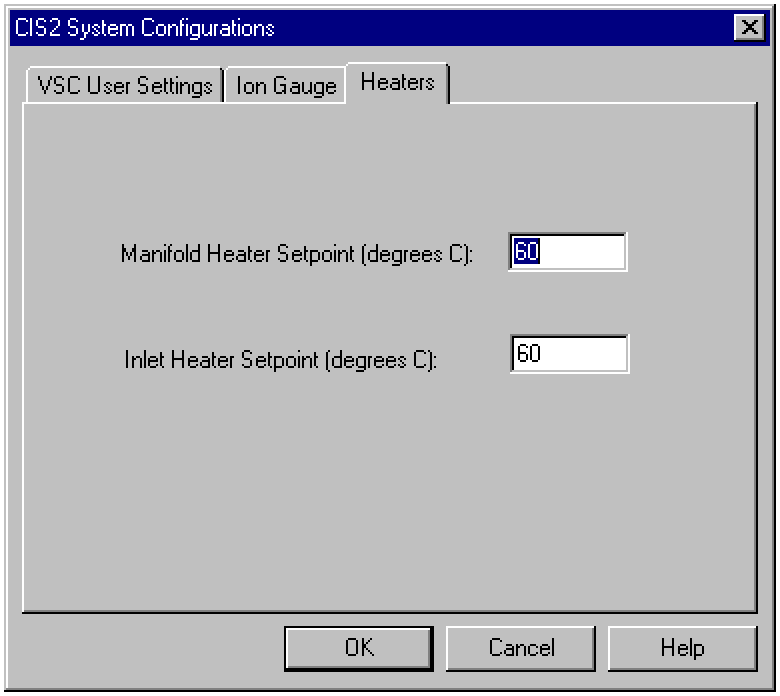
Figure 9-16 Heaters - CIS2 System Configurations Dialog



Temperature Setpoints may be changed on any installed heater. Inlet and Manifold heaters can range from 40 to 200 °C. The specified heater will begin to update after the new setpoint is entered, **OK** is clicked, and the heater is turned on.

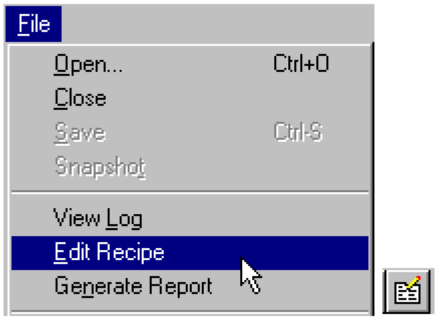
The Temperature Setpoints are only used when performing a manual bake. Once the Temperature Setpoints are entered and the program is in Manual mode, the heater(s) can be turned on by pressing the heater label (black box) on the CIS2 screen.

Temperature Setpoints do not have any effect when running a Bakeout Recipe.

9.3.7.2 How to Create a Bakeout Recipe

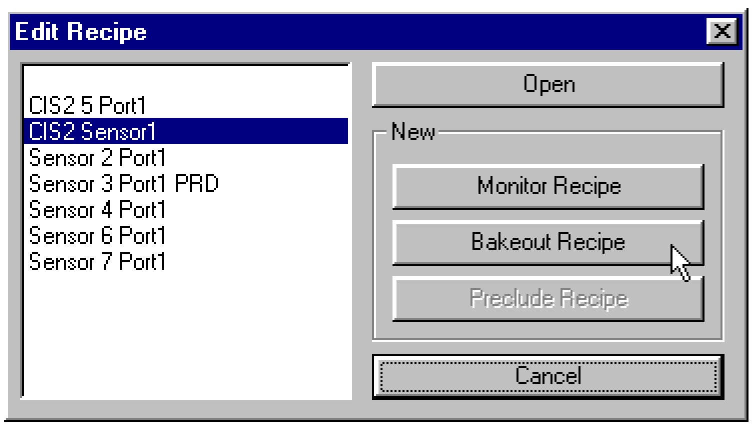
Select **File >> Edit Recipe**, or click the **Recipe Editor button** on the main tool bar. See Figure 9-17.

Figure 9-17 File >> Edit Recipe and Recipe Editor Button



Select a CIS2 sensor from the list and click **Bakeout Recipe** from the **Edit Recipe** dialog. See Figure 9-18.

Figure 9-18 Edit Recipe Dialog



Make any desired changes to the options in the **Edit Bakeout Parameters** dialog. See section 9.3.7.3, How to Edit the Bakeout Parameters, on page 9-13 for more information. Select **Save** when finished. Enter a path and file name in the **Save As** dialog and select **Save**.

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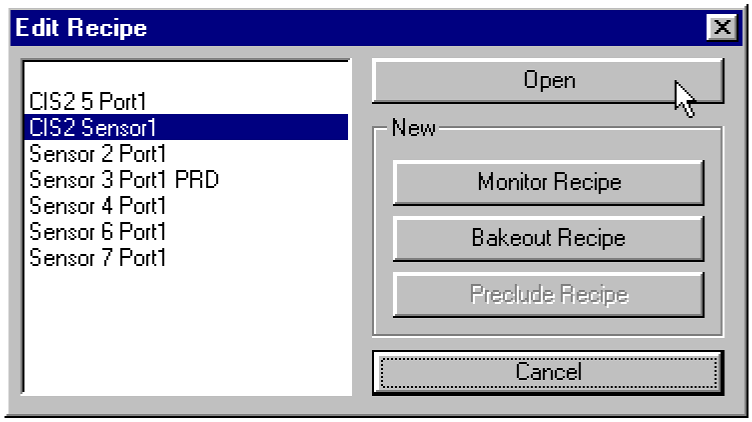
9.3.7.3 How to Edit the Bakeout Parameters

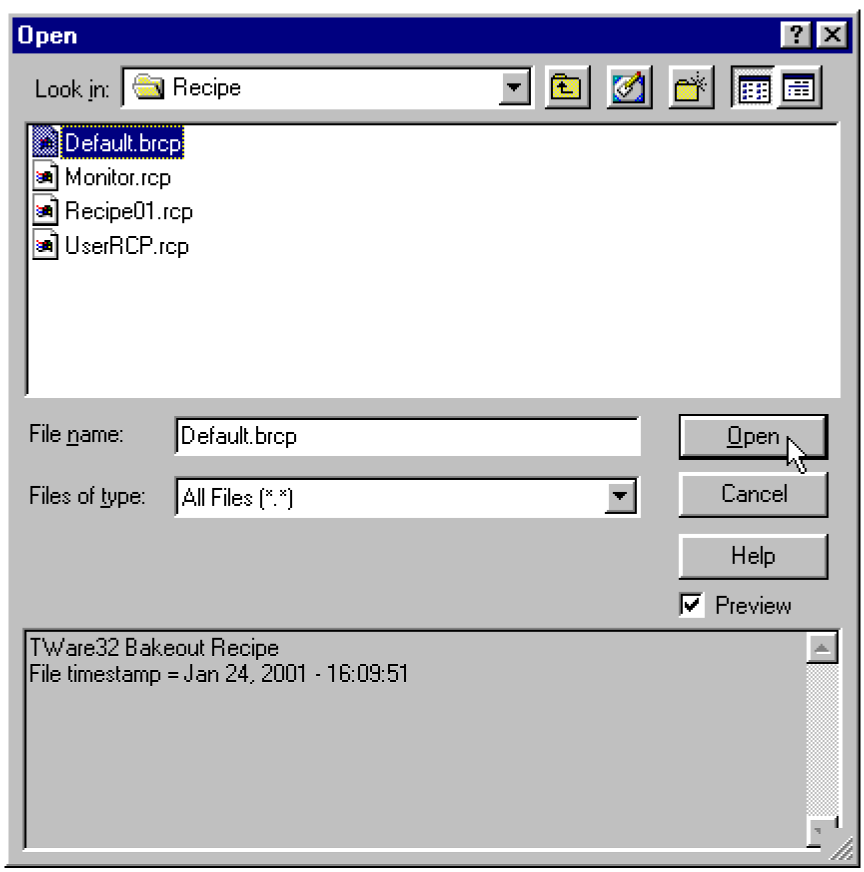
Select **File >> Edit Recipe** or the **Recipe Editor** button. Refer to Figure 9-17 on page 9-12. Select the desired sensor and click **Open** in the **Edit Recipe** dialog. See Figure 9-19.

Figure 9-19 Edit Recipe - Open Recipe



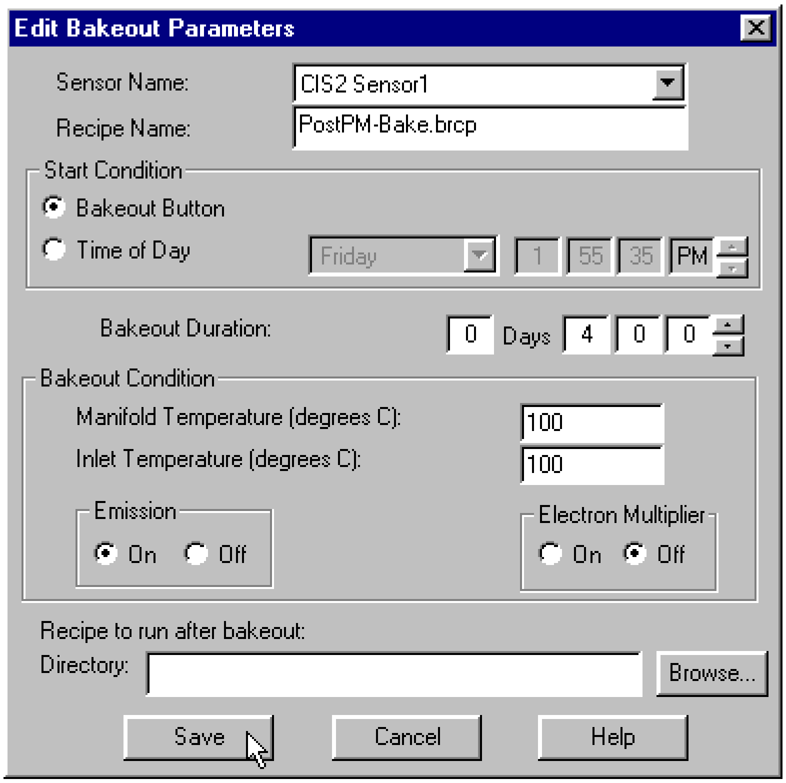
The **Open** dialog will be displayed. See Figure 9-20. Select a bakeout recipe file (`.brcp`) to edit and click **Open**.

Figure 9-20 Open Recipe File



Once a Bakeout Recipe is selected for editing, the **Edit Bakeout Parameters** dialog will be displayed (see Figure 9-21).

Figure 9-21 Edit Bakeout Parameters



NOTE: **Emission** is recommended **On**.
Electron Multiplier is recommended **Off**.

NOTE: The recipe name can be changed through this dialog prior to saving.

NOTE: The **Manifold** and **Inlet heaters** should be set to the same temperature for a consistent bakeout. The internal surfaces of the manifold and inlet will not reach the temperature setting in less than four hours. Therefore, the bakeout recipe should be configured for a duration longer than four hours.

NOTE: The **Recipe to run after bakeout** entry allows for the automatic start of a data collection recipe immediately after the bakeout completes.

CAUTION

The Electron Multiplier must not be on if the Manifold Heater temperature is higher than 125 °C.

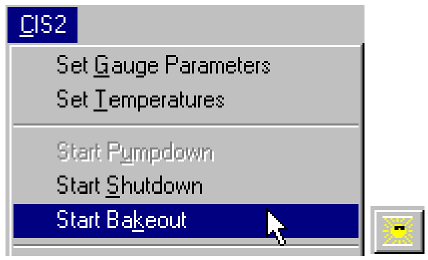
Several bakeout files may be saved. When saving changes to the bakeout parameters as a new recipe file, enter a new file name in the **Recipe Name** field and click **Save**. To save the new parameters to the existing bakeout recipe, click **Save** and choose **Yes** to replace the existing file.

9.3.7.4 How to Start a Bakeout

NOTE: You must have at least one heater installed to perform a bakeout.

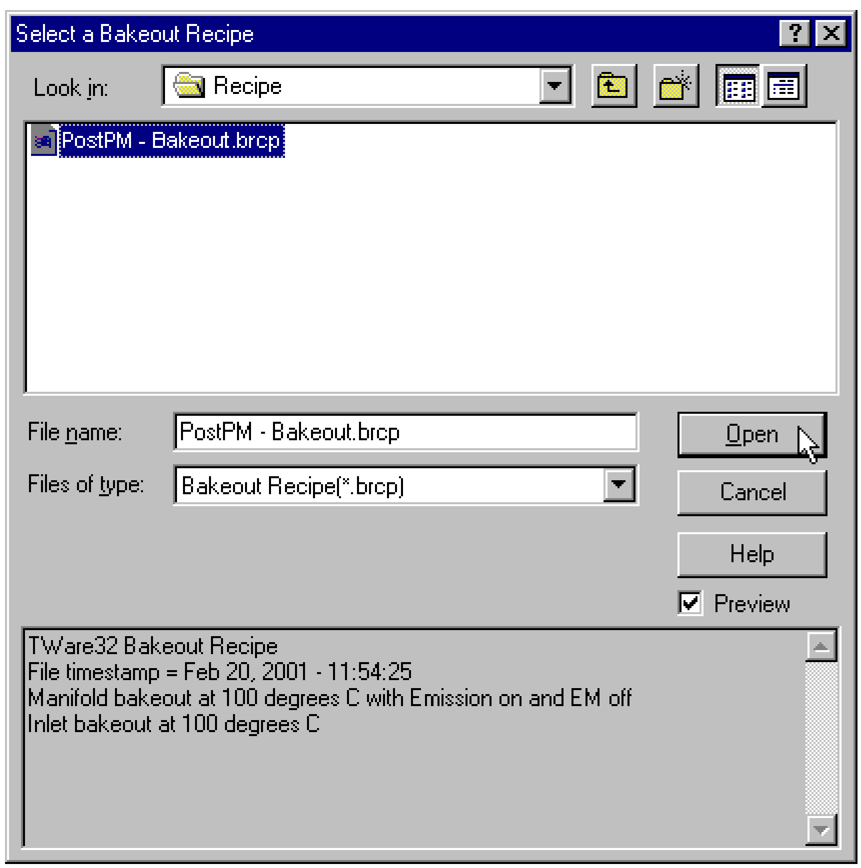
Select **CIS2 >> Start Bakeout** or click the **Start Bakeout** button located on the function tool bar. See Figure 9-22.

Figure 9-22 CIS2 >> Start Bakeout and Start Bakeout Button



The **Select a Bakeout Recipe** dialog will display a list of bakeout files (recipes). See Figure 9-23.

Figure 9-23 Select a Bakeout Recipe Dialog



Select a bakeout file and click **Open**. The Bakeout will begin as determined by the bakeout parameters. A message will display the programmed temperature and the time of day the recipe will complete.

WARNING

During or immediately after bakeout, the manifold surface will be hot.

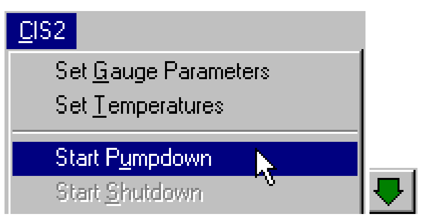
9.3.7.5 How to Start Pumpdown

CAUTION

If the CIS2 system has not been operated for a period of 25 days or more, a Conditioning Cycle must be performed. See page 9-21.

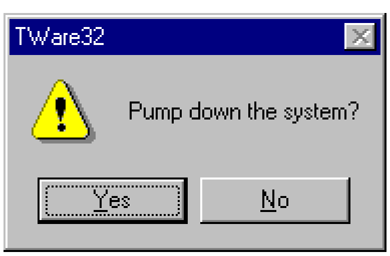
Select **CIS2 >> Start Pumpdown** or click the **Start Pumpdown** button. See Figure 9-24.

Figure 9-24 CIS2 >> Start Pumpdown and Start Pumpdown Button



A message will be displayed: **Pump down the system?** Select **Yes**, which will start the pumpdown sequence. Refer to section 9.3.9.1, Edit Pumpdown Parameters, on page 9-32 for more details.

Figure 9-25 Pump Down The System Message



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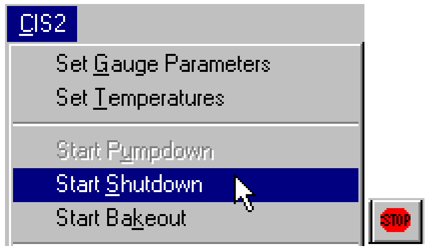
9.3.7.6 How to Shutdown the System

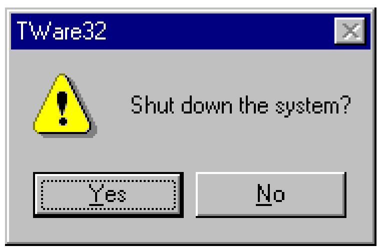
Select **CIS2 >> Start Shutdown** or click the **Stop** button. See Figure 9-26.

Figure 9-26 CIS2 >> Start Shutdown and Stop Button



A message will be displayed: **Shut down the system?** Select **Yes.** See Figure 9-27 on page 9-17. All valves and devices will close and turn off.

Figure 9-27 Shut Down The System Message

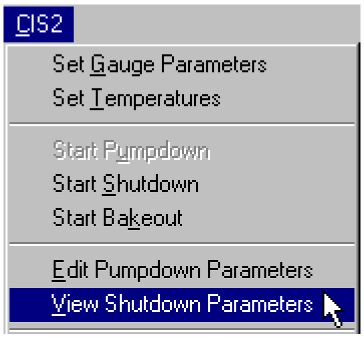


NOTE: The **Power Module, VSC and Transpector** will still have power after the system is shut down in order to receive other commands.

9.3.7.7 How to View the Shutdown Parameters

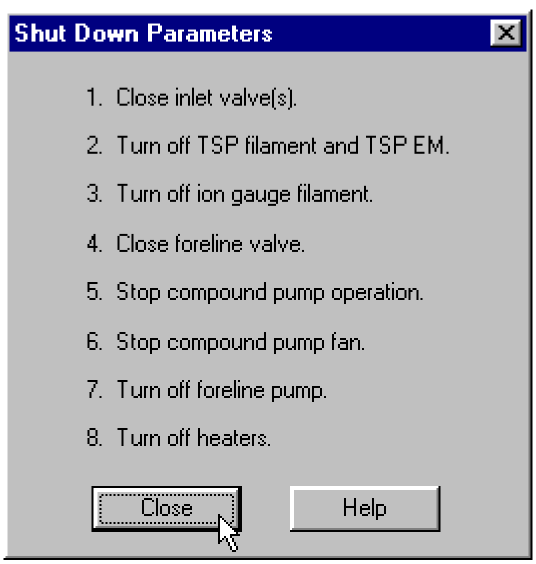
Select **CIS2 >> View Shutdown Parameters**. See Figure 9-28.

Figure 9-28 CIS2 >> View Shutdown Parameters



The **Shut Down Parameters** dialog will display the eight sequential steps the system takes to shut down. Shut Down Parameters may be viewed, but not changed. See Figure 9-29.

Figure 9-29 Shut Down Parameters Dialog



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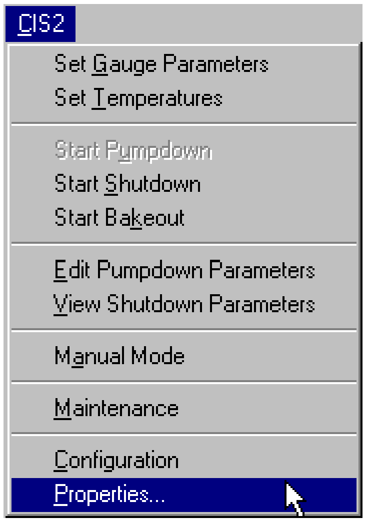
9.3.7.8 How to View the Status Dialogs

Select **CIS2 >> Properties**, and click the tab of the device in question. See Figure 9-30.

Figure 9-30 CIS2 >> Properties



NOTE: The status of each device may also be viewed in the CIS2 Configuration screen (refer to Figure 9-5 on page 9-4). Right click over a device graphic and select **Properties** from the context menu to display its status.

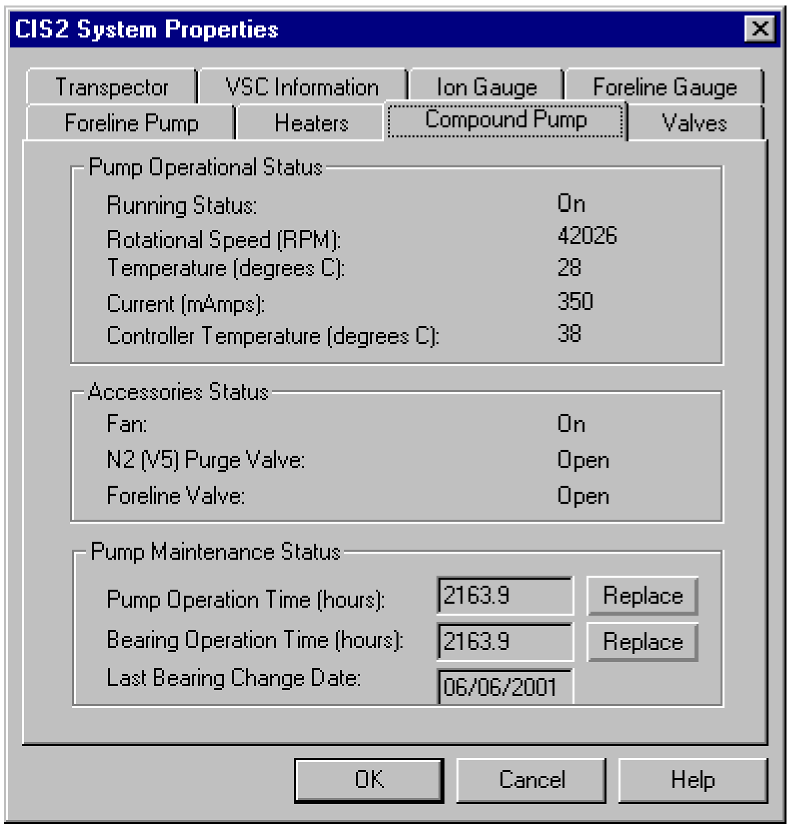
NOTE: When in Normal mode you can only view the status of the CIS2 components. You must be in Advanced mode to effect any changes.

9.3.7.8.1 How to Check the Compound Pump Status

Select **CIS2 >> Properties** and click the **Compound Pump** tab. Status information about the Compound Pump will appear in the dialog. See Figure 9-31.

NOTE: Status information for many components includes the time of operation. This refers to the actual number of hours the component has been turned on.

Figure 9-31 Compound Pump - CIS2 System Properties Dialog



- The **Rotational Speed** is the actual RPM at which the compound pump is operating. Normal speed, the speed at which the pump is running when the system is in operation, will vary depending on pump type. Contact INFICON Service if this information is desired.
- The **Temperature** is the actual temperature measured inside the compound pump. It depends on the gas load at any particular time, but normal temperature is typically between 10 and 20 °C above ambient temperature.
- **Current** is the actual current draw of the compound pump, in milliampere. This will vary depending on the gas load of the pump, whether it is accelerating, and the pressure of the manifold. Normally, it is between 800 and 2000 mA.

- **Controller Temperature** is the actual temperature measured at the compound pump controller board located in the Power Module. Normal temperature depends on the gas load at any particular time, but typically it is 5 to 10 °C above ambient temperature.
- **Pump Operation** shows the approximate number of hours that the compound pump has operated. Pressing the **Replace** button next to **Pump Operation Time** will reset the Pump Hours and the Bearing Hours to zero and change the **Last Bearing Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.
- **Bearing Operation** shows the approximate number of hours that the compound pump bearings have operated, along with the date when the bearings were last changed. Pressing the **Replace** button located next to **Bearing Operation Time** will reset the time to zero and change the **Last Bearing Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.

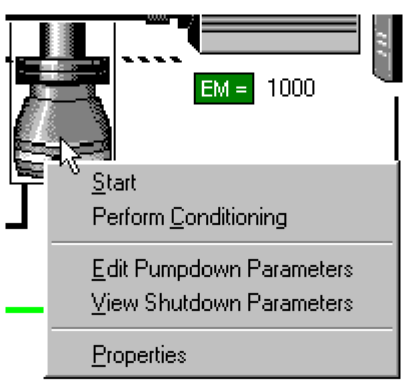
NOTE: The **Replace** buttons are only available in the Advanced user mode. The **Replace** buttons should not be pressed if the components have not been physically replaced.

CAUTION

If the Compound pump remains idle for a period of more than 25 days, a Conditioning Cycle must be performed.

To start Conditoning on the **Compound Pump**, select **Perform Conditioning** on the Compound Pump context menu as shown in Figure 9-32.

Figure 9-32 Compound Pump, Perform Conditioning



The conditioning cycle is as follows:

1. With the foreline at atmosphere, the compound pump is turned on for 10 minutes.
2. With the foreline under vacuum, the compound pump goes through a sequence of accelerating to 17,000, 26,000 and 36,000 RPM. This entire conditioning process will take about 30-40 minutes.

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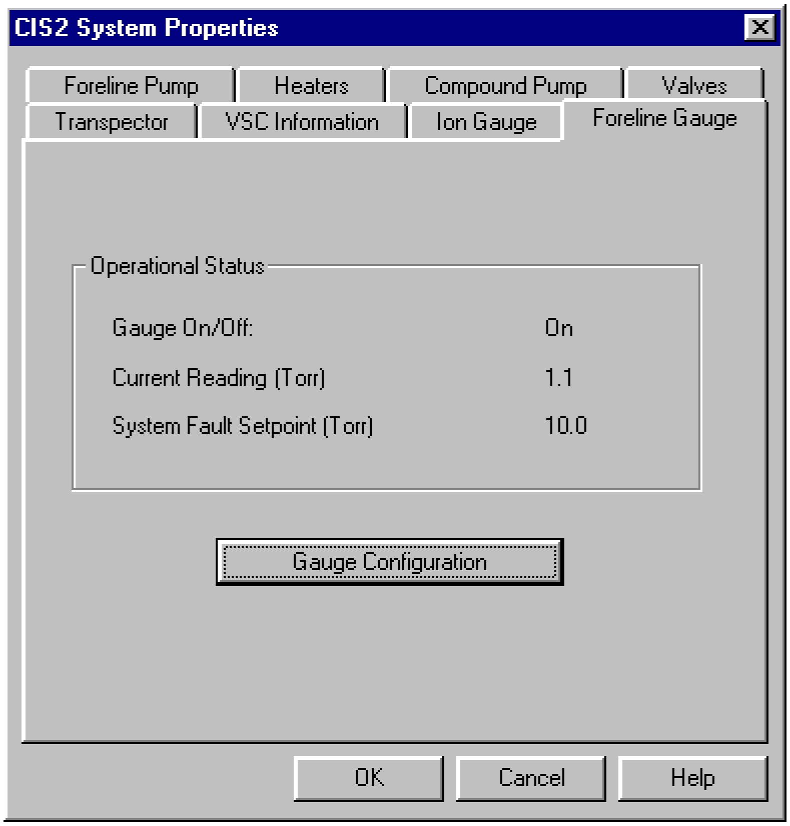
9.3.7.8.2 How to Check the Foreline Gauge Status

Select **CIS2 >> Properties** and click the **Foreline Gauge** tab. Status information about the Foreline Gauge will appear in the dialog. See Figure 9-33. There is also a **Gauge Configuration** button which displays the **CIS2 System Configuration, Gauges** tab. See section 9.3.9.3 on page 9-39 for information on gauge configuration.

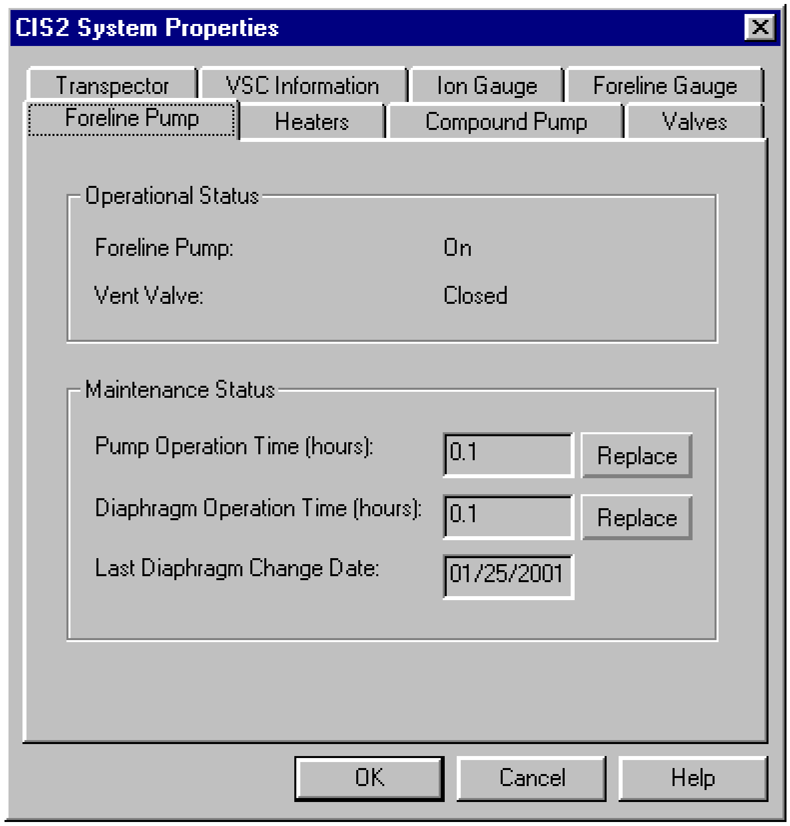
Figure 9-33 Foreline Gauge - CIS2 System Properties Dialog



9.3.7.8.3 How to Check the Foreline Pump Status

Select **CIS2 >> Properties** and click the **Foreline Pump** tab for status information about the Foreline Pump. See Figure 9-34.

Figure 9-34 Foreline Pump - CIS2 System Properties Dialog



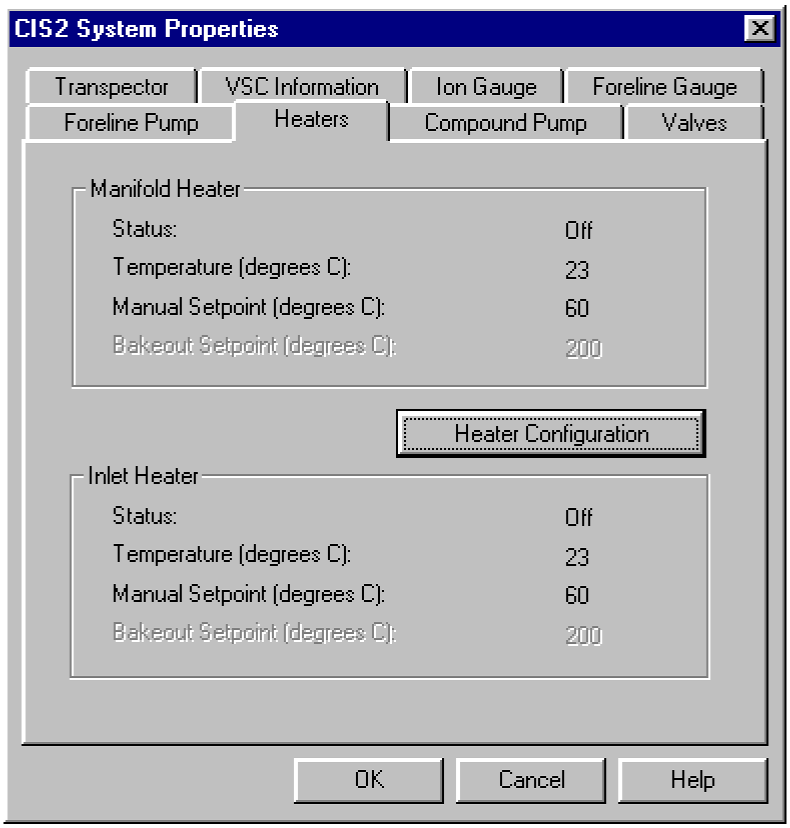
- **Pump Operation Time** shows the approximate number of hours that the compound pump has operated. Pressing the **Replace** button next to **Pump Operation Time** will reset hours to zero and changes the **Last Diaphragm Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.
- **Diaphragm Operation Time** shows the approximate number of hours that the diaphragm has operated. Pressing the **Replace** button located next to **Diaphragm Operation Time** will reset the time to zero and change the **Last Diaphragm Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.

NOTE: The replace buttons are only available in the Advanced user mode. The replace buttons should not be pressed if the components have not been physically replaced.

9.3.7.8.4 How to Check the Heater Status

Select **CIS2 >> Properties** and click the **Heaters** tab to see status information about the **Manifold** and **Inlet Heaters**. See Figure 9-35.

Figure 9-35 Heaters - CIS2 System Properties Dialog



Refer to section 9.3.7.1, How to Change Temperature Setpoints, on page 9-10 for information on **Heater Configuration**.

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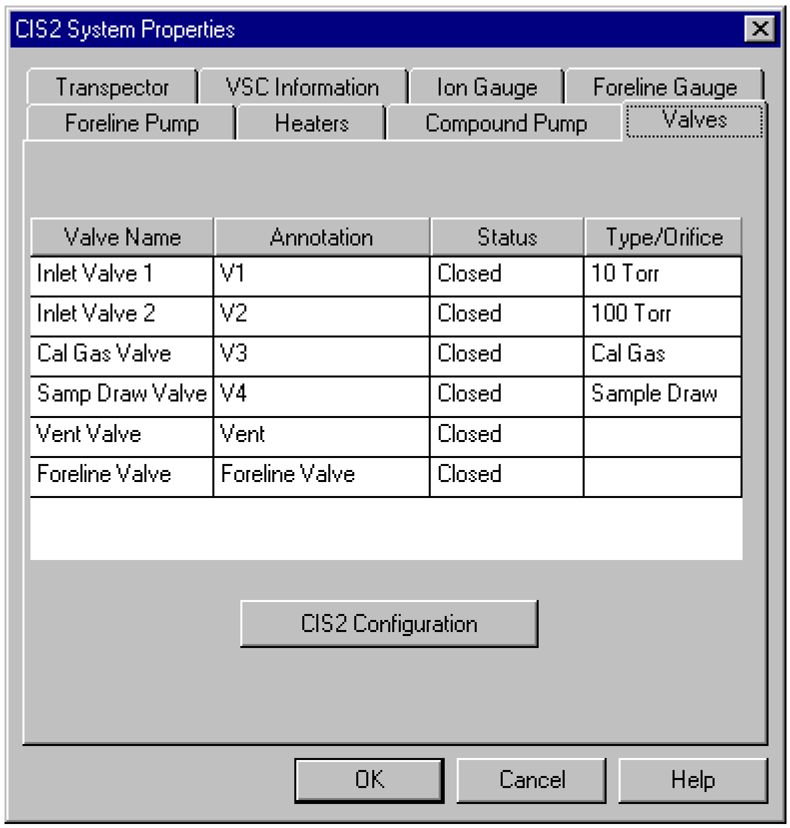
9.3.7.8.5 How to Check the Inlet Valve(s) Status

Select **CIS2 >> Properties** and click the **Valves** tab. The dialog displays the status of each sample Valve installed. If Valve 1 or Valve 2 is installed, the Valve state and type are displayed. The Calibration Valve state is displayed if it is installed. See Figure 9-36.

Figure 9-36 Valves - CIS2 System Properties Dialog

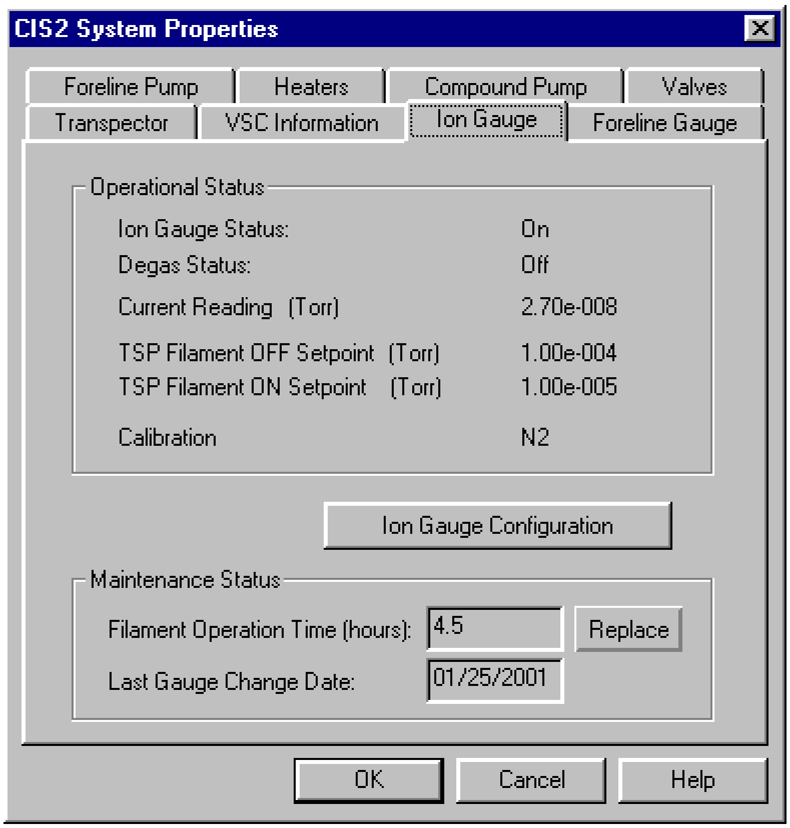


See section 9.3.9.2, CIS2 Configuration - VSC User Settings, on page 9-34 for information on **CIS2 Configuration**.

9.3.7.8.6 How to Check the Ion Gauge Status

Select **CIS2 >> Properties** and click the **Ion Gauge** tab. Status information about the Ion Gauge will appear in the dialog. See Figure 9-37.

Figure 9-37 Ion Gauge - CIS2 System Properties Dialog



See section 9.3.9.3, CIS2 Configuration - Gauges, on page 9-39 for information on **Ion Gauge Configuration**.

Filament Operation Time is the time in hours that the filament has been operating. Clicking on **Replace** will change the **Filament Operation Time** to 0 and will change the **Last Gauge Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.

NOTE: The **Replace** button is only available in the Advanced user mode.

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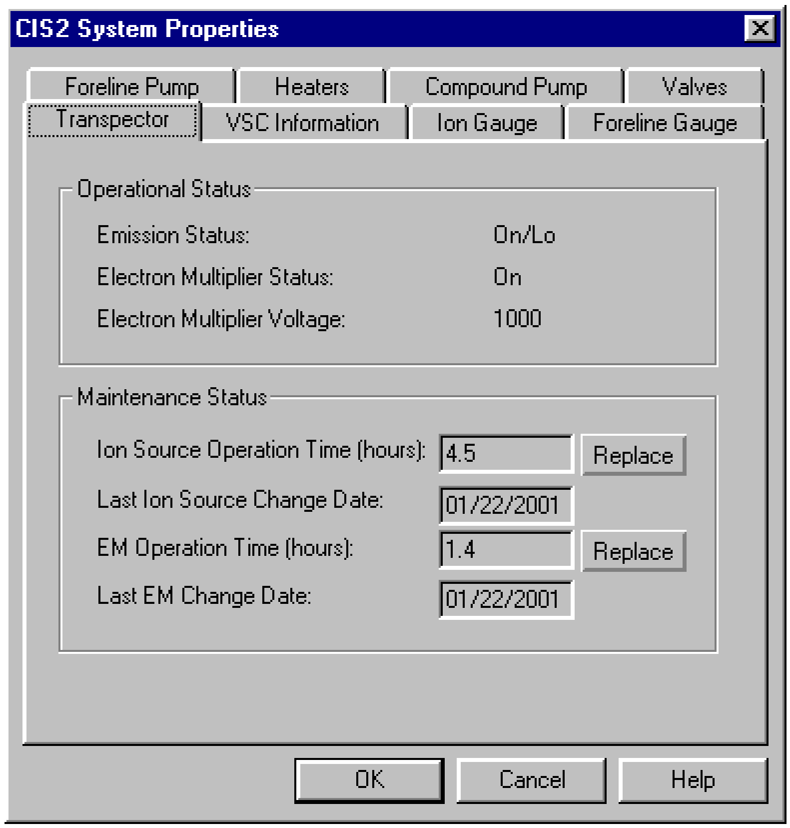
9.3.7.8.7 How to Check the Transpector Status

Select **CIS2 >> Properties** and click the **Transpector** tab. Status information about the Transpector will appear in the dialog. See Figure 9-38.

Figure 9-38 Transpector - CIS2 System Properties Dialog



The **Ion Source Operation Time** is the amount of time in hours that the ion source has been operating. Clicking **Replace** will change the **Ion Source Operation Time** to 0 and resets the **Last Ion Source Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.

The **EM Operation Time** is the amount of time in hours that the electron multiplier has been operating. Clicking **Replace** will change the **EM Operation Time** to 0 and resets the **Last EM Change Date** to the current date. See section 9.3.8, Preventative Maintenance, on page 9-30.

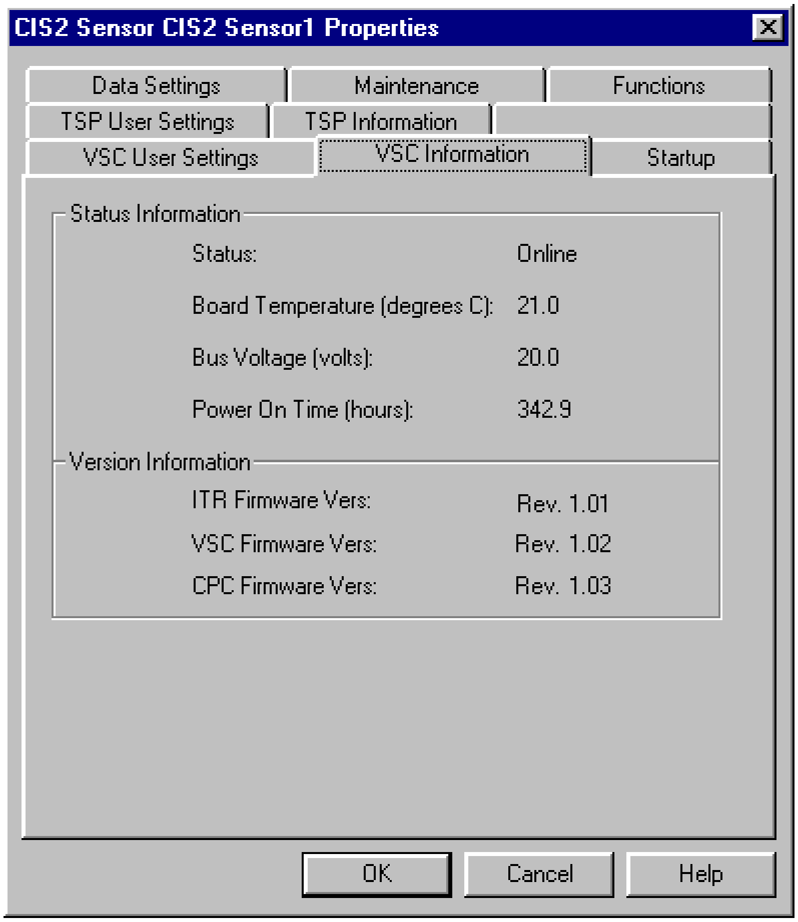
NOTE: The **Replace** button is only available in the Advanced user mode.

9.3.7.8.8 How to Check the VSC Status

Select **CIS2 >> Properties** and click the **VSC Information** tab. Status information about the VSC will appear in the dialog. See Figure 9-39.

NOTE: Refer to the *Transpector CIS2 Gas Analysis System Operating Manual* (IPN 074-303) for a detailed description of the VSC.

Figure 9-39 VSC Information - CIS2 System Properties Dialog



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9.3.7.9 How to Check Component Operation Times

Select **CIS2 >> Maintenance** (see Figure 9-40) and click the **Operating Time** tab. The dialog displays the operation times and the installation dates of the various components. See Figure 9-41.

Figure 9-40 CIS2 >> Maintenance

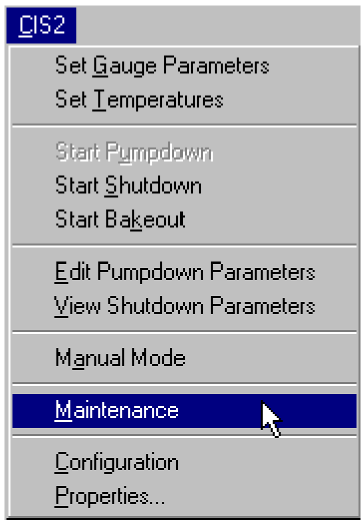
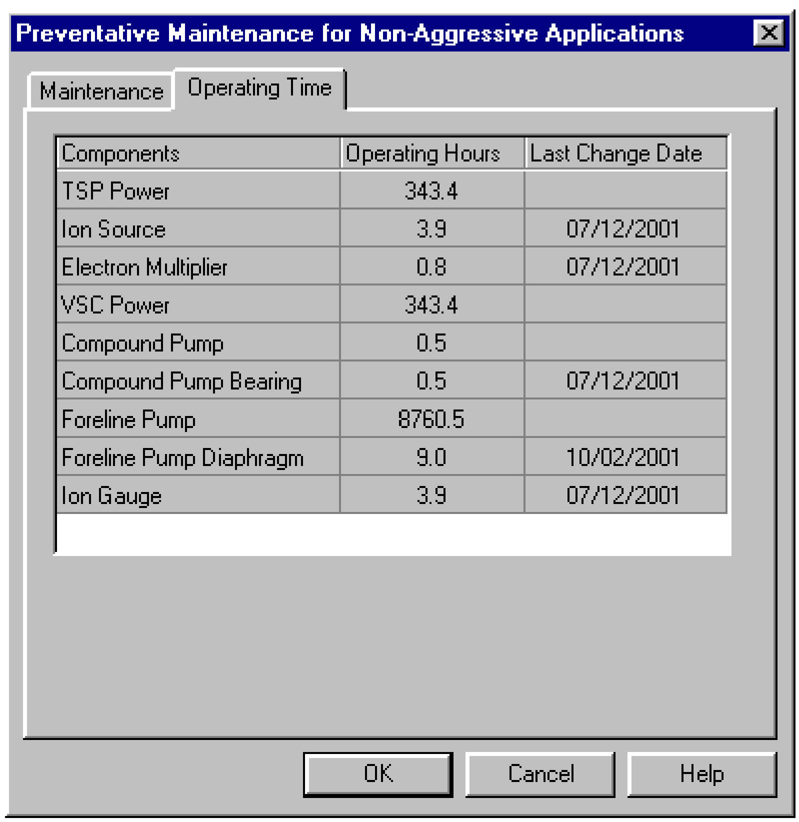


Figure 9-41 Operating Time - Preventative Maintenance for Non-Aggressive Applications

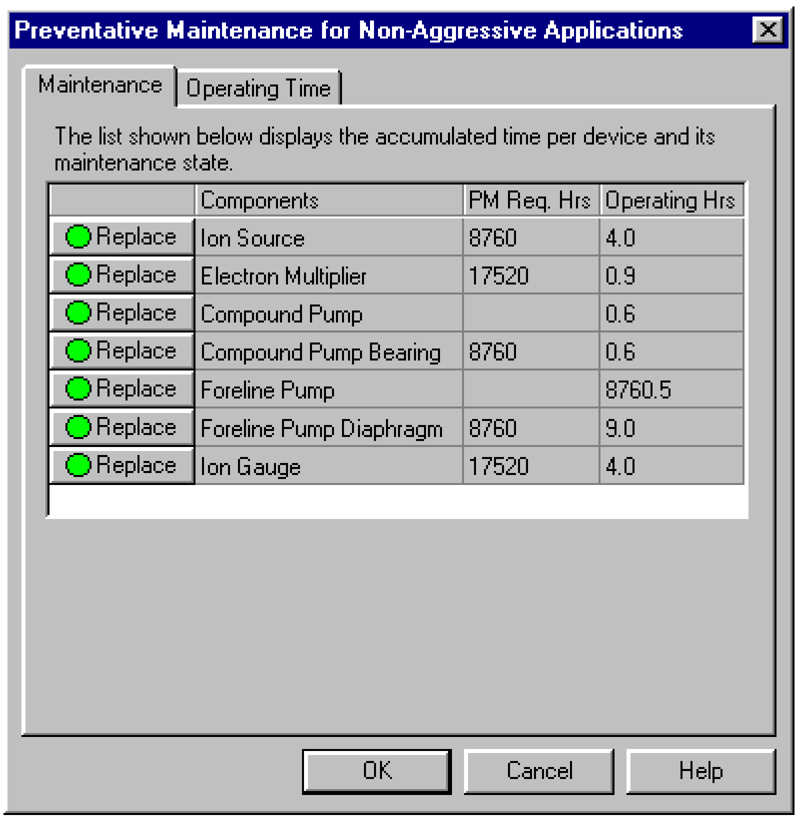


NOTE: The operation time is logged in actual operating hours. The date is the actual calendar date that the component was installed. If the component operates 24 hours a day, the hours and the dates will agree. If the component operates less than 24 hours a day, the hours and the date will not agree.

9.3.8 Preventative Maintenance

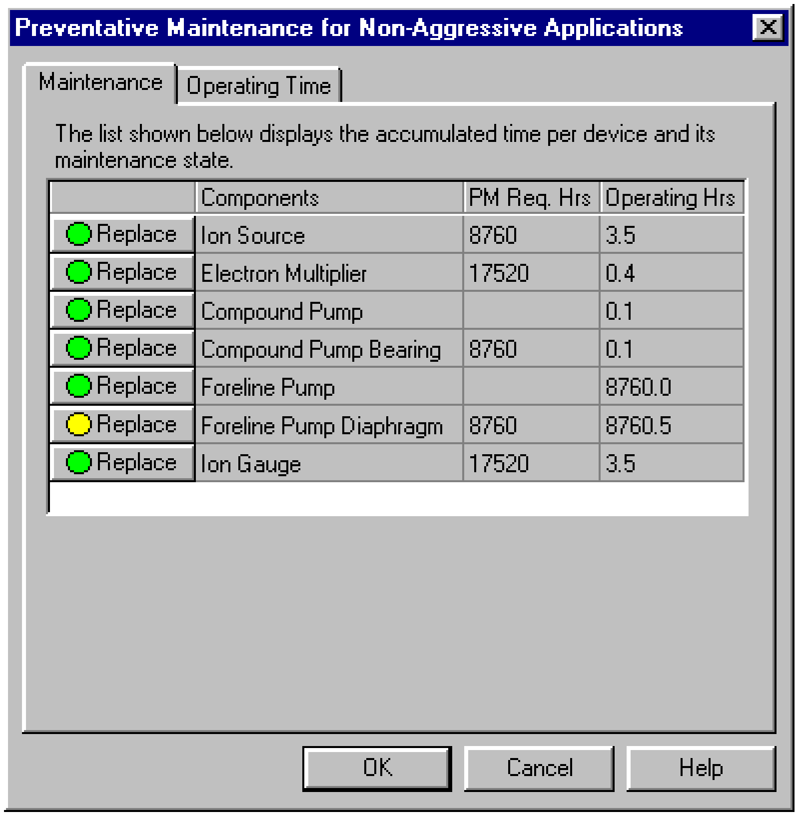
Select **CIS2 >> Maintenance** and click the **Maintenance** tab. The **Preventative Maintenance** (PM) dialog provides the actual operating hours of the components as well as the recommended maintenance schedule for replacement of these components. See Figure 9-42.

Figure 9-42 Maintenance - Preventative Maintenance for Non-Aggressive Applications



Once the **Operating Hours** value exceeds the **Preventative Maintenance Required Hours**, the indicator for that component will turn yellow and maintenance will be necessary. The example in Figure 9-43 shows that the Foreline Pump Diaphragm needs to be replaced.

Figure 9-43 Preventative Maintenance is Required for the Foreline Pump Diaphragm



Once the component has been physically replaced, it is necessary to update the operation time by clicking **Replace** next to the component name in the **Preventative Maintenance** dialog. This will reset the operation time to zero. This function can only be accomplished in Advanced mode.

NOTE: The number of hours before a PM is required is different for different applications. For applications that use aggressive gases, the number of hours before a PM is required will be less.

CAUTION

Failure to perform the Preventative Maintenance at the required time will shorten the life of the component and void the warranty.

The **Preventative Maintenance** dialog, as seen in Figure 9-42 and Figure 9-43, can also be accessed by clicking the **Preventative Maintenance** button. See Figure 9-44.

Figure 9-44 Preventative Maintenance Button

The **Preventative Maintenance** button is located in the lower right corner of the CIS2 System Configuration screen. Clicking this button will display the **Preventative Maintenance** dialog.

When the operating time of a component exceeds the PM Required Hours, the PM button will turn yellow and change to **Service Required** as an alert.

9.3.9 Software Operation For Advanced Mode

Advanced mode has all of the capabilities of Normal mode (refer to section 9.3.5 on page 9-9) plus the capabilities described in the following sections.

9.3.9.1 Edit Pumpdown Parameters

Select **CIS2 >> Edit Pumpdown Parameters** (see Figure 9-45) to display the **Pump Down Parameters** dialog. This dialog will display sequential steps describing start up conditions. See Figure 9-46.

Figure 9-45 CIS2 >> Edit Pumpdown Parameters

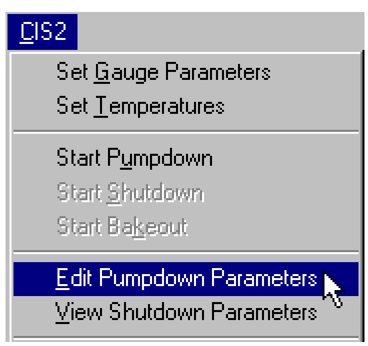
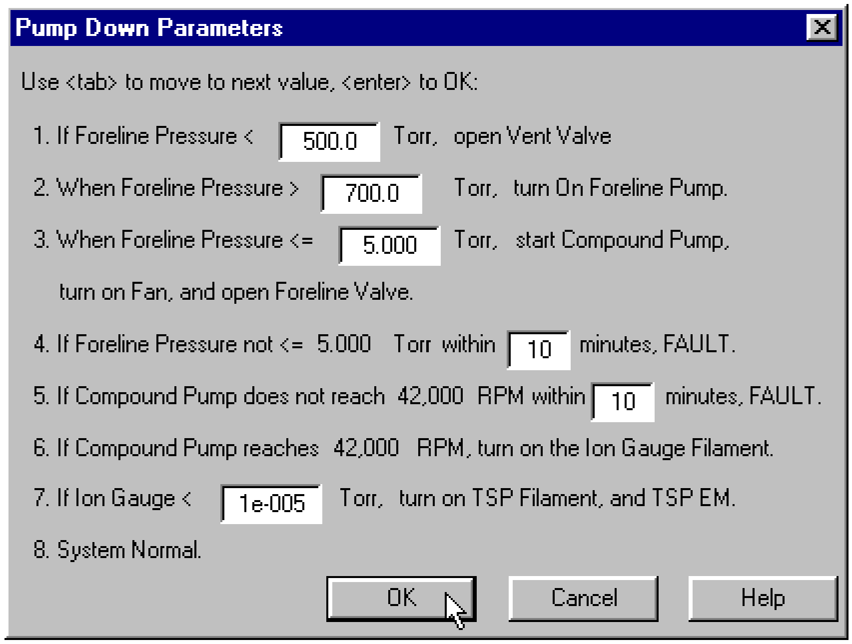


Figure 9-46 Pump Down Parameters Dialog



The Pumpdown Parameters are:

1 The foreline pump should be at atmosphere for reliable starting. This set of parameters will use the Pirani sensor to measure the foreline pressure. If the pressure is below 500 Torr (default), this implies that the foreline is under vacuum. The vent valve is then opened.

2 When the foreline pressure is near atmosphere (700 Torr default), the foreline pump is turned on.

3 Once the foreline pressure reaches 5 Torr (default), the Compound pump and the Compound pump fan are turned on, and the foreline valve will open.

4 If the foreline pressure does not reach its setpoint pressure of 5 Torr (default) within 10 minutes (default), the system will Fault and Shutdown.

5 If the Compound pump does not reach its normal operational speed of 42,000 RPM within 10 minutes (default), the system will Fault and Shutdown.

NOTE: “Normal operational speed” is pump dependent and may not be the same, as documented here, for your pump.

6 Once the Compound pump does reach its normal operational speed of 42,000 RPM, the UHV ITR ionization gauge will turn on and the Nitrogen purge valve will open.

CAUTION

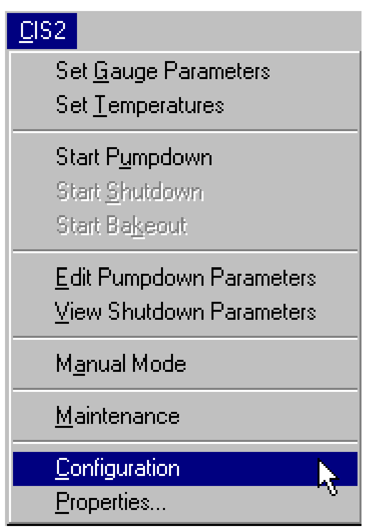
When the corrosive version compound pump (CVD/Etch) is operated, the Nitrogen purge must always be flowing or the lifetime of the pump will be shortened.

7. If the ionization gauge reading is less than 1E-5 Torr (default), the Transpector filament and electron multiplier will turn on.
8. At this point, the system is considered “System Normal”.

9.3.9.2 CIS 2 Configuration - VSC User Settings

When **CIS2 >> Configuration** is selected (see Figure 9-47), the **VSC User Settings** tab of the **CIS2 System Configurations** dialog shown in Figure 9-48 is displayed. This is normally pre-configured at the factory and does not need changing unless you have specifically changed something in the system.

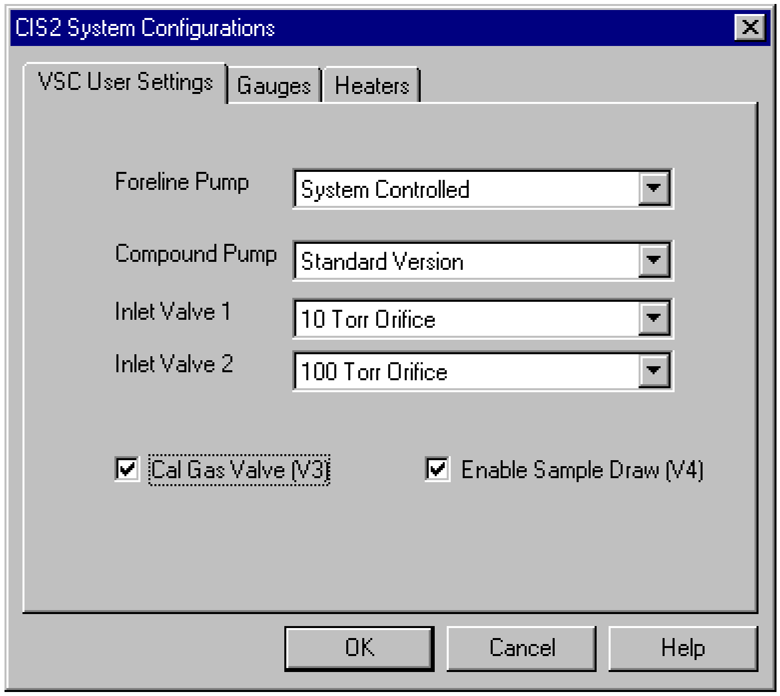
Figure 9-47 CIS2 >> Configuration



The items that can be changed are the:

- Foreline Pump, either System Controlled or Customer Supplied.
- Compound Pump, either the Standard or Corrosive version.
- Inlet arrangement, the type of inlet and/or orifices.
- Calibration standard.
- Presence of Pirani Foreline Gauge (on the **Gauges** tab).

Figure 9-48 VSC User Settings - CIS2 System Configurations Dialog



NOTE: The CIS2 System Configuration settings will be saved in a battery-backed non-volatile RAM located in the VSC. This enables TWare32 to initialize the CIS2 properly regardless of the computer connected to the system.

CAUTION

Only experienced personnel should alter the CIS2 System Configuration settings.

9.3.9.2.1 Foreline Pump

The **System Controlled** foreline pump configuration is selected when there is an INFICON-supplied foreline pump. The standard foreline is a complete assembly that includes a 24 volt relay for allowing the VSC to turn the pump and a vent valve on and off. The vent valve is used to reliably start the diaphragm pump.

If the **Customer Supplied** foreline pump configuration is selected, the software will remove the foreline pump and the vent valve from the CIS2 screen and no control of these items can be made.

CAUTION

If a Customer Supplied pump is used, it must supply a continuous foreline pressure that is less than 10 Torr.

9.3.9.2.2 Compound Pump

The **Standard Version** compound pump configuration is selected when the application is non-corrosive and a non-corrosive compound pump is purchased with the CIS2 system.

CAUTION

With the Standard Version compound pump, the foreline connection is to the middle port of the pump and corrosive gases should not be used.

The **Corrosive Version** of the compound pump configuration should be selected if the corrosive version compound pump was purchased with the CIS2 system. This pump should always be used for applications such as CVD or Etch, or whenever corrosive gases are being sampled. Once the **Corrosive Version** is selected, a nitrogen purge valve will be shown in the software. This purge valve should always be open when the CIS2 compound pump is operating. For a more detailed description of the concerns related to the Nitrogen Purge option, refer to the *Transpector CIS2 Gas Analysis System Operating Manual* (IPN 074-303), “Corrosive Gases: CVD/Etch” section.

CAUTION

With the Corrosive Version compound pump, the nitrogen purge valve with flow controlling orifice is connected to the middle port of the pump. The nitrogen purge valve should always be open when the Corrosive Version compound pump is running. This provides protection for the bearings from corrosive gas attack and evaporation of bearing lubricant.

9.3.9.2.3 *Inlet Valve 1*

Select from the **Inlet Valve 1** options listed in the dialog. If **No Valve** is selected for V1 then the **Cal Gas Valve** (**V3**) will not be available. Refer to Figure 9-48 on page 9-35.

9.3.9.2.4 *Inlet Valve 2*

Select from the **Inlet Valve 2** options listed in the dialog. If the **Enable Sample Draw (V4)** is checked, the only Valve 2 orifice sizes available are the 100 and 10 Torr. Refer to Figure 9-48 on page 9-35.

If the **Enable Sample Draw (V4**) option is checked, additional plumbing will be seen. The additional parts include another valve (Valve 4) and a hose between the compound pump and V4. Having this option along with the proper hardware will allow you to sample high pressures (>1 Torr) with minimum response time. This sample draw inlet will pull 10 sccms of process gas to the orifice located at V2. This will cut the response time down from several minutes to less than 10 seconds for a 100 Torr process.

NOTE: V4 should always be opened before V2 to prevent pressure bursts. Consequentially, once V2 is closed, V4 should remain open for several seconds to pump out any residuals left from sampling the process. When running a recipe, control of V4 in relation to V2 is handled by the software. In **Manual Mode**, warnings are provided when these guidelines are not followed.

9.3.9.2.5 *Cal Gas Valve*

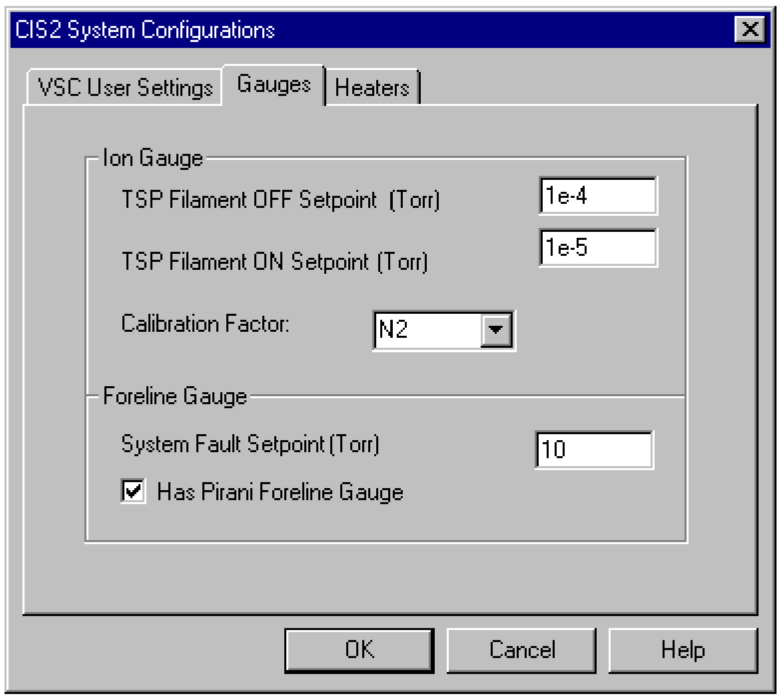
The **Cal Gas Valve (V3)** refers to the option of adding a Calibration Standard to the CIS2 system. It may be installed on any system that does not use a Virtual Valve (Gas Shield). For a PVD installation, the Calibration standard is located near the ion source of the CIS2 system. For a CVD/Etch installation, the Calibration standard is located near the compound pump inlet.

NOTE: The Transpector2 emission and electron multiplier must be turned off before the **Cal Gas Valve (V3)** can be opened. When V3 is opened, the trapped gas in the capillary of the calibration standard will evacuate. As a precaution, the Transpector2 will turn the emission and EM off before the valve opens and back on after the valve has been open for a short time.

9.3.9.3 CIS 2 Configuration - Gauges

The Gauges tab allows for changes to the **Ion Gauge** configuration — the **Transpector Filament Setpoints** and the **Calibration Factor —** and the **Foreline Gauge System Fault Setpoint**. These parameters are gauge specific and generally are not changed after they are configured.

Figure 9-49 CIS2 Configuration - Ion Gauge



<u>Ion Gauge</u>

TSP Filament OFF Setpoint . . . . The pressure at which the system should turn the Transpector emission off (as a protection).

TSP Filament ON Setpoint . . . . . The pressure at which the system is allowed to turn the Transpector emission on.

Calibration Factor . . . . The mass at which the **Ion Gauge** is calibrated.

<u>Foreline Gauge</u>

System Fault Setpoint . . . . This is the pressure at which the system is considered **Faulted** and is automatically shutdown for system component protection.

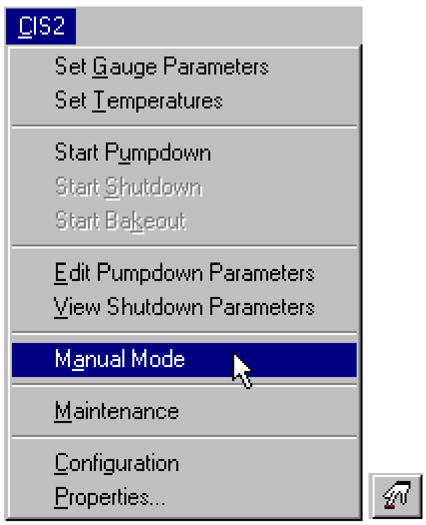
9.3.9.4 CIS2 Configuration - Heaters

See section 9.3.7.1, How to Change Temperature Setpoints, on page 9-10.

9.3.9.5 Manual Mode

Select **CIS2 >> Manual Mode** or click the **Manual Mode** button to toggle **Manual Mode** on and off. See Figure 9-50. A message, **Manual Mode**, displayed above the Manifold heater, will indicate that **Manual Mode** is active.

Figure 9-50 CIS2 >> Manual Mode and Manual Mode Button



CAUTION

When using the CIS2 system in Manual mode, certain interlocks can be bypassed. While the VSC will still have interlocks in place to protect the system and the tool, various device states can be changed that could shorten the life of the CIS2 system. *Only experienced personnel should use the system in Manual mode.*

9.3.9.6 Device States

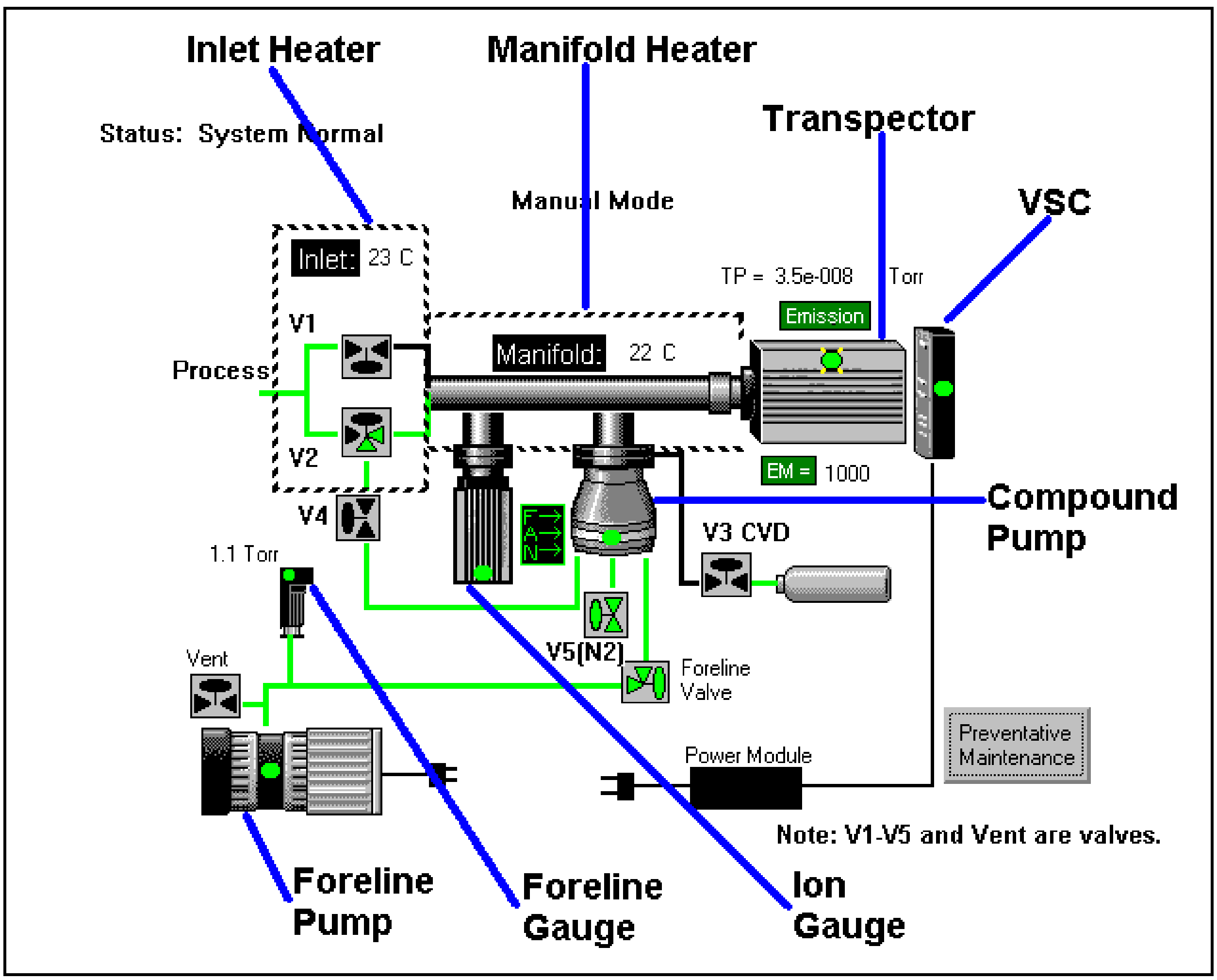
A device can be turned on and off by clicking the device graphic in the CIS2 Configuration screen. See Figure 9-51. Additional operation features can be accessed by right-clicking over a component and selecting the appropriate option from the context menu.

NOTE: Device states may only be changed while in Manual Mode (refer to section 9.3.9.5 above).

Device states can be changed by clicking the device graphic. A few examples are:

- Turn the UHV manifold ITR ionization gauge emission on or off by clicking the ITR gauge. Turning on the ITR emission will display the total pressure.
- Turn the Transpector2 emission on or off by clicking the Transpector2 electronics unit. Turning the emission off will also turn the electron multiplier off.
- Turn the Transpector2 electron multiplier on or off by clicking the box labeled **EM =**. The electron multiplier cannot be turned on if the emission is off.
- Closing or opening any valve by pressing the valve graphic.
- Turning the heaters on or off by clicking the heater outlined area.
- Starting or stopping the pumps by clicking the appropriate pump.

Figure 9-51 CIS2 Screen in Manual Mode



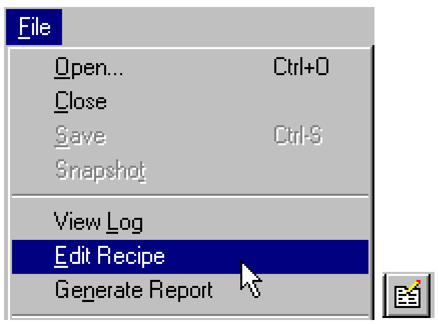
9.4 Recipe Valve Selection

Refer to Chapter 5, Editing Recipes for directions on how to create a recipe and edit each recipe page.

The **CIS2 system** can be programmed to open and close any valve when a recipe starts and stops. A delay can be programmed that will delay the Valve Start Condition for V1, V2 and V3. To program the valve selections, proceed as follows:

Select **File >> Edit Recipe** or click the **Recipe Editor** button. See Figure 9-52. Select the desired sensor and click **Monitor Recipe** from the **Edit Recipe** dialog (or **Open** to open an existing recipe). Refer to Figure 9-19 on page 9-13.

Figure 9-52 File >> Edit Recipe and Recipe Editor Button



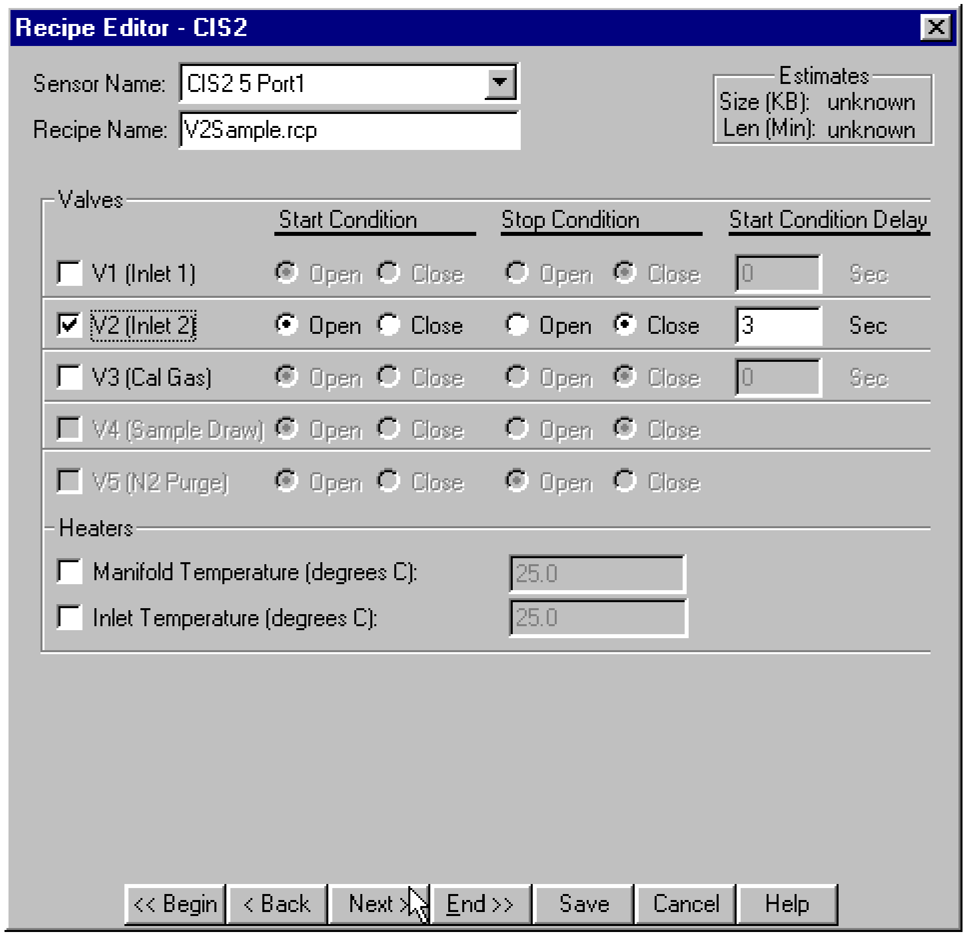
To program the valves, click **Next >** until the **CIS2** screen is reached. The valves available, based on the CIS2 configuration, are shown. To include a valve in the recipe you must first check the box in front of the valve. This will enable the radio buttons for that valve. See Figure 9-53. The **Start** and **Stop Conditions** for that valve may then be set to **Open** or **Close**. A positive integer **Delay** can be programmed for V1, V2 and V3.

NOTE: The Recipe Editor **CIS2 Valves** page is only available if the Sensor shown in the **Sensor Name** box is that of a CIS2 Transpector. It is also shown if editing a recipe with the **Sensor Name** box blank.

NOTE: Valves that are unchecked on the Recipe Editor **CIS2 Valves** page will be inactive while the recipe is running. However, an existing valve state can impact the action taken on valves that are programmed in the recipe. As an example, if the Cal Gas Valve (V3) is left open in Manual Mode and a recipe is run that is programmed to open Inlet Valve 1 (V1) then the recipe will run, but will not open V1. An error will report: **Inlet 1 Valve: Cannot change value now**.

Only valves that are available through the CIS2 Configuration will be shown (see Figure 9-48 on page 9-35). The valve defaults to open when the recipe starts and to close when the recipe stops. You may use the default configuration or change and save the configuration with the recipe.

Figure 9-53 Programming of Valves through Recipe Editor



After all modifications to the recipe are made the recipe can be saved (using the **Save** button) and started by clicking on the **Run** icon. While the recipe is running, the valves can be changed manually from the CIS2 Configuration screen only if the CIS2 is in Manual Mode and the recipe is programmed to not save data automatically.

NOTE: If Enable Sample Draw (V4) has been selected (see Figure 9-48 on page 9-35) then V4 will be automatically opened before V2, and V4 will be left open for several seconds after V2 is closed.

9.5 Manual Valve Selection

To manually change the valve states, select **View >> Sensor Status Grid** and click the **VSC-Valve** tab. A dialog will appear with the states of the valves which may be changed. See Figure 9-54 and Figure 9-55.

Figure 9-54 View >> Sensor Status Grid

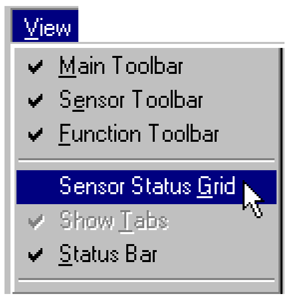


Figure 9-55 Sensor Status Grid with Manual CIS2 Valve Control

To change the valve state, left-click over the appropriate valve position (the black or green circle for that particular valve). The circle will change color to green, indicating that the valve is now open, or to black, indicating that the valve is now closed. The valves that can be operated from this Status bar are:

- **Inlet V1** - Inlet valve #1 - For a PVD-configured CIS2 system, it is the PVD isolation valve. For a CVD/Etch-configured CIS2 system, it is the low pressure orifice of the dual inlet.
- **Inlet V2** - Inlet valve #2 - Only used with a dual inlet for CVD/Etch applications.

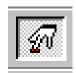
  NOTE: If V2 is configured as a sample draw valve then it is strongly recommended that V4 be opened prior to V2 and that V2 be closed prior to closing V4.

- **Cal Gas V3** - Cal(ibration) Gas valve - Used to turn on or off the Calibration Standard.

- **Samp Draw V4** - Sample Draw valve - Used in conjunction with Inlet Valve #2. This valve must be open whenever V2 is open in this configuration.

  NOTE: If V2 is configured as a sample draw valve then it is strongly recommended that V4 be opened prior to V2 and that V2 be closed prior to closing V4.

- **Cmp Purge V5** - Nitrogen Purge valve - Provides a continuous flow of dry nitrogen to the bearings of the compound pump. It should be open whenever the CIS2 system is sampling corrosive or reactive gases.

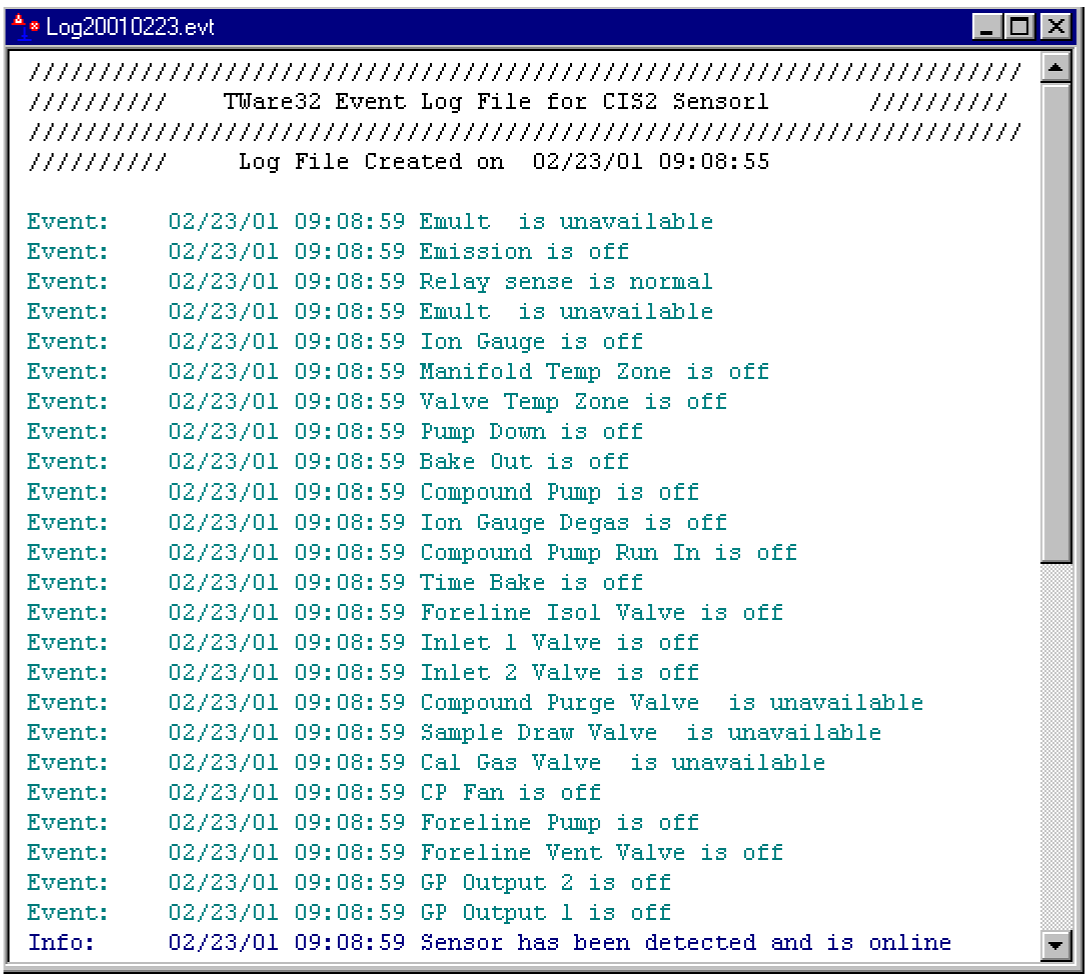
NOTE: Manually opening or closing the valves through the Sensor Status Grid can only be accomplished when operating at the Advanced User Level and in Manual Mode  .

9.6 Event Log

NOTE: TWare32 must be running in order to record events in the event log.

All CIS2-related Events can be logged to an Event Log (based on user selections, see Figure 3-15 on page 3-16). The Event Log, a **`.evt`** file, is located in the Sensor folder in a subfolder named Events. When an event happens in the system, a descriptive message about the event is added to the Event Log. Errors, Warnings and Marks can also logged in the Event Log. A new Event Log is created for each day. To view the contents of the Event Log, select **File >> View Log** and choose the file for a particular day of operation. An example of an Event Log is shown in Figure 9-56.

Figure 9-56 Event Log



```
Log20010223.evt
//////////////////////////////////////////////////////////////////////////
//////////    TWare32 Event Log File for CIS2 Sensor1       //////////
//////////////////////////////////////////////////////////////////////////
//////////     Log File Created on  02/23/01 09:08:55

Event:    02/23/01 09:08:59 Emult  is unavailable
Event:    02/23/01 09:08:59 Emission is off
Event:    02/23/01 09:08:59 Relay sense is normal
Event:    02/23/01 09:08:59 Emult  is unavailable
Event:    02/23/01 09:08:59 Ion Gauge is off
Event:    02/23/01 09:08:59 Manifold Temp Zone is off
Event:    02/23/01 09:08:59 Valve Temp Zone is off
Event:    02/23/01 09:08:59 Pump Down is off
Event:    02/23/01 09:08:59 Bake Out is off
Event:    02/23/01 09:08:59 Compound Pump is off
Event:    02/23/01 09:08:59 Ion Gauge Degas is off
Event:    02/23/01 09:08:59 Compound Pump Run In is off
Event:    02/23/01 09:08:59 Time Bake is off
Event:    02/23/01 09:08:59 Foreline Isol Valve is off
Event:    02/23/01 09:08:59 Inlet 1 Valve is off
Event:    02/23/01 09:08:59 Inlet 2 Valve is off
Event:    02/23/01 09:08:59 Compound Purge Valve  is unavailable
Event:    02/23/01 09:08:59 Sample Draw Valve  is unavailable
Event:    02/23/01 09:08:59 Cal Gas Valve  is unavailable
Event:    02/23/01 09:08:59 CP Fan is off
Event:    02/23/01 09:08:59 Foreline Pump is off
Event:    02/23/01 09:08:59 Foreline Vent Valve is off
Event:    02/23/01 09:08:59 GP Output 2 is off
Event:    02/23/01 09:08:59 GP Output 1 is off
Info:     02/23/01 09:08:59 Sensor has been detected and is online
```

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9.7 The CPM - Compact Process Monitor

The CPM (Compact Process Monitor) was designed specifically for complex etch and CVD processes in semiconductor production environments. This dry pumped, compact, affordable system uses the proven technology of the INFICON Transpector®2 Gas Analysis System with a closed ion source.

Unlike the CIS2, the CPM uses no gauges or Vacuum System Controller. Valve control can be automatic, using a programmed recipe, or manual through the Sensor Status Grid.

Due to CPM implementation, no Transpector Relays are available and only two Analog Outputs are available. Digital I/O is available for the CPM.

9.7.1 Manual Valve Control

To manually control the CPM valves, use the Sensor Status Grid buttons as shown in Figure 9-57.

Figure 9-57 Sensor Status Grid CPM Valve Control

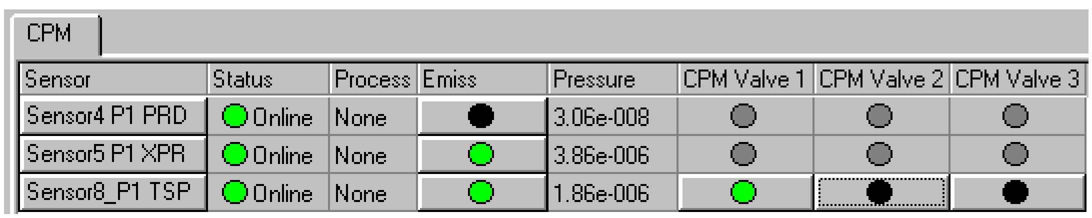
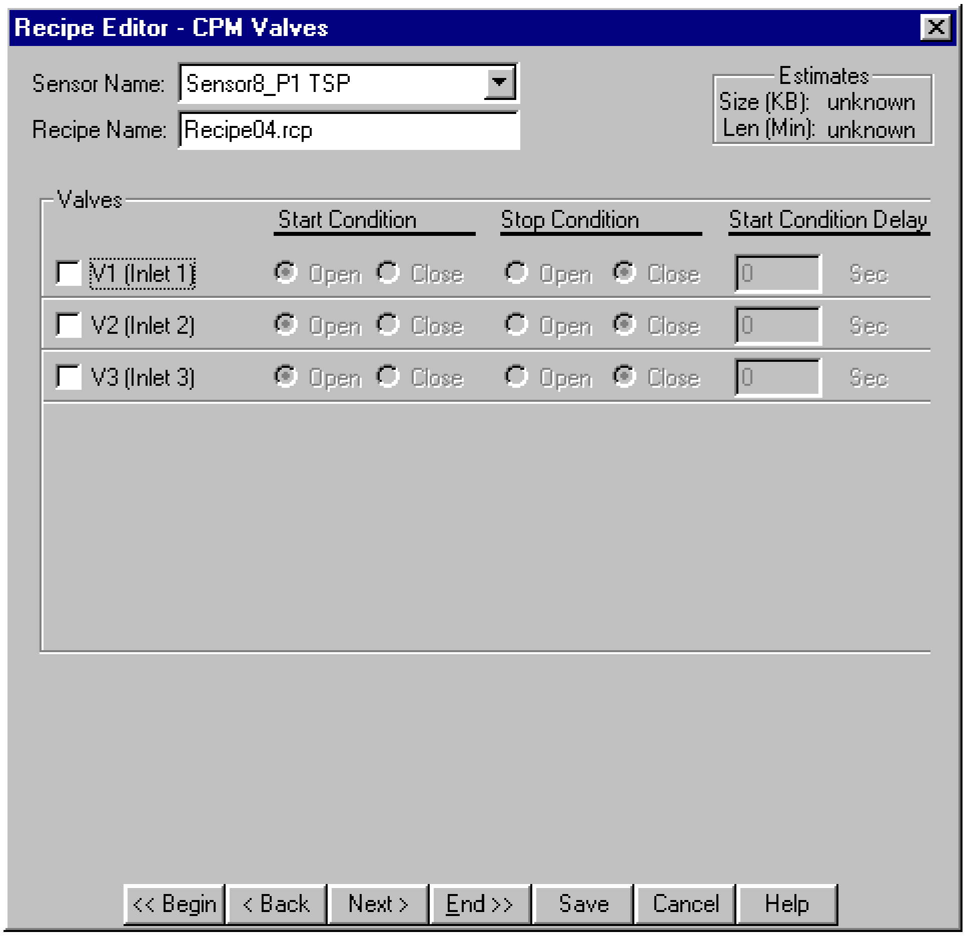


Figure 9-57 shows the emission on and Valve 1 open for the CPM (Sensor8_P1 in the figure). The emission must be on in order to open any CPM valve. If a CPM valve button is pressed while the emission is off then the CPM valve button will be shown in yellow which indicates the valve is pending. A pending valve will be opened once the emission is turned on.

9.7.2 Automatic Valve Control

To automatically control the CPM valves, a recipe must be created. Refer to Chapter 5, Editing Recipes for directions on how to create a recipe and edit each recipe page. To create a recipe for the CPM valves, move to the Recipe Editor **CPM Valves** page as shown in Figure 9-58.

Figure 9-58 Recipe Editor - CPM Valves Page



To include a valve in the recipe you must first check the box in front of the valve. This will enable the radio buttons for that valve. See Figure 9-58. The **Start** and **Stop Condition**s for that valve may then be set to **Open** or **Close**. A positive integer **Delay** can be programmed for V1, V2 and V3.

NOTE: Valves that are unchecked on the Recipe Editor **CPM Valves** page will be inactive while the recipe is running.

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Chapter 10
Preclude Operation

10.1 Introduction

The Preclude is a Transpector2 Residual Gas Analyzer (RGA) with special firmware and software that enables it to act as a detector of residual photoresist (or other contaminants) on wafers in the degas chamber before they can do extensive damage to the tool or affect product yield.

However, the Preclude is more than just a dedicated photoresist detector. The flexibility of implementation allows it to be configured to detect other contaminants which may affect product quality or yield. In addition, since the Preclude is based on a standard Transpector2, all the capabilities and functionality of a standard Transpector2 are available when it is not being used to monitor wafers for contamination. This eliminates the need for an additional RGA to be used for leak detection or pump down monitoring.

Much of what is written in the preceding chapters on **Sensor Setup**, **Monitor**, **Tuning the Sensor**, **Locating Leaks**, **Editing Recipes**, and **Saving and Recalling Data** directly applies to the Preclude. This chapter provides information specific to the Preclude Transpector that was not covered in the preceding chapters — editing Preclude recipes and running the Preclude.

NOTE: Refer to the *Preclude Operating Manual* (IPN 074-325) for a detailed description of the Preclude Transpector2.

NOTE: Most of the functionality described in this chapter requires an Advanced User Access Level. Refer to section 3.6.1 on page 3-31 for more information.

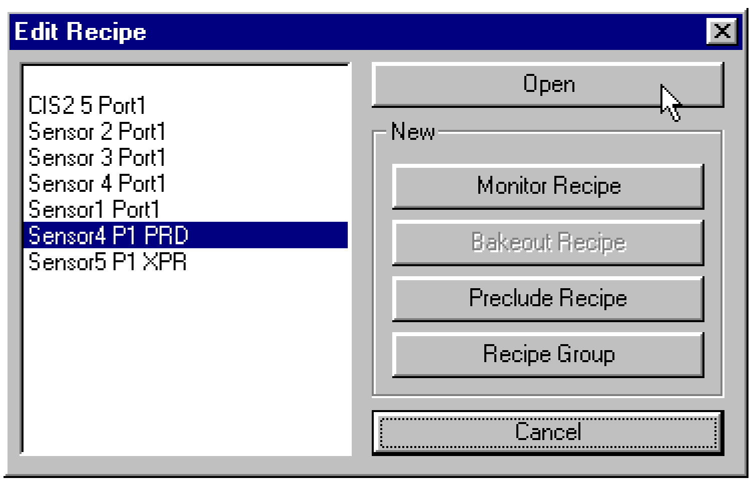
10.2 Editing Preclude Recipes

Preclude recipes are edited in much the same way as other recipes in TWare32. The editor is invoked by either clicking the **Recipe Editor** icon or selecting **File >> Edit Recipe.** A **Recipe Editor** dialog (see Figure 10-1) will present the choices of creating a new **Monitor** or **Preclude** recipe or opening an existing recipe. Click **Open** to open an existing recipe, or **Preclude Recipe** to create a new Preclude recipe.

CAUTION

You should not create a New Preclude recipe if you are an inexperienced user, since several parameters were set up during installation which can only be adjusted by experienced users. Instead, you should Open an existing Preclude recipe and save it under a different recipe name.

Figure 10-1 Opening a Recipe File to Edit



After selecting **Open**, a standard file **Open** dialog, as shown in Figure 10-2, will be displayed. Select a Preclude recipe to open from the recipes listed with the extension `.prcp`.

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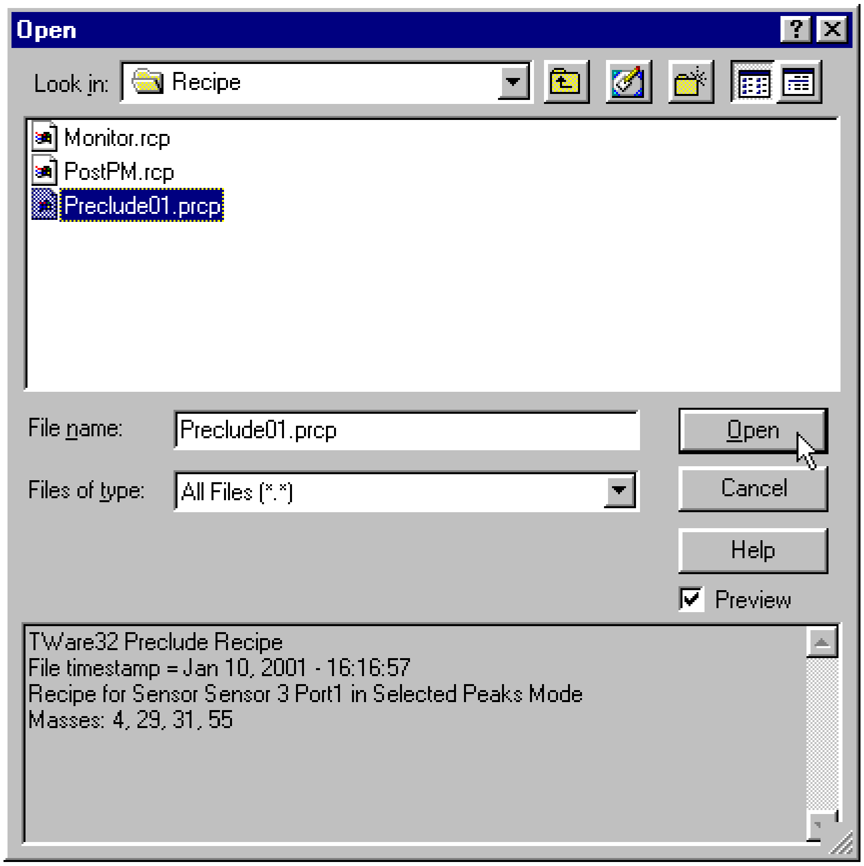
Figure 10-2 Recipe Selection Dialog



10.3 The Preclude Recipe

Refer to Chapter 5, Editing Recipes for directions on how to create a recipe and edit each recipe page.

The main differences between a **Monitor** recipe and a **Preclude** recipe are as follows:

- A Preclude recipe can only be run as a Selected Peaks recipe. Therefore, the only **Collection Mode** available on the recipe **Description** page is **Selected Peaks**. For more information on the Recipe Editor **Description** page refer to Figure 5-4 on page 5-3**.**
- A Preclude recipe uses a different default Mass list than the Monitor recipe. It is recommended that these default masses remain in the recipe. Additional masses can be added on the **Selected Peaks** page. For more information on the Recipe Editor **Selected Peaks** page, refer to Figure 5-10 on page 5-13
- The **Preclude Settings** page, not part of a Monitor recipe, is the most important page of the Preclude recipe. This page allows creation and editing of the **Preclude Algorithm** and **Preclude Mass Thresholds**. This page is fully described in section 10.4, Preclude Settings in the Preclude Recipe, on page 10-5.
- The **Relays** page only allows programming of Relays 2 and 3. Relay 1 is reserved for the Preclude Algorithm in the Preclude recipe. For more information on the Recipe Editor **Relays** page, refer to Figure 5-13 on page 5-17
- The **Collection Parameters** page has two choices available for saving data and does not have an option to “not save data”. Data collected from a Preclude recipe is either all saved or saved as “’n’ scans around an alarm”. There is no choice of “do not automatically save” as there is in a Monitor recipe. Of course, if an alarm never occurs, no data will be saved. For more information on the Recipe Editor **Collection Parameters** page, refer to Figure 5-16 on page 5-24

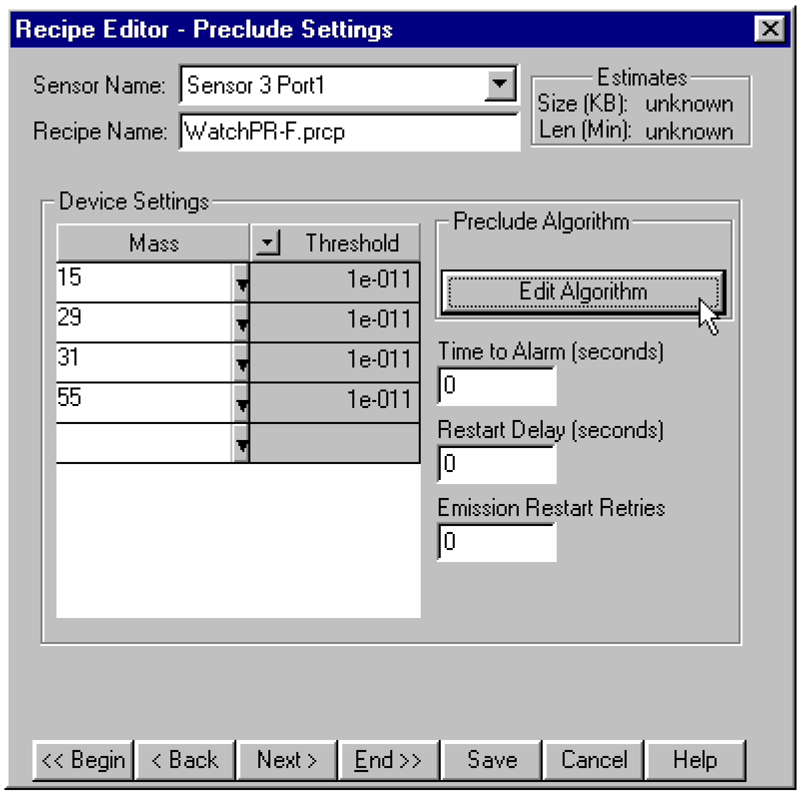
The remaining pages and features of the **Recipe Editor** are as described in Chapter 5, Editing Recipes.

10.4 Preclude Settings in the Preclude Recipe

10.4.1 Editing the Preclude Settings

The **Preclude Settings** page is the most important page of the Preclude recipe. This page, shown in Figure 10-3, lists the default masses and thresholds available for use in the Preclude Algorithm.

Figure 10-3 Recipe Editor - Preclude Settings



Sensor Name . . . . The name of the Preclude sensor to be used to collect data. If the sensor name is changed after any parameters have been changed, a warning (refer to Figure 5-5 on page 5-4) will be displayed. This warning gives you the option to save the recipe for the current sensor before creating a new recipe for the new sensor.

NOTE: It must be a Preclude sensor to run a Preclude recipe.

Recipe Name . . . . The file name used to save the recipe. Any name can be used, but a descriptive name is recommended. Since TWare32 is a 32 bit application, the name is not limited to eight characters and an extension, thus allowing a more descriptive name to be chosen. If the extension is omitted, then `.prcp` will be appended. The file name can be changed at any time during the recipe editing process.

Device Settings

This table contains a list of Masses to be measured, from the **Selected Peaks** page, and the Thresholds by which the Preclude Algorithm will make decisions. The first column contains the **Mass** and an optional descriptive string. Masses may be added by typing in the blank line located on the bottom of the mass list, or by using the drop-down list. Existing lines may be edited either by typing or using the drop-down list. Masses may also be deleted by selecting the mass and pressing the keyboard's **Delete** key. Any action taken on a mass on this list is also taken on the **Selected Peaks** list.

The second column contains the mass **Thresholds**. The threshold is the ion current (in Amps) above which an alarm condition will be asserted. Each threshold can be programmed as an alarm trigger after the mass has been programmed into the Preclude Algorithm. See Figure 10-4 on page 10-7 for details regarding programming the Preclude Algorithm.

Special Peaks are also available for use in the mass list and algorithm. Refer to Figure 5-11 on page 5-14 for information on selecting Special Peaks.

Edit Algorithm . . . . When selected, a dialog for creating the Preclude Algorithm is opened. See section 10.4.2, Editing the Preclude Algorithm, on page 10-7.

NOTE: A Preclude Recipe cannot be saved without a valid Preclude Algorithm programmed.

Time to Alarm . . . . This is the number of seconds the **Preclude Algorithm** must evaluate to a TRUE condition before an alarm condition is declared. See section 10.4.4.1 on page 10-11 for more information on setting the **Time to Alarm**.

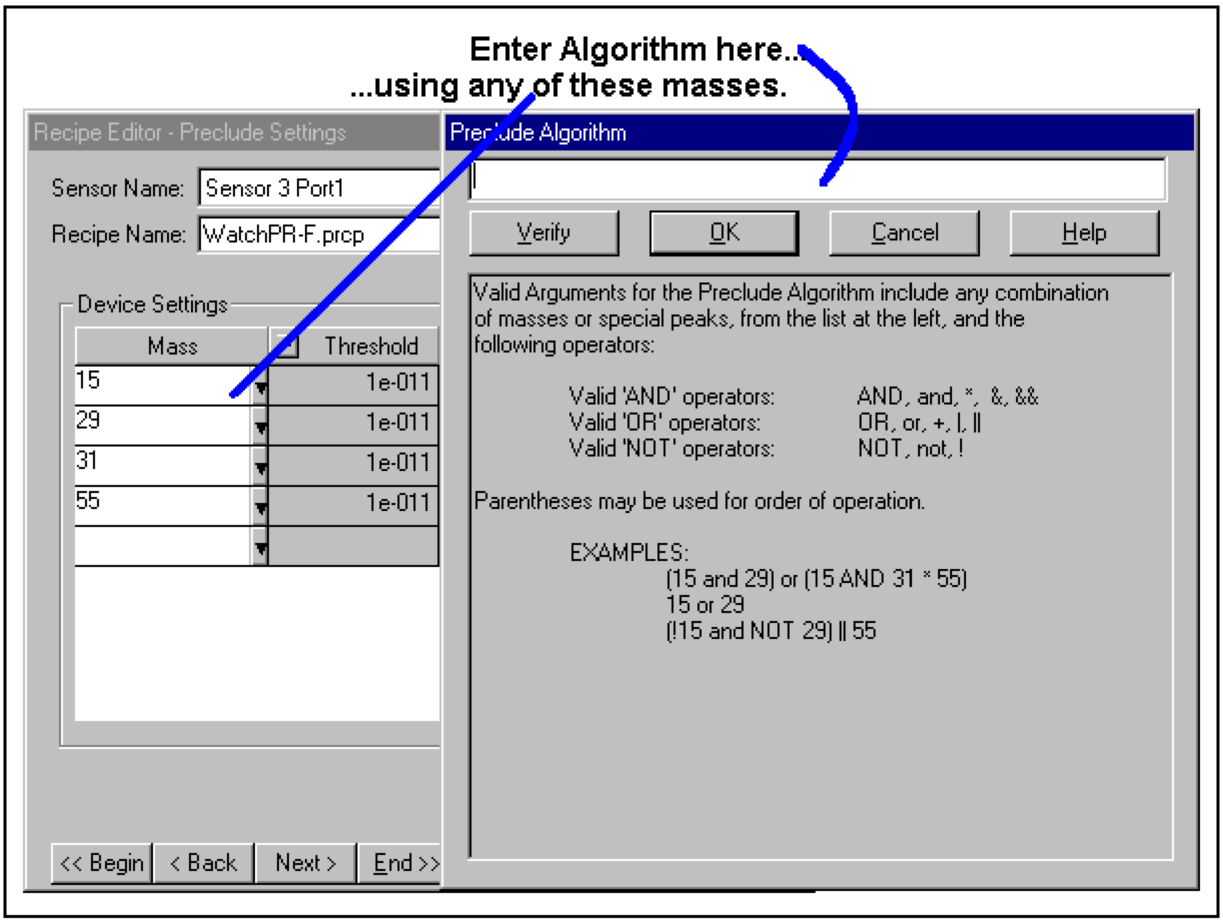
Restart Delay . . . . This parameter will delay turning the emission on after it has been shut off due to an overpressure condition.See section 10.4.4.2 on page 10-11 for more information on setting the **Restart Delay**.

Emission Restart Retries . . . . . . This is the number of times the sensor will try to restart the emission after it has been tripped off by an overpressure condition.

10.4.2 Editing the Preclude Algorithm

Clicking the **Edit Algorithm** button on the **Preclude Settings** page produces a **Preclude Algorithm** dialog and entry box. See Figure 10-4.

Figure 10-4 Edit Preclude Algorithm



The **Preclude Algorithm** dialog box allows entry of an algorithm used to test ion current against the programmed thresholds. The algorithm can be entered in any form as illustrated in the examples in the dialog. The Preclude Algorithm is what determines an alarm condition during operation of the Preclude sensor. It consists of any of the currently defined Preclude channels combined using the AND (*), OR (+), and NOT (!) operators.

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The order of evaluation is always: whatever are enclosed in (parenthesis), then NOT operator, then AND operator, then OR operator.

Three buttons are available to act upon the algorithm entered:

Verify . . . . This button can be clicked at any time to test the validity of the algorithm without closing the dialog. The entered algorithm is not saved using this button.

OK . . . . This button will test the validity of the algorithm, save the algorithm, and close the dialog.

Cancel . . . . This button will close the dialog with no changes to the algorithm.

Valid Algorithm Operators

The following **Operators** are valid for building the **Preclude Algorithm**:

AND . . . . Can be entered as AND, and, *, &, &&. This operator is understood to mean, in an algorithm written as 15 AND 29, for example, “both 15 and 29 must be above their thresholds at the same time of measurement.”

OR . . . . Can be entered as OR, or, +, |, ||. This operator is understood to mean, in an algorithm written as 15 OR 29, for example, “either 15 or 29 (or both) is above the threshold.”

NOT . . . . Can be entered as NOT, not, ! . For example, in an algorithm written as 15 OR (29 AND NOT 55), an alarm condition will be asserted for three conditions:

- 15 above its threshold
- 29 above its threshold and 55 below its threshold during the same measurement
- both cases listed above during the same measurement.

NOTE: Parentheses may be used to determine order of evaluation in the algorithm.

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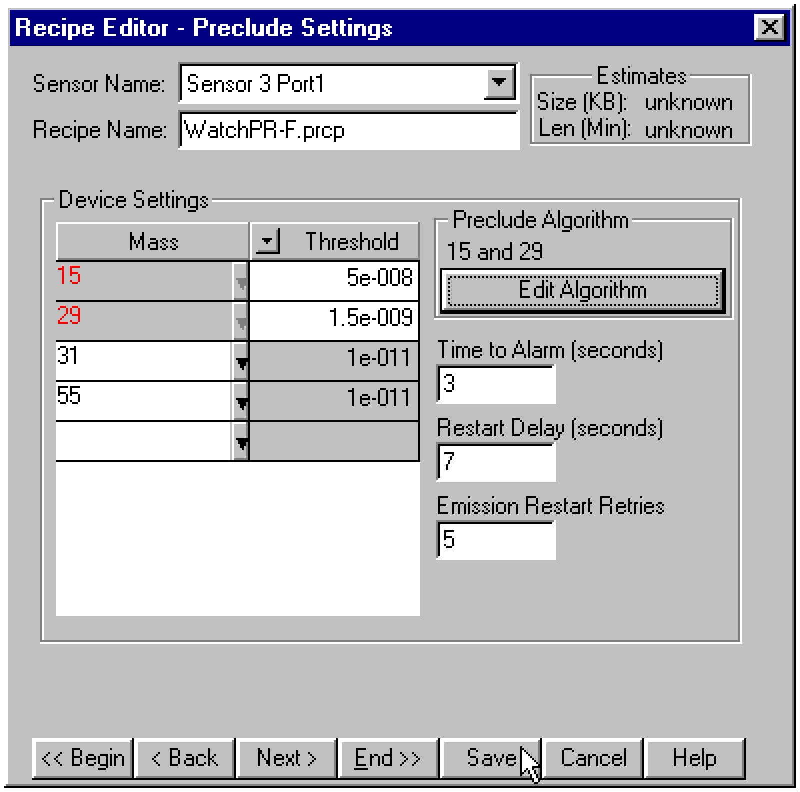
Figure 10-5 shows a programmed Preclude Algorithm in which both mass 15 and mass 29 must exceed their thresholds for 3 seconds for an alarm to occur.

Figure 10-5 Finished Preclude Algorithm



10.4.3 Setting Alarm Thresholds

The threshold values will originally be set by INFICON personnel. However, from time to time it may be necessary to change these values as the O/D module gets dirty or the Preclude sensor ages or becomes contaminated. This section describes a method of determining the best values for the thresholds.

10.4.3.1 Determining the Threshold Levels

To determine if changes are required to the Thresholds, it is recommended that a Monitor recipe be created containing the masses normally used in a Preclude recipe. Be sure the dwell for each channel and the status and voltage is set to the values that will be used for monitoring the system. The Monitor recipe can then be run on the Preclude Transpector by selecting the **Functions >> Run Recipe** menu item for that sensor and selecting the recipe just created.

In the **Trend** display, select the **Amps** button to display the channel intensities as ion currents. For each mass, record the maximum current under baseline conditions. From these readings a new Threshold for each mass can be determined and entered in the Preclude recipe.

10.4.3.2 Setting the Thresholds

To change the thresholds, edit the recipe by selecting **File >> Edit Recipe...**. Click next until the **Preclude Settings** page is displayed (refer to Figure 10-5 on page 10-9). Make the desired changes to the setpoints and save the new recipe. You may want to save the new recipe under a different file name than the old recipe. When entering the Preclude mode, make sure to select the new recipe.

There are four main reasons for changing the setpoint values.

1 The first reason is that electron multiplier gain has decreased, causing lower signals. Multiplier gain loss is natural, even when there is no contamination problem. That is why it is generally recommended to operate the Preclude in the Faraday cup mode unless the multiplier is essential. Extensive studies with Preclude have shown that, except for the XPR sensor, the Faraday cup mode is sufficiently sensitive for the Preclude application.

If it is necessary to use the electron multiplier, and its gain decreases with use, it may be possible to increase the electron multiplier high voltage until the original gain is achieved instead of changing the setpoints. If changing the multiplier high voltage is not possible, then measure the decrease in gain for some convenient mass in the system background (for example, mass 28) and multiply the original setpoints by the fractional gain loss to determine the new setpoint values. That is, if the gain is down to one half its original value, multiply the old setpoints by one half to determine the new setpoints. This procedure, however, presupposes that the original gain of the multiplier is known.

2 The second reason for changing the setpoint values is that the basic Faraday-mode sensitivity of the RGA has decreased due to contamination of the sensor. Changes in Faraday cup mode sensitivity can be measured by letting in a known pressure of reference gas (for example, argon) and measuring the ion current at an appropriate mass (40 AMU for this example). Calculate the ratio of the original current to the new current, and multiply the old setpoints by this factor to calculate the new setpoints. If no reference gas is available, an alternative procedure is to select a mass in the chamber background which is known to be relatively stable, assuming there is such a mass. Both these procedures presuppose that the original ion current at the appropriate mass is known.

3 The third reason for changing the setpoint values is that the vacuum system background at the photoresist masses has increased due to gradual contamination of the chamber with trace photoresist. The recommended procedure, in this case, is to measure the ion currents for the photoresist masses for a non-photoresist contaminated wafer during the degas process, and to pick new setpoints which are approximately 50% greater than the maxima obtained for this test wafer. The drawback with this procedure is that the new set points might result in degraded sensitivity for photoresist. It may be necessary to run a test wafer with a known amount of photoresist (e.g., 1% photoresist covered area) to verify that the new setpoints allow for adequate sensitivity.

4 The fourth reason is that the signature for a normal wafer has changed due to changes in the patterning and/or processing of the wafer. In this case, follow the procedures outlined for the third reason above.

10.4.4 Setting Alarm Conditions

10.4.4.1 Setting The Time to Alarm Parameter

Due to the frequent pressure bursts encountered in the degas chamber, there is a high probability that all the channels being watched would exceed their limits during the bursts. This would cause a false alarm and could result in unnecessarily shutting down a tool. In order to avoid this problem, an alarm delay was implemented. An alarm is only asserted if the Preclude Algorithm evaluates to a TRUE and maintains that state for the time specified by this parameter. The value of this parameter should be longer than the widest pressure burst expected, but shorter than the length of the degas step.

10.4.4.2 Setting the Restart Delay Parameter

The behavior of this parameter depends on whether or not there is a Pirani interlock installed.

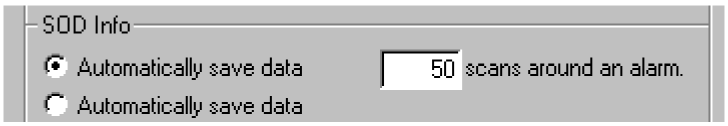
If an interlock *is* installed, and the emission is tripped off due to an overpressure condition, the emission will be restarted when the pressure drops to a safe level. If this delay is non-zero then the system will wait the specified amount of time after a safe pressure is achieved before trying to restart the emission.

If an interlock *is not* installed, and the emission is tripped off due to an overpressure condition, the emission will be restarted immediately if this delay is zero. If this delay is non-zero, the system will wait the specified amount of time before trying to restart the emission.

10.5 Collection Parameters - SOD Information

The Preclude recipe can be programmed to save data in one of two ways - either all the time or after an alarm occurs.

Figure 10-6 Collection Parameters - Save Options



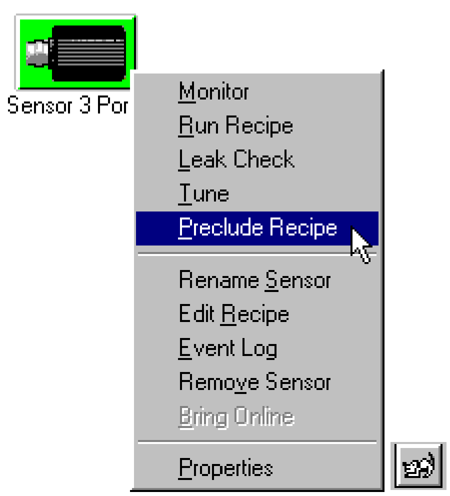
If **Automatically save data "n" scans around an alarm** is selected, a snapshot will automatically be taken only when an alarm condition occurs. When an alarm occurs the program will collect enough scans to save a scan window around the alarm. For the example shown in Figure 10-6 above, the program will collect 25 additional scans after the alarm and will save data for 25 scans before the alarm, the alarm scan, and 25 scans after the alarm.

If **Automatically save data** is selected, all data collected will be saved to the current recipe's SOD file. This allows a complete record of the process to be maintained in a series of files. In this mode, each time the **Stop Condition** specified in the recipe (**Scheduler** page, refer to Figure 5-17 on page 5-26) is reached, the data is saved to disk.

10.6 Running Preclude

To run a Preclude recipe, select the **Preclude** icon, the menu item **Functions >> Preclude Recipe**, or **Preclude Recipe** from the context menu when the cursor is on a Preclude sensor in the **System Setup Screen**. For other ways to start a Preclude Recipe, refer to the techniques described in section 4.2 on page 4-1 for starting a process on a sensor.

Figure 10-7 Starting a Preclude Recipe



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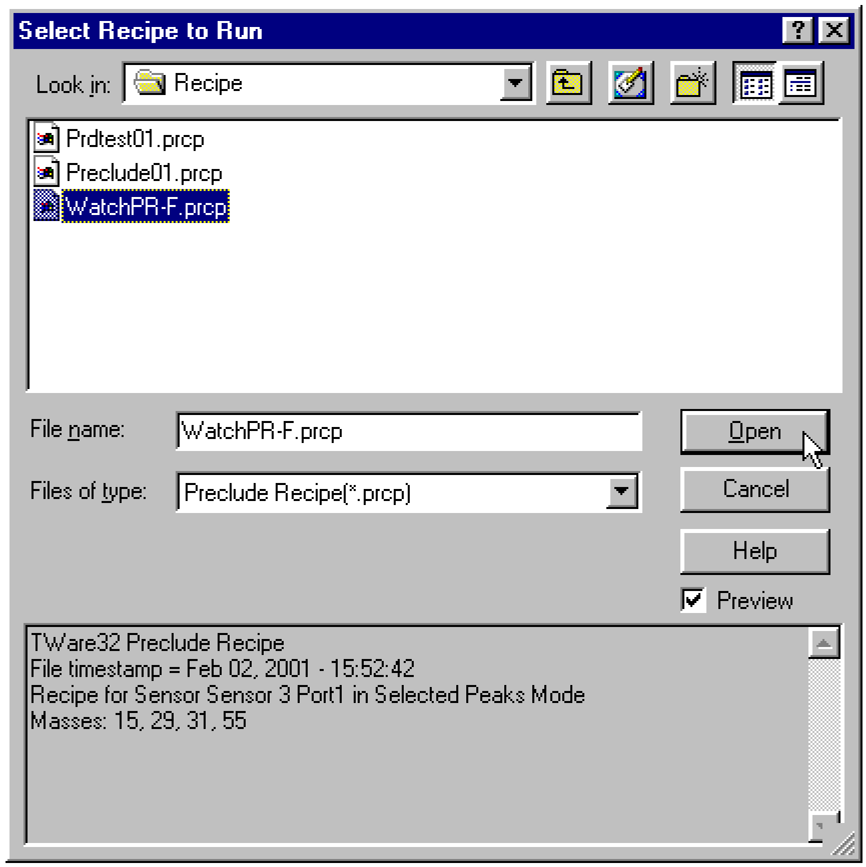
The **Select Recipe to Run** dialog box will be displayed listing any **Preclude Recipes** (`.prcp` file extension) for the sensor. Choose a Preclude recipe and click **Open** (see Figure 10-8).

Figure 10-8 Selecting (Opening) a Preclude Recipe



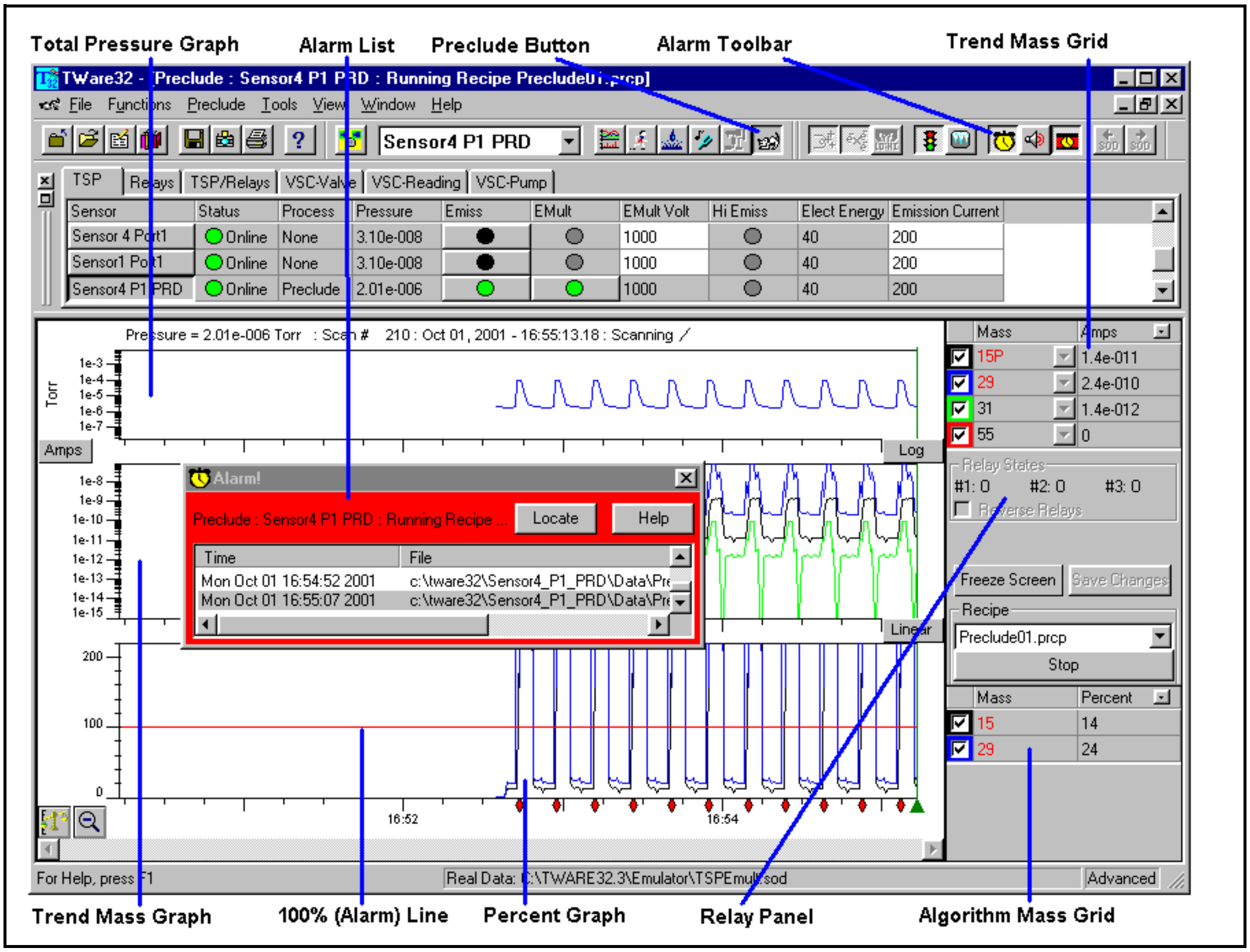
You *must* choose a Preclude recipe. If the recipe chosen is *not* a Preclude recipe, a message box will be displayed (see Figure 10-9). After the message is acknowledged the **Select Recipe to Run** dialog box will be displayed again.

Figure 10-9 Error: Recipe is not a valid Preclude recipe

10.7 The Preclude Display

As soon as the Preclude Recipe is opened the Preclude display is launched. The Preclude display (see Figure 10-10) is as configurable as the Monitor display in that the different graphs, panels, and grids can be selected as shown or not shown.

Figure 10-10 The Preclude Display



The most important components of the Preclude display are:

Total Pressure Graph

The **Total Pressure Graph** is a logarithmic display showing the sensor's total pressure, in the system pressure units, as a function of time.

Trend Mass Graph

The **Trend Graph** displays the user specified mass information per scan. See section 10.7.2 on page 10-17.

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Percent Graph

The **Percent Graph** displays the Preclude Algorithm mass information per scan as a percentage of each programmed mass threshold. See section 10.7.3 on page 10-19.

Control Panel

The **Control Panel** includes the **Trend Mass Grid** and **Algorithm Mass Grid** which display information concerning the masses displayed in the **Trend Mass Graph** and **Percentage Graph**, respectively. The **Relay Panel**, when selected, is also shown on the Control Panel. See section 10.7.4 on page 10-20.

Alarm Toolbar

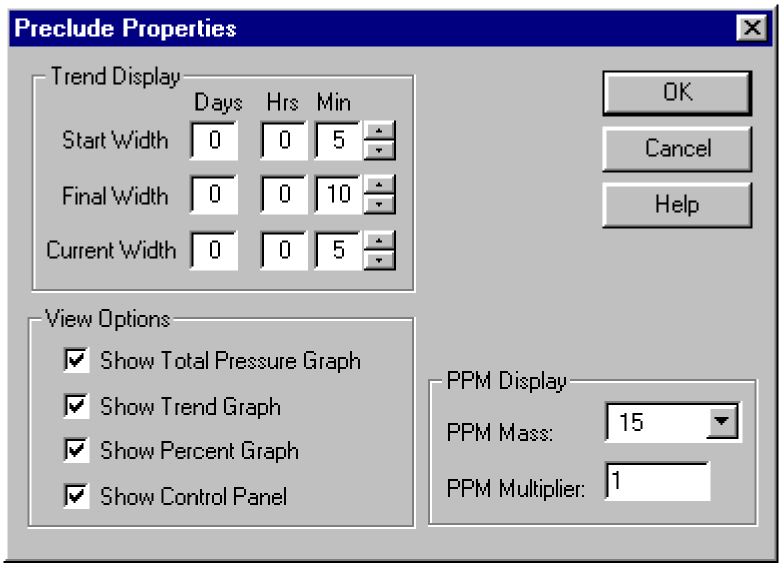
The **Alarm Toolbar** provides buttons to enable and disable Preclude Alarming, the Preclude Audio Alarm, and the Preclude Alarm List. This toolbar is only accessible by an Advanced user. See section 10.7.5 on page 10-21.

NOTE: The Preclude **Rescale Button** affects both the **Trend Mass Graph** and the **Percent Graph**. Selecting the **Rescale** button rescales the **Trend Graph** so that the largest intensity in view is about 95% of full scale and resets the 100% line to the middle of the **Percent Graph** Y axis.

10.7.1 Preclude Properties

The **Preclude Properties** sheet can be displayed by selecting **Preclude >> Properties** from the main menu or by selecting **Properties** from the context menu. The **Preclude Properties** sheet is shown in Figure 10-11.

Figure 10-11 Preclude Properties Sheet



__Trend Display__

Start Width . . . . Specify the width in days, hours, and minutes, of the displayed portion of the trend display when first starting **Preclude Recipe**.

Final Width . . . . Specify the maximum width in days, hours, and minutes, of the displayed portion of the data. The display will start with a width of **Start Width** and each time the display fills up the width is doubled until it reaches the **Final Width**.

Current Width . . . . Specify the width in days, hours, and minutes, of the displayed portion of the **Trend Graph** at any time during data collection.

Manually setting the **Current Width** will override the automatic axis change towards the **Final Width.**

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View Options

Show Total Pressure Graph . . . . When selected, the **Total Pressure** graph will be displayed on the **Preclude** screen.

Show Trend Graph . . . . When selected, the **Trend Graph** will be displayed on the **Preclude** screen.

Show Percent Graph. . . . . When selected, the **Percent Graph** will be displayed on the **Preclude** screen.

Show Control Panel . . . . When selected, the **Control Panel** will be displayed on the **Preclude** screen.

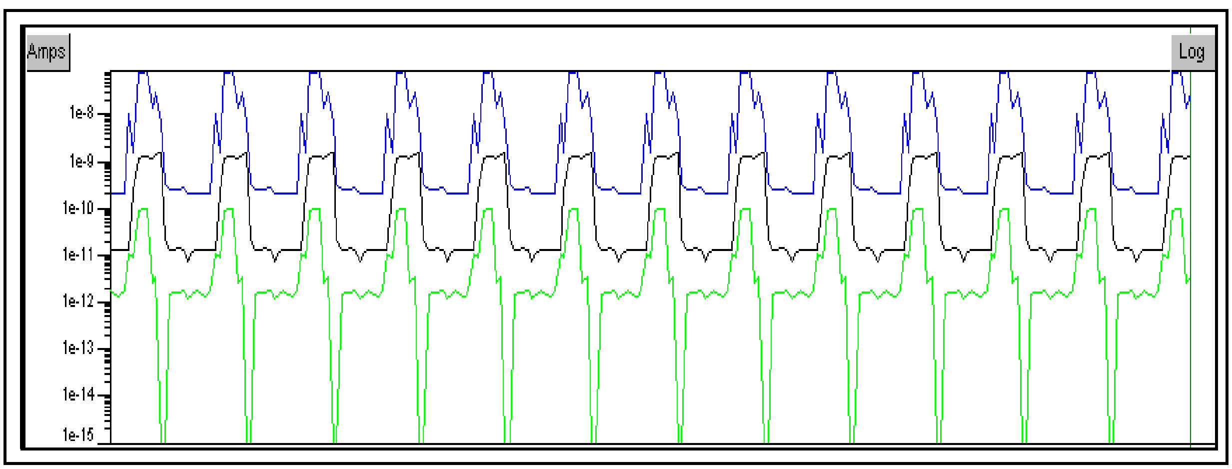
PPM Display Options

PPM Mass . . . . Mass to be used as the reference for displaying intensities as parts per million.

PPM Multiplier. . . . . Enter a multiplier to be applied to the PPM mass intensity before calculating the PPM ratio.

10.7.2 The Trend Mass Graph and Grid

Figure 10-12 Preclude Trend Graph and Grid



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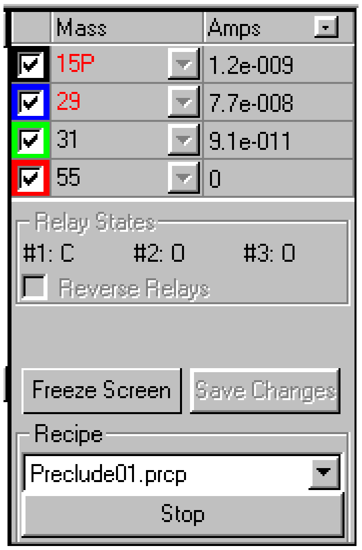


The **Trend Graph** displays specified masses, per scan, for user selected masses of a recipe.

The data can be displayed in the **Trend Graph** in **Amps**, Partial Pressures (**PP**), or **PPM** mode. The default is **Amps**. To select the way data are displayed, click the **Amps/PP/PPM** button on the left side of the graph.

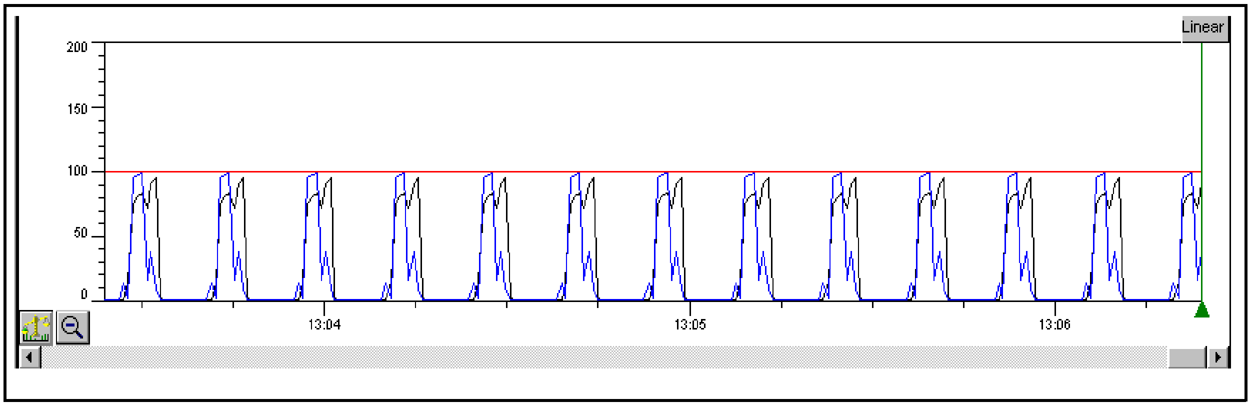
In addition to the displayed data units, the vertical axis of the graph may also be toggled between a linear or a logarithmic scale. To change the vertical axis between **Log** and **Linear** mode, use the **Log/Linear** button on the right side of the graph.

The **Trend Mass Grid** shows the masses in the recipe, the measured intensity for each mass for the current scan, and the selection to show or hide the mass on the graph. The **Relay States** are also displayed, on the Control Panel, as C for Closed or O for Open.

Functions to **Freeze** the graph, **Stop** and **Start** the recipe, **Open** a recipe, and **Save Changes** to a recipe are all available and function as described in Chapter 4, Monitor.

10.7.3 The Preclude Algorithm Percent Graph and Grid

Figure 10-13 Percent Graph and Grid



	Mass	Percent
☑	15	1.3e+003
☑	29	8.1e+003

The **Percent Graph**, coupled with the **Preclude Algorithm Grid**, displays the intensities of the Preclude Algorithm masses as a percentage of each mass threshold. This provides a clean and simple way of visually displaying how close each mass is to its threshold without rescaling or cluttering up the display with a trend line and threshold line for each mass. The **Percent** column shown in the **Preclude Algorithm Grid** can be changed to display the **Threshold** for each mass by clicking on the triangle in the column header.

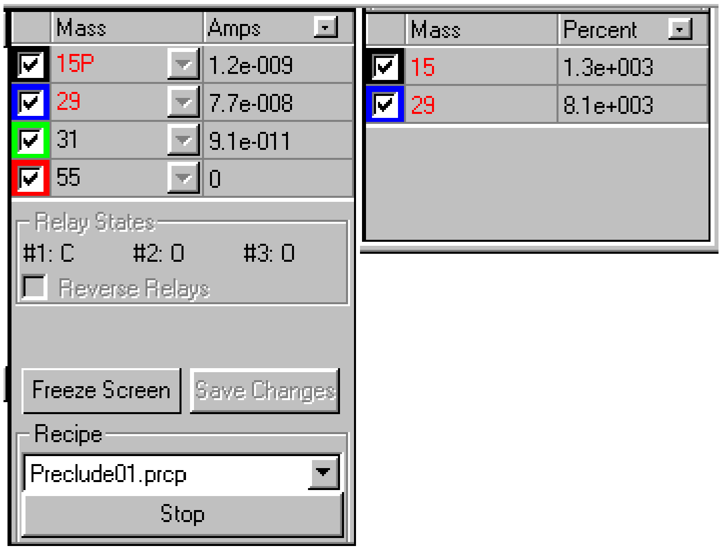
A mass percentage displayed as greater than 100% is considered in an alarm state. Depending on the algorithm programmed, some masses can be greater than 100% without a Preclude Algorithm alarm tripping.

For example, if a Preclude Algorithm is programmed as 15 AND 29 AND 33 then 15 and 29 can be greater than 100%, while 33 is less than 100%, without generating an alarm.

The vertical axis of the Percent Graph can be toggled between a linear or a logarithmic scale.

10.7.4 The Control Panel and Mass Grids

Figure 10-14 Trend Mass Grid and Algorithm Mass Grid



The **Trend Mass Grid**, when running a Preclude Recipe, lists the masses being collected and their intensities in **Selected Peaks** mode. Clicking on the right column header gives a list of parameters of which one can be selected for display in the column. The list contains the parameters **Amps** (intensity)**, Dwell, Mat**erial **Fact**or, **Multiplier, Offset, Lo**w **Relay, Hi**gh **Relay, Relay Num**ber, and **Edit Current Recipe**. The ✔ (checkmark) boxes on the left of the grid indicate the color of the trace in the **Trend** graph. Clicking on the box toggles the display of that mass on and off. A ✔ in the box indicates it is being displayed.

The **Preclude Algorithm Grid** always lists the masses programmed into the Preclude Algorithm along with the intensity of each mass as a **Percentage** of each mass threshold. The right column can be changed to display the **Threshold** of each mass by clicking the triangle in the column header. The ✔ (checkmark) boxes on the left of the grid indicate the color of the trace in the **Percentage Graph**. Clicking on the box toggles the display of that mass on and off. Color in the box indicates it is being displayed (grey indicates it is not displayed).

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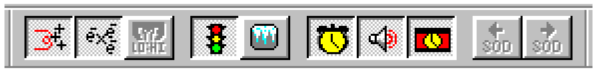
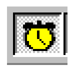
10.7.5 The Preclude Toolbar

Figure 10-15 Function Toolbar, Preclude Buttons



Three Preclude-specific buttons are added to the Function toolbar when a Preclude Recipe is running. These buttons, available to Advanced access level operators, provide the ability to run without alarming, audio alarming, and the alarm list display.

Enable Alarm  . . . . Enable/Disable Alarming while running a Preclude Recipe. When enabled, Alarming will produce an audible tone and write a message to the Alarm List (based on the other buttons listed here). Alarming will also write a message to the Sensor History and add a Mark to the Percent Graph for each alarm. When Alarming is disabled there will be no tone, message, or mark produced.

Alarming is enabled at the start of any Preclude Recipe.

NOTE: This will only enable/disable checking of alarm status by TWare32. This setting will have no effect on the Transpector2 alarm checking status, as this will be performed as long as there is a recipe running.

Enable Sound  . . . . Enable/Disable Sound on alarm activation. When enabled, the sound will remain on for the duration of the alarm.

Sound is enabled at the start of any Preclude Recipe.

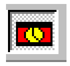
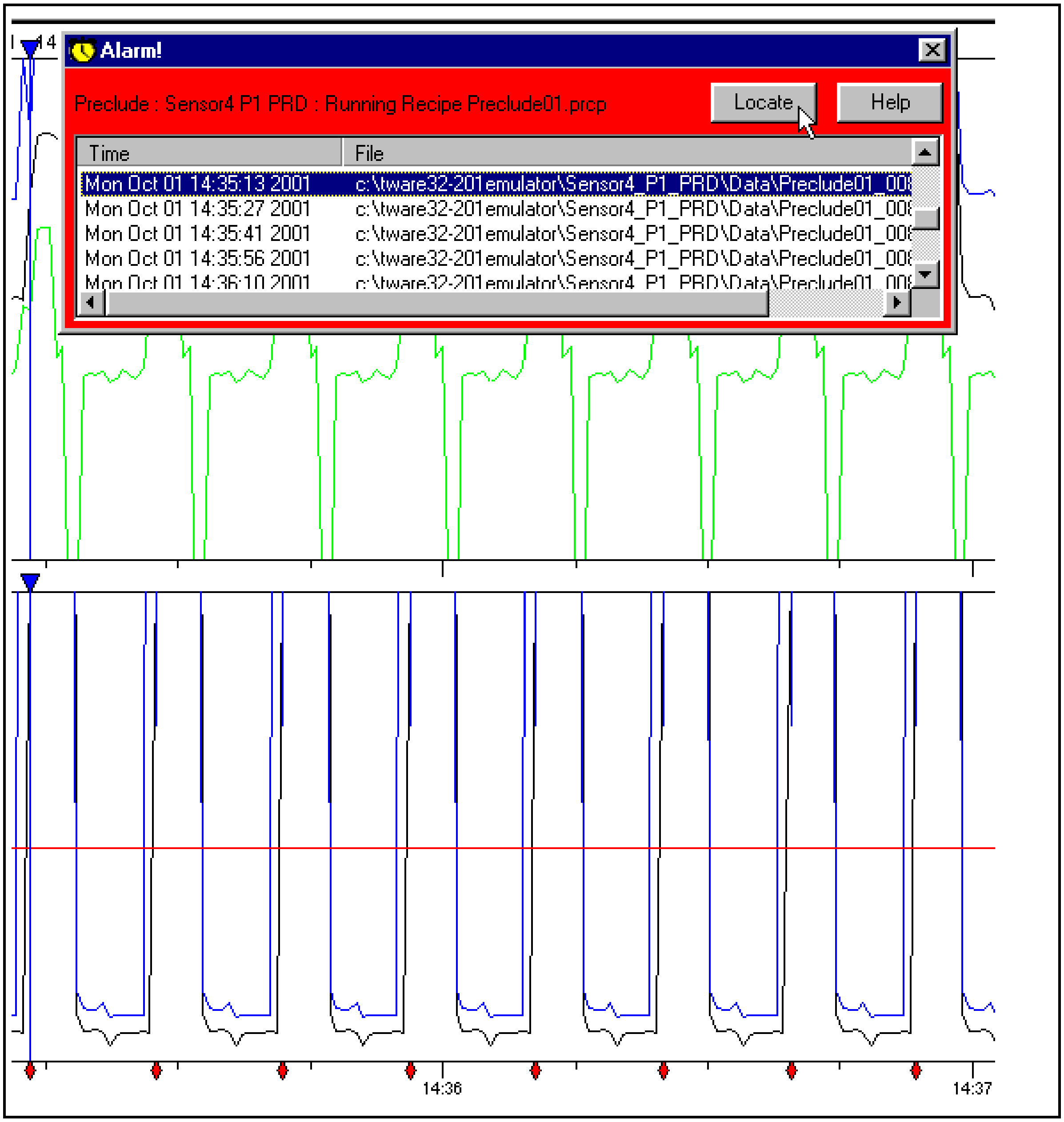
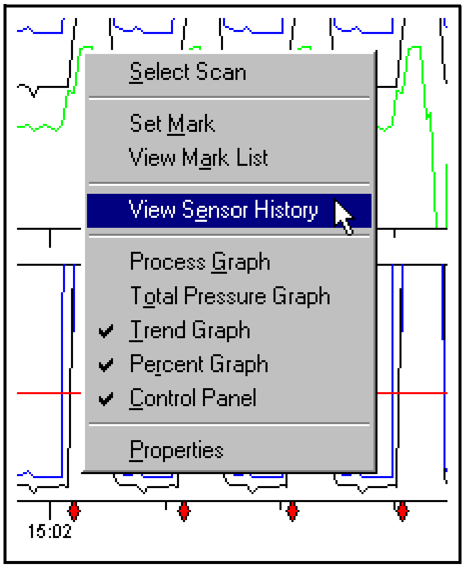
Alarm List  . . . . Enable/Disable the display of the Alarm List. When Alarming is enabled, alarms will be written to the Alarm List regardless of the state of this display. Display of the Alarm List is enabled at the start of any Preclude Recipe. Any Alarm in the Alarm List can be located in the **Trend Graph** by either double-clicking on the alarm in the list, or highlighting the alarm and clicking the **Locate** button (see Figure 10-16 on page 10-23). Locating an Alarm will place a blue-line Cursor and triangle at the location of the alarm and automatically freeze the screen. Data collection and alarming does not stop while the screen is frozen; the screen is updated once it is unfrozen.

Figure 10-16 Preclude Alarm List, Locating an Alarm



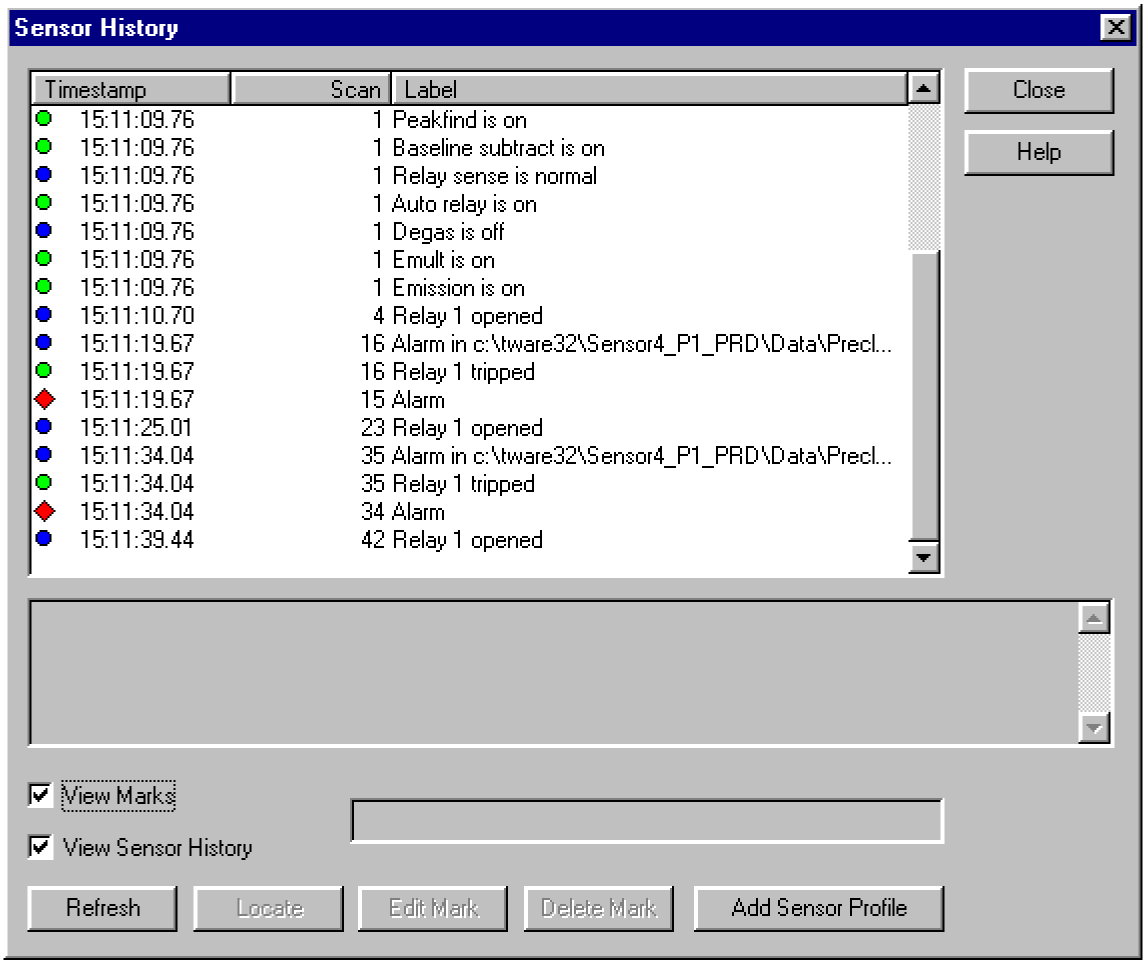
10.7.6 Sensor History

Figure 10-17 Preclude Context Menu - View Sensor History



View Sensor History will invoke the **Sensor History** dialog, which provides a list of the events and marks that occurred during the run. See Figure 10-18 on page 10-25.

Figure 10-18 Preclude Sensor History



From the **Sensor History**, any Event, Mark or Alarm can be located within the **Trend Graph.** To Locate an Event, Mark or Alarm, either double-click on the item in the list or highlight the item and select the **Locate** button. An example of locating an Alarm is shown in Figure 10-19. Locating an Event, Mark or Alarm will place a blue-line cursor (see Figure 10-20) at the item location in the graph and automatically freeze the screen. Data collection and alarming does not stop while the screen is frozen; the screen is updated once it is unfrozen.

Figure 10-19 Preclude Sensor History, Locating an Alarm

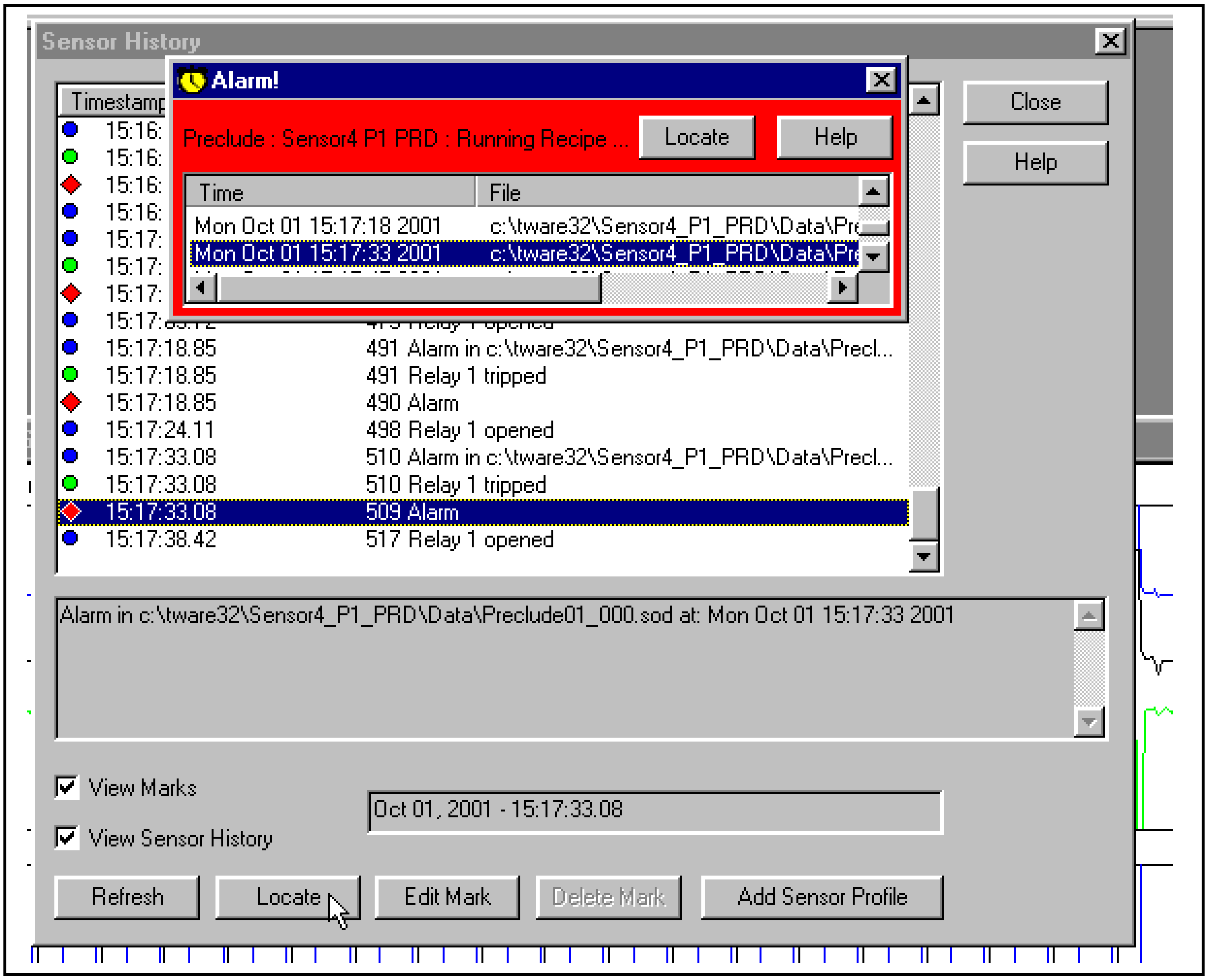
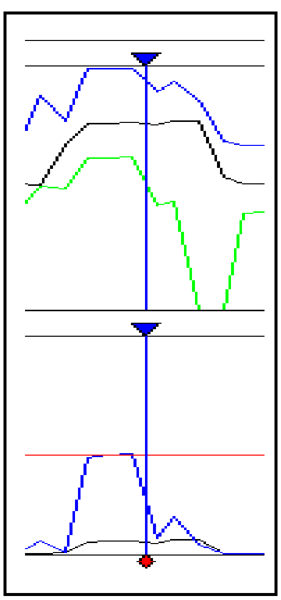


Figure 10-20 Preclude Alarm Locate Cursor



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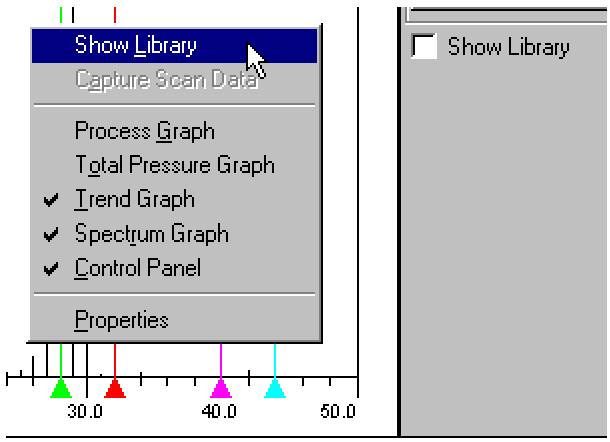
Chapter 11
Library

11.1 How To Enter Library

Library applies to Spectrum Mode only and can be accessed in the following manner:

- as a standalone view (Figure 11-1) from the toolbar Library button or the **File >> Library** menu selection.

- from the Spectrum Graph context menu while running Monitor (Figure 11-2 on page 11-3) or a Recipe in Spectrum mode.



- from the Recipe Editor Subtraction page.
- from **Edit Current Recipe** when running a recipe that is not saving data.

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Figure 11-1 Standalone Library Display

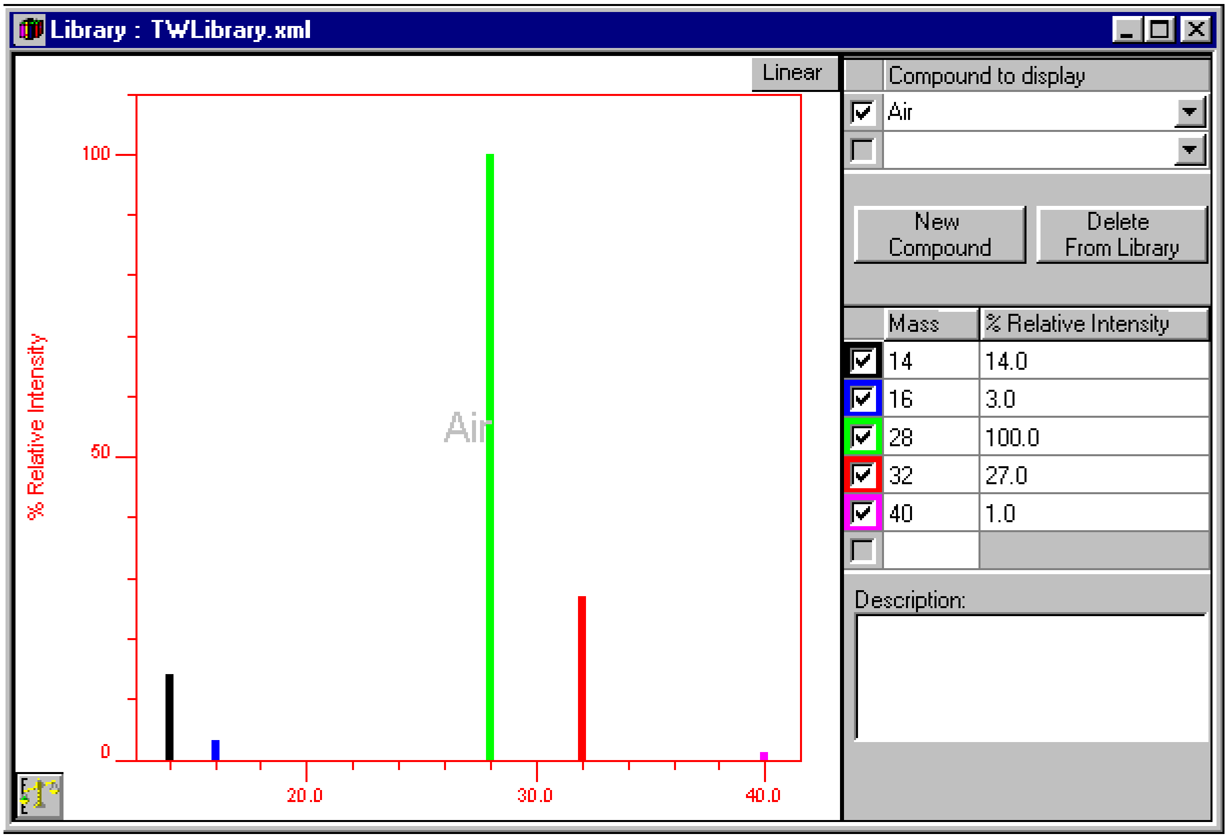

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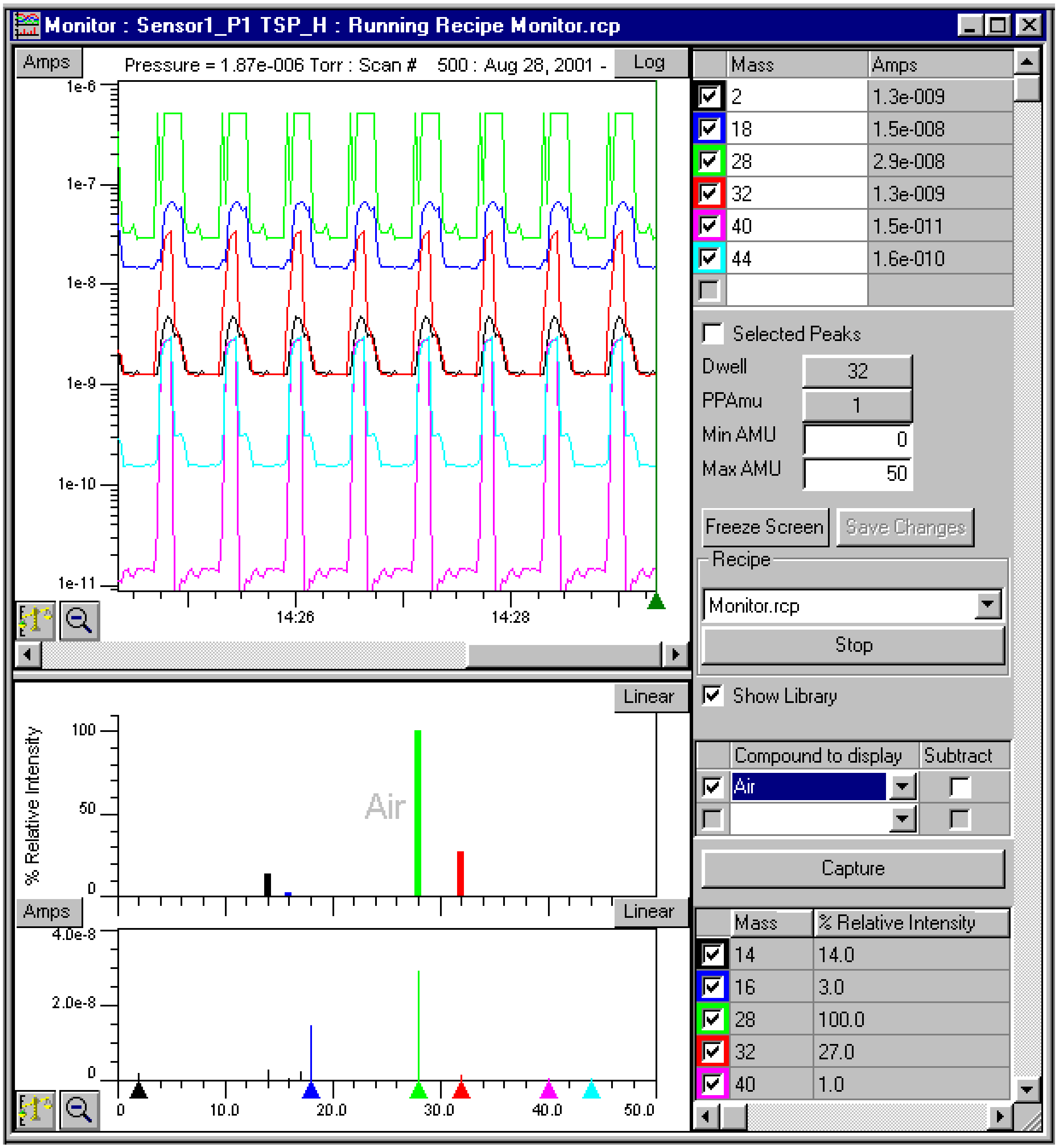
Figure 11-2 Library Display While Running Monitor



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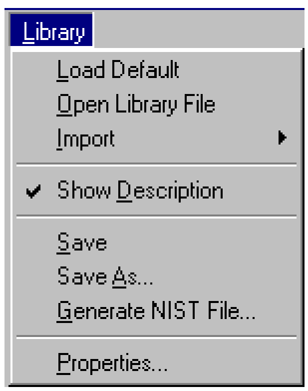
11.2 Library Menu

The **Library** menu, present when Library is open, provides the options shown in Figure 11-3. When Library is started it opens a file named *TWLibrary.XML* that contains a list of default compounds. This file can be modified through the Library interface by adding, editing and deleting compounds, adding, editing and deleting masses from compounds, and capturing and saving spectra as new compounds. Changes made to the library can be saved to TWLibrary.XML via the **Library >> Save** menu selection. If the Library interface is closed, with unsaved changes, then a prompt will appear, as a reminder, to save the changes. A custom Library can be created by opening TWLibrary.XML, making modifications, and saving it to a new filename by using the **Library >> Save As...** menu selection. This Library can then be opened using the **Library >> Open Library File** menu selection.

Figure 11-3 Library Menu



11.2.1 Load Default

Load Default loads the TWare32 default library, from the write-protected DefaultLibrary.XML file, which can then be saved to a working Library file (e.g. TWLibrary.XML). This is the recommended starting point towards creation of a custom Library. This is also recommended if modifications over a period of time render the working Library file (TWLibrary.XML) unusable.

11.2.2 Open Library File

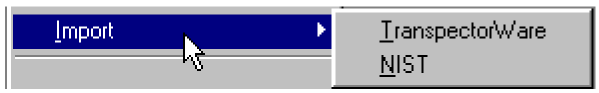
Open Library File displays a standard ‘file open’ interface that allows selection of a Library file to open. This file then becomes the working library file to which all changes can be saved by using the **Save** menu selection.

NOTE: The Library can also be opened using **File >> Open**.

11.2.3 Import

Import (Figure 11-4) allows importing of Library information from a TranspectorWare (TWare32 predecessor) Library file or a properly-formatted NIST Library file (.msp file extension. Consult NIST documentation for file format information). Either of these data sets can then be saved as a TWare32 Library file using the **Save As...** menu selection.

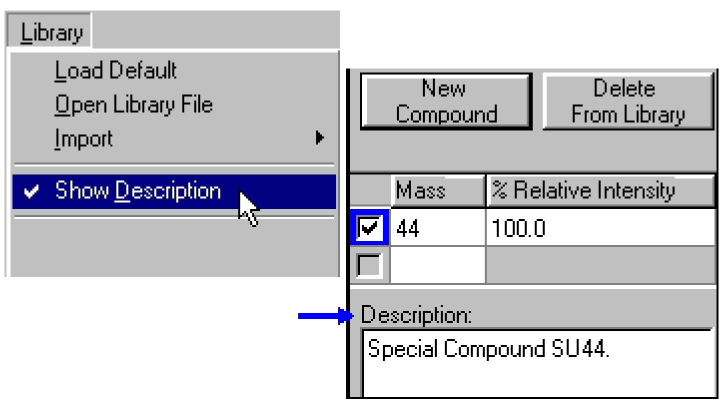
Figure 11-4 Library >> Import



11.2.4 Show Description

Show Description selects if a Compound Description should be displayed in the Control Panel while using Library. A check mark indicates that the Description is displayed. See Figure 11-5.

Figure 11-5 Library >> Show Description



11.2.5 Save

This menu selection provides an easy way to save changes to the Library file. If compounds are being developed or modified then the **Save** selection can be used to store the changes to the open Library file. This selection, however, does not allow the changes to be saved to a library other than that which is open. To save changes to a custom library use the **Save As...** menu selection.

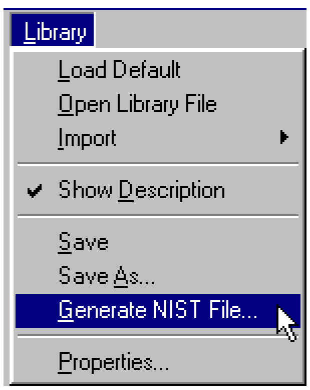
11.2.6 Save As...

This menu selection allows library changes to be saved to a user-specified Library file. This is a good technique for backing up custom Compounds created while using TWare32. *User-specified Library files are only available in the standalone Library for this release. User-specified Library files are not available to the Recipe Editor.*

NOTE: A custom Library can be created and renamed to TWLibrary.XML if necessary; however, is it strongly recommended that the TWLibrary.XML (shipped with TWare32) is backed up before it is replaced.

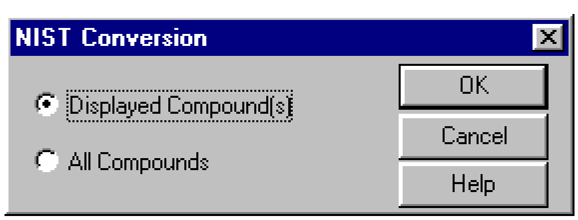
11.2.7 Generate NIST file

Figure 11-6 Library >> Generate NIST File…



Generate NIST File... invokes the **Create NIST File** dialog, a standard "Save As..." dialog which allows selection of the destination folder and entry of a file name. This function allows either the full Library or the displayed Compounds to be exported into a NIST compatible text file. See Figure 11-7.

Figure 11-7 NIST File Conversion Choices

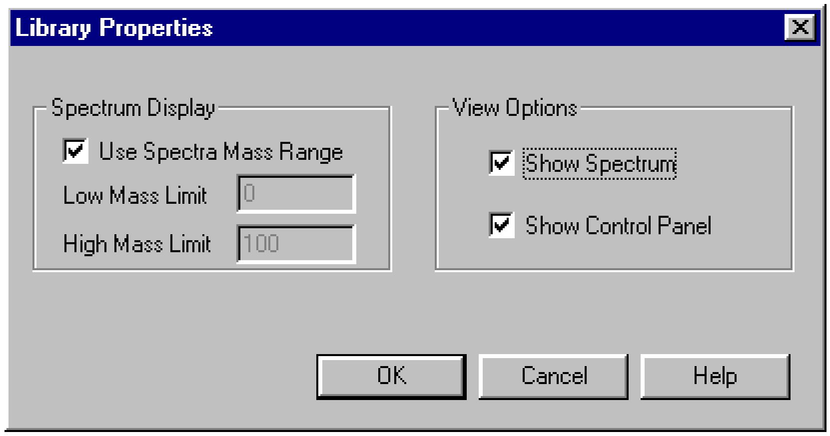


The.msp file extension is used for NIST compatibility.

11.2.8 Properties

This menu selection allows for changes to the Library display properties shown in Figure 11-8.

Figure 11-8 Library>>Properties



Spectrum Display

Use Spectra Mass Range . . . . . . When selected, the X-axis will be adjusted to a width equal to the largest mass range of all compounds listed in the grid. Note that the low X-axis setting will sometimes be greater than zero for this selection.

Low Mass Limit . . . . The low X-axis setting used when **Use Spectra Mass Range** is not selected. Default is zero.

High Mass Limit . . . . The high X-axis setting used when **Use Spectra Mass Range** is not selected. Default is 100.

View Options

Show Spectrum . . . . When selected, will display the mass Spectrum graph.

Show Control Panel . . . . When selected, will display the Control Panel.

11.3 The Standalone Library

To start Library, select the Library toolbar button . This button launches the Library interface shown in Figure 11-9 and opens the standard Library file TWLibrary.XML. The default displayed compound is Air.

Figure 11-9 Standalone Library Display Showing Two Compounds

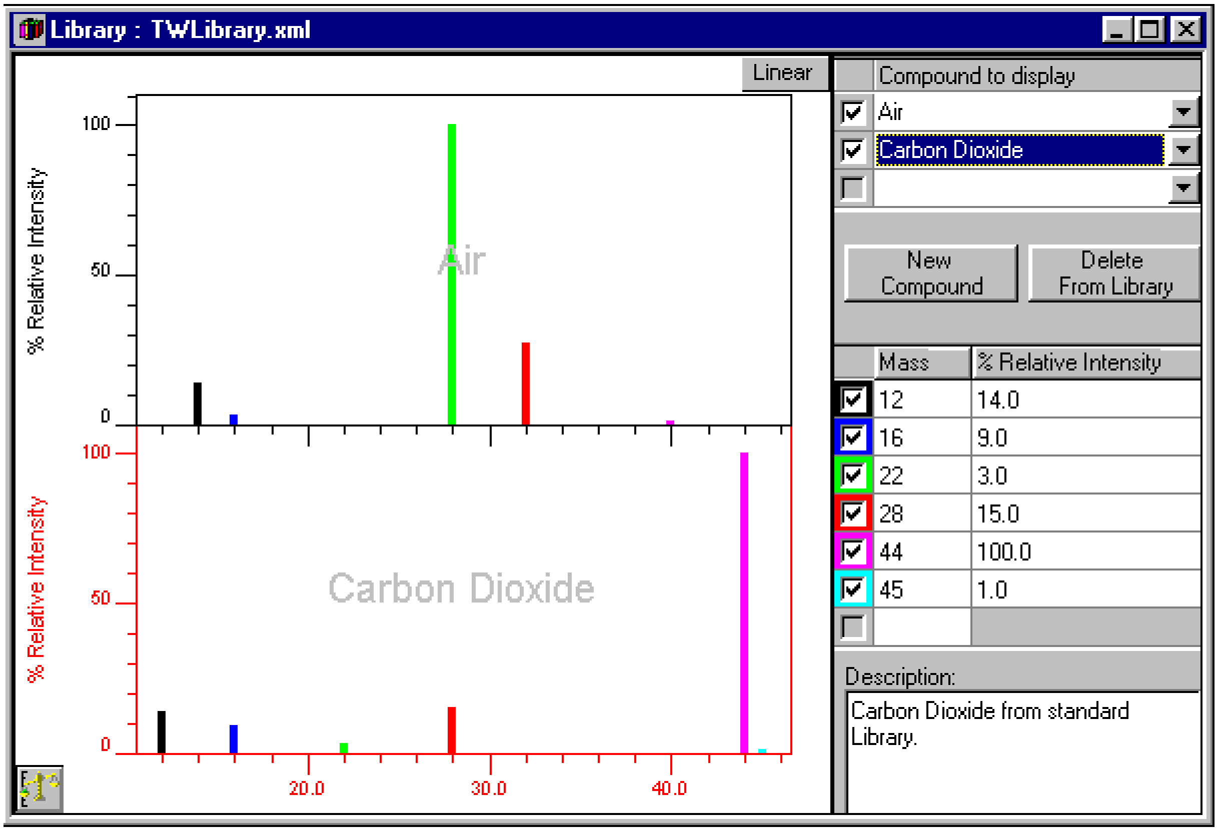


Figure 11-9 shows two compounds, Air and Carbon Dioxide, displayed in the Library interface. The Compound Mass Grid (showing 12,16,22,28,44,45) displays the masses of the compound highlighted in the 'Compound to display' list (in this case Carbon Dioxide). The Spectrum Graph for the highlighted Compound, showing all peaks in percent relative intensity, is also highlighted.

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11.3.1 Modify the Library Database

The Library interface (refer to Figure 11-9) is fully able to be edited and allows addition of new Compounds, editing of Compounds, and deletion of Compounds.

Modifications can be saved to the open Library at any time by selecting **Save** from the Library menu. Modifications can also be saved to a new Library file by selecting **Save as...** from the Library menu.

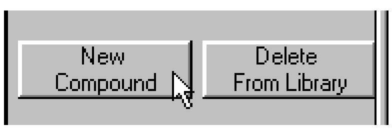
If the Library interface is closed, with unsaved changes, then a prompt will appear, as a reminder, to save the changes.

It is important to note that changes made to a Compound in the Standalone Library are not automatically updated in any previously created Recipe. To update a Recipe with changes made in the Standalone Library one must open the Recipe in the Recipe Editor and remove the old Compound before adding the new Compound.

11.3.1.1 Adding a New Compound

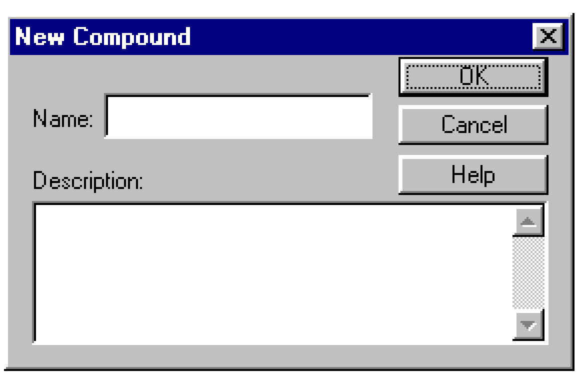
To add a new compound to the Library, press the New Compound button on the Control Panel as shown in Figure 11-10 or enter the New Compound name in a blank row in the grid.

Figure 11-10 New Compound button



Enter the Compound name and optional description in the Add New Spectrum dialog that appears as shown in Figure 11-11.

Figure 11-11 Entering a New Compound Name



Press OK and the new Compound will appear in the Library Compound Grid. At least one Mass with a Percent Relative Intensity equal to 100 must then be entered in the Compound Mass Grid.

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The new Compound is not saved to the Library until either the **Save** selection is made from the Library menu or the Library is closed (and the choice to save is selected).

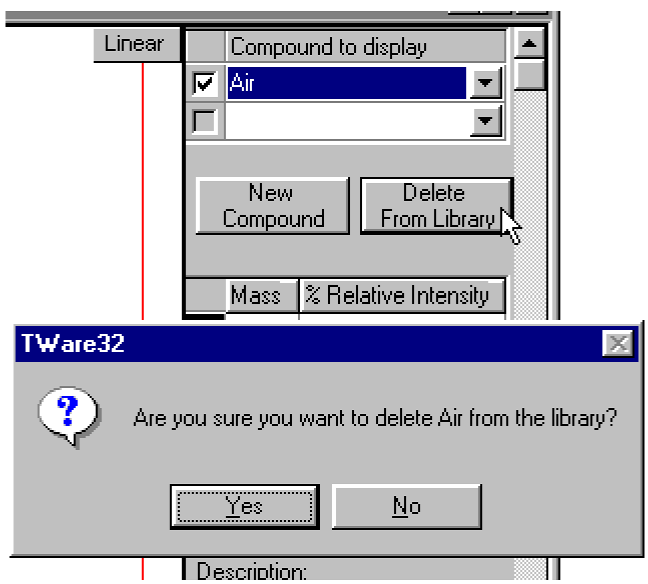
11.3.1.2 Modifying an Existing Compound

Compounds can be modified by highlighting the Compound in the Library Compound Grid, editing the masses in the Compound Mass Grid, or editing the Percent Relative Intensities in the Compound Mass Grid. Any modifications made are immediately displayed on the Spectrum Graph for that Compound. Modifications are not saved to the Library file until either the **Save** selection is made from the Library menu or the Library is closed.

11.3.1.3 Deleting a Compound from the Library

To delete a Compound from the Library, highlight the Compound name in the Library Compound Grid and select the **Delete From Library** button (see Figure 11-12). A dialog will appear to confirm this action. This action will again be confirmed, when exiting the Library function, with a dialog that will ask about saving the changes. If the changes are not saved, then this delete action is cancelled and the Compound is retained in the Library.

Figure 11-12 Deleting a Compound



11.3.1.4 Renaming a Compound in the Library

To rename a Compound in the Library, highlight the Compound name in the Library Compound Grid and select Rename from the right-click context menu (see Figure 11-13). The selection bar will change from a full-width bar to a bar that only highlights the Compound name (see Figure 11-14). After editing the name, press Return on the keyboard or click the mouse elsewhere on the display to accept the new name.

Figure 11-13 Using the Rename Menu Item

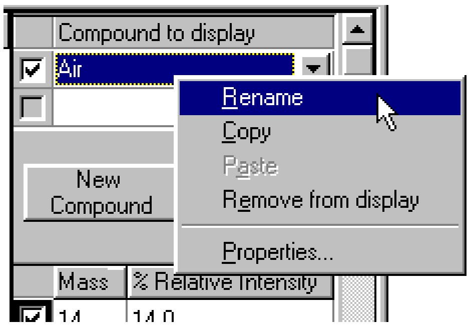
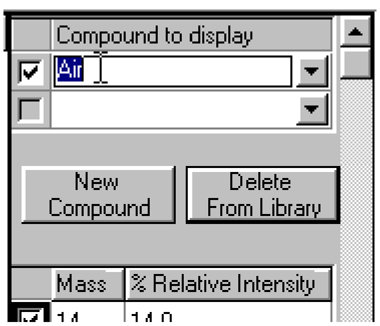


Figure 11-14 Renaming the Compound



NOTE: Double-clicking on the name will also allow the name to be changed as shown in Figure 11-14.

11.3.1.5 Copying a Compound in the Library

To copy a Compound in the Library, highlight the Compound name in the Library Compound Grid and select Copy from the right-click context menu (see Figure 11-15).

After a Compound has been copied it can then be pasted into the Library Compound Grid by highlighting an unused row in the grid, right-clicking on that row, and selecting Paste from the right-click context menu (see Figure 11-16). The copy will be named “Copy of *the Compound Name*” (see Figure 11-17) and can then be renamed, edited and saved to the Library. The copied compound is not immediately displayed in the graph.

Figure 11-15 Copying a Compound

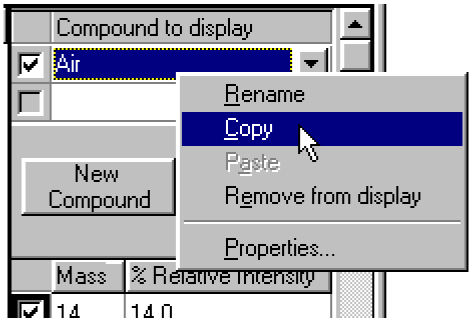


Figure 11-16 Pasting the Compound

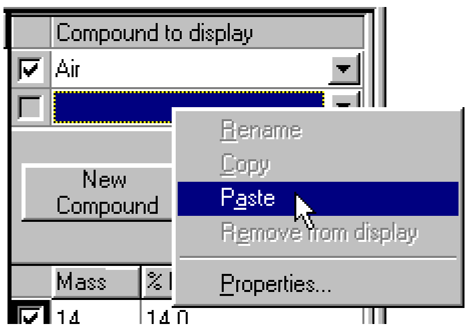
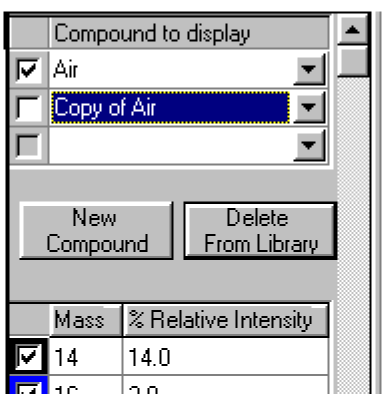


Figure 11-17 The Copied Compound

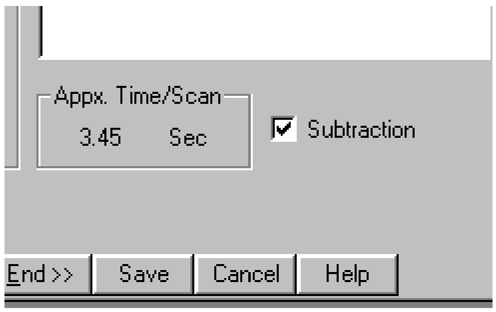


11.4 Programming a Recipe to Use Library Subtraction

The use of Library, specifically the Subtract function, can be programmed into a Spectrum recipe to automatically subtract spectra while collecting data.

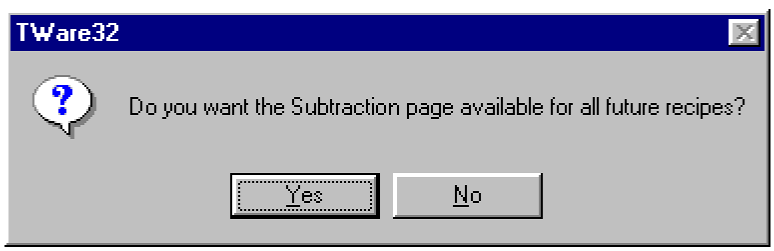
To program a Spectrum recipe for Library, check the **Subtraction** checkbox on the Spectrum page as shown in Figure 11-18.

Figure 11-18 Selecting Subtraction in the Spectrum Recipe



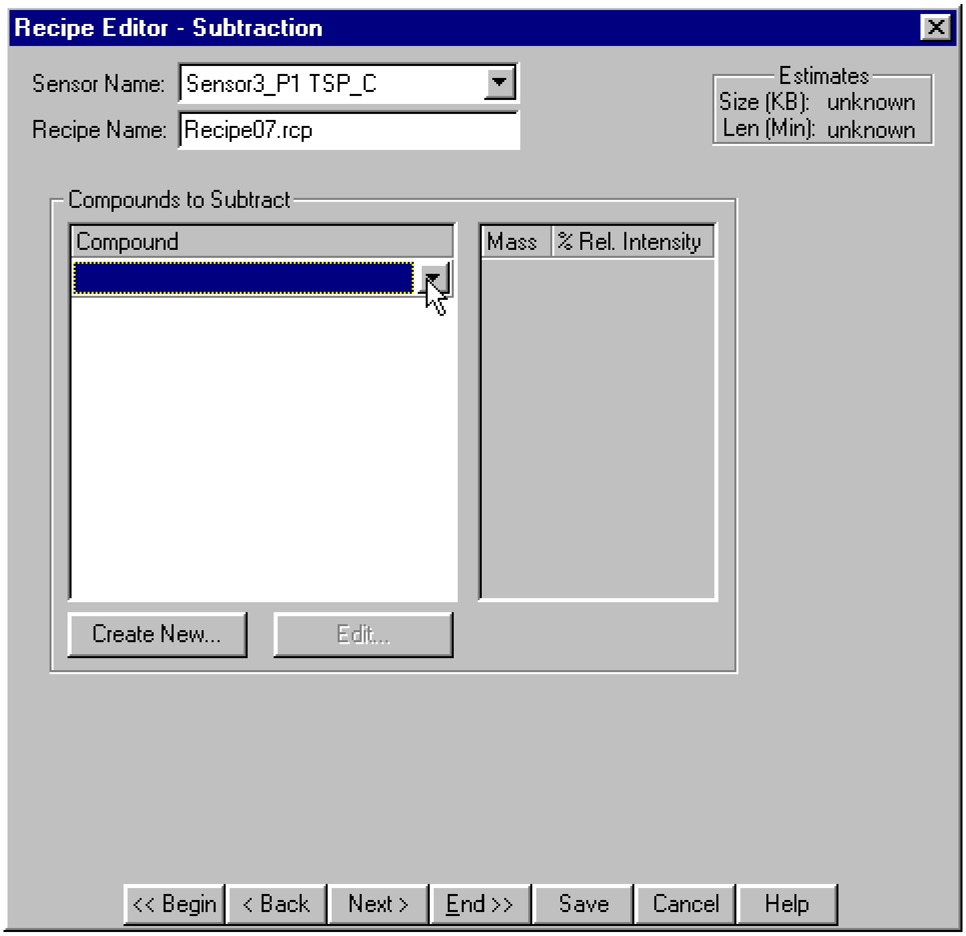
A prompt (see Figure 11-19) will appear the first time **Subtraction** is checked. The answer to this prompt will determine if the Subtraction page will automatically appear in all future Spectrum recipes.

Figure 11-19 'Always Show the Subtraction Page' Choice



The Subtraction page (see Figure 11-20 on page 11-14) allows for a list of compounds to be included in the recipe. This list, if programmed, will be shown in the Monitor Control Panel while the recipe is running and will automatically be subtracted from the collected data for display purposes. The list can be left empty if desired.

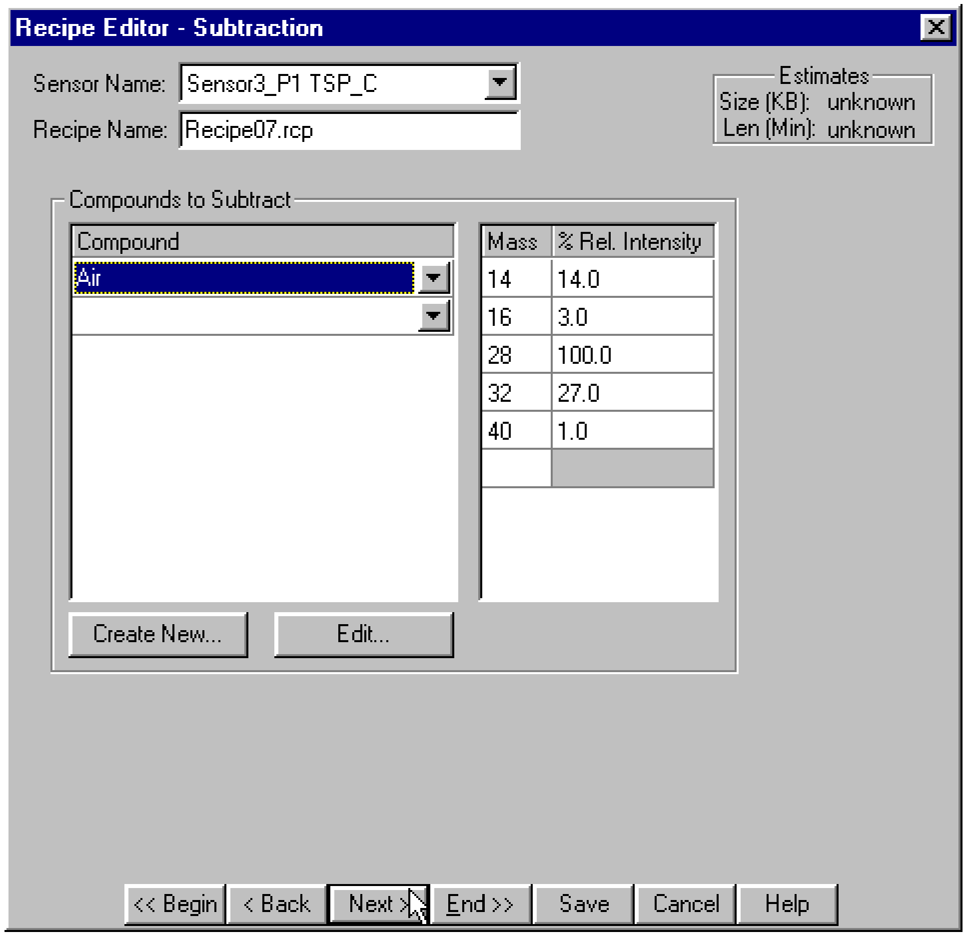
Figure 11-20 Recipe Editor, Subtraction Page



The Compounds, and corresponding mass lists, can be edited on the Recipe Editor Subtraction page. **It is important to note** that the Compounds included in the Recipe are copies of the Compounds from the Library. Modifications or edits made to the compounds in the Recipe Editor are not transferred into the Standalone Library. **It is also important to note** that changes made to a Compound in the Standalone Library are not automatically updated in any previously created Recipe. To update a Recipe with changes made in the Standalone Library one must open the Recipe in the Recipe Editor and remove the old Compound before adding the new Compound.

NOTE: This release only allows access to Compounds in the TWLibrary.XML Library file. *Future releases will allow access to custom libraries.* A custom Library can be created and renamed to TWLibrary.XML if necessary; however, is it strongly recommended that the TWLibrary.XML (shipped with TWare32) is backed up before it is replaced.

Figure 11-21 Subtraction Page with Compound Selected

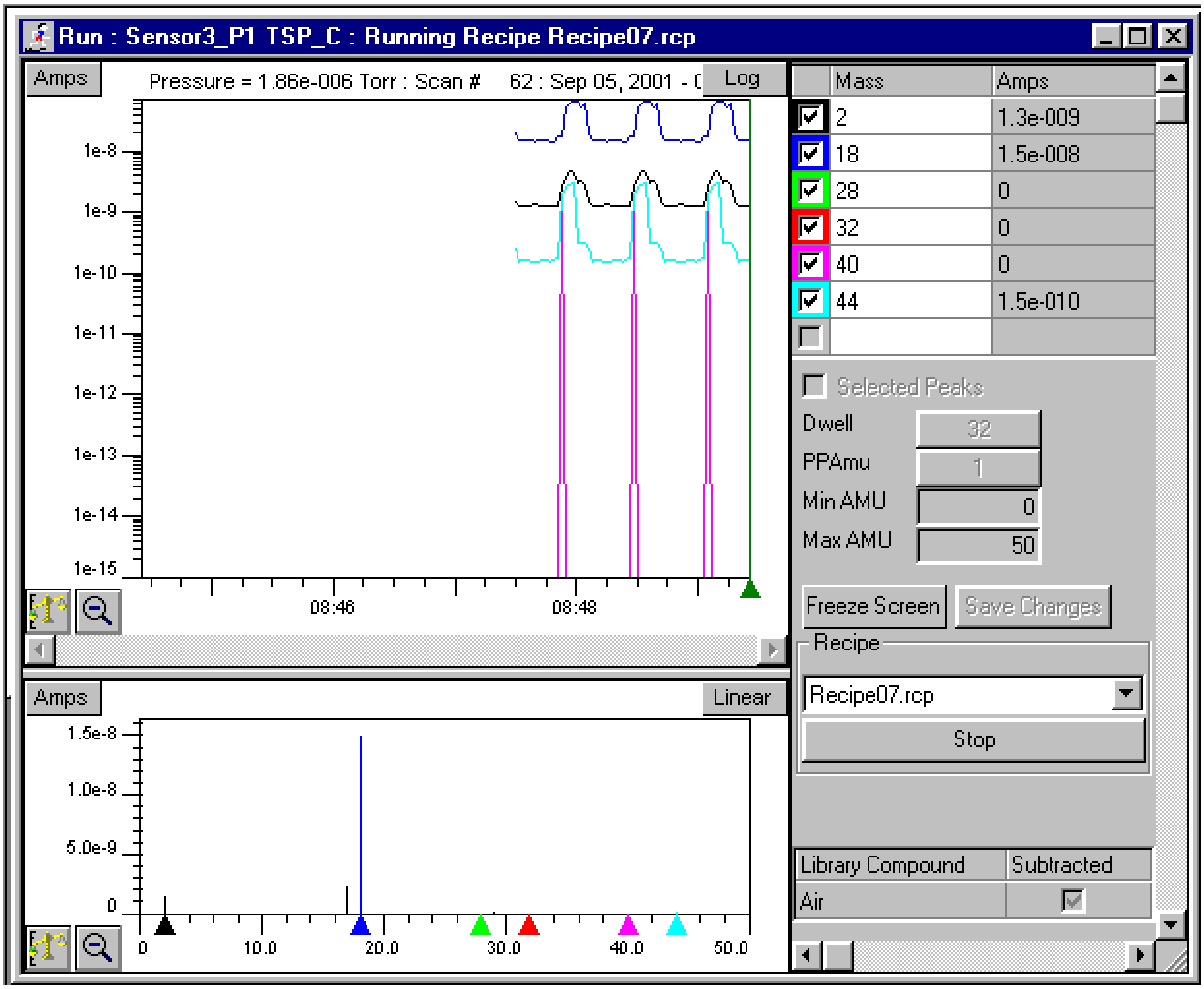


11.5 Running a Recipe Programmed to Use Library Subtraction

A recipe programmed to use the Library subtraction function will automatically start the subtraction on the first data scan. The compounds in use are shown in the lower half of the control panel as shown in Figure 11-22 on page 11-16. Also note that some masses are at zero intensity, in the Spectrum Mass Grid, due to the subtraction that has been executed.

NOTE: When running a recipe, the Library Compound of the recipe can not be edited when Library Subtract is enabled. To access the Compound, or the entire Library, Library Subtract must be disabled from the Trend Graph context menu (see See Figure 11-23.).

Figure 11-22 Recipe Running with Library Subtraction Enabled



To turn subtraction off, right-click on the Trend Graph and select **Library Subtract** from the context menu. A check mark indicates that subtraction is enabled; no check mark indicates subtraction is disabled. See Figure 11-23 on page 11-17. When **Library Subtract** has been disabled, a check box will appear in the Control Panel which allows the Library to be shown (see Figure 11-24 on page 11-17). If checked, **Show Library** will show only those Compounds that are programmed in the recipe. The listed Compounds can then be **Subtracted** or **Added Back** by checking and unchecking the **Subtracted** checkbox in the Library Compound Grid. The entire Library can be made available to show by then checking the **TWare32 Library** checkbox as shown in Figure 11-25 on page 11-18. When the **TWare32 Library** checkbox has been checked, other Compounds can be displayed and subtracted from the data.

NOTE: Displaying other Compounds does not update the Recipe contents with those Compounds. To include Compounds in the Recipe use the Recipe Editor.

NOTE: The **Save Changes** button does not save changes to the Library; **Save Changes** only affects the Recipe. To save changes to the Library one must use the Library menu Save choices.

Figure 11-23 Disabling Library Subtract in a Running Recipe

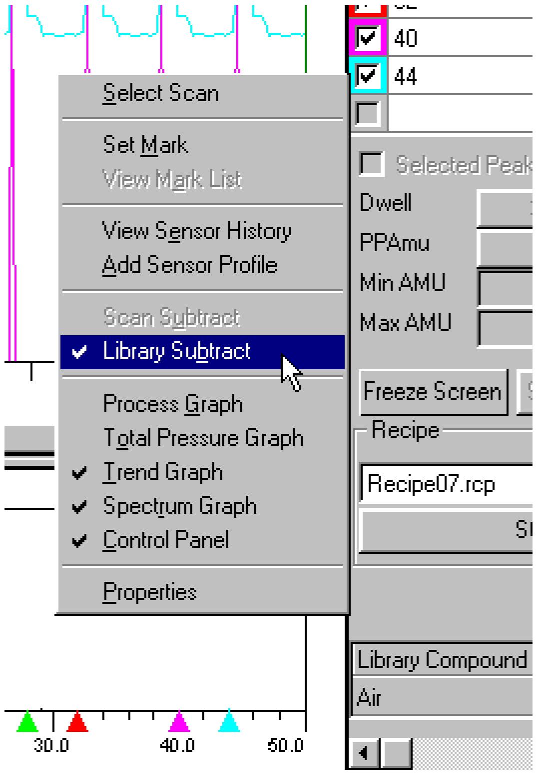


Figure 11-24 The Show Library Selection while Running a Recipe

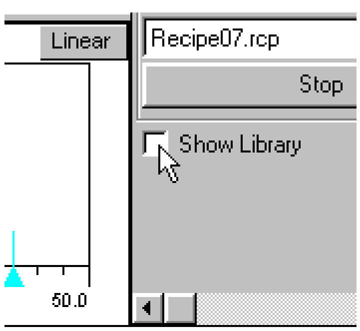
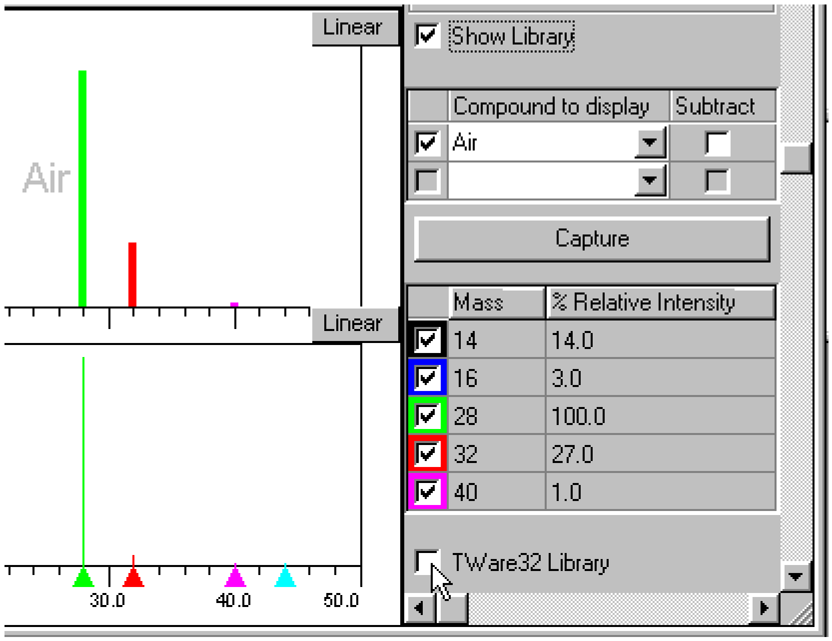


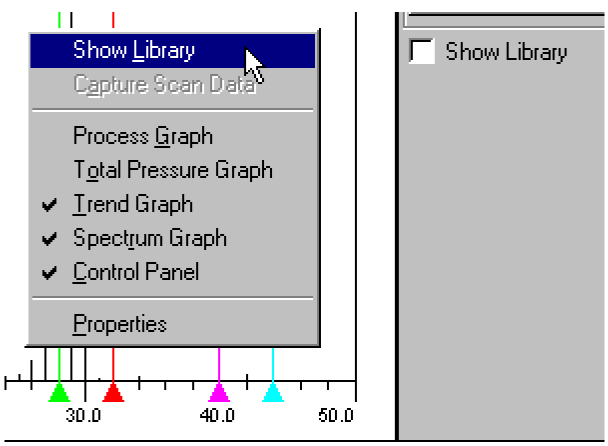
Figure 11-25 The Show TWare32 Library Selection While Running a Recipe



11.6 Using Library Subtraction with Monitor

The Library function can be started at any time while running Monitor. To use Library in Monitor it must first be displayed by either right-clicking on the Spectrum Graph and selecting **Show Library** or by checking the **Show Library** checkbox on the Control Panel. See Figure 11-26.

Figure 11-26 The Show Library Selection while Running Monitor



NOTE: Data must be collected in Spectrum mode in order to use Library.

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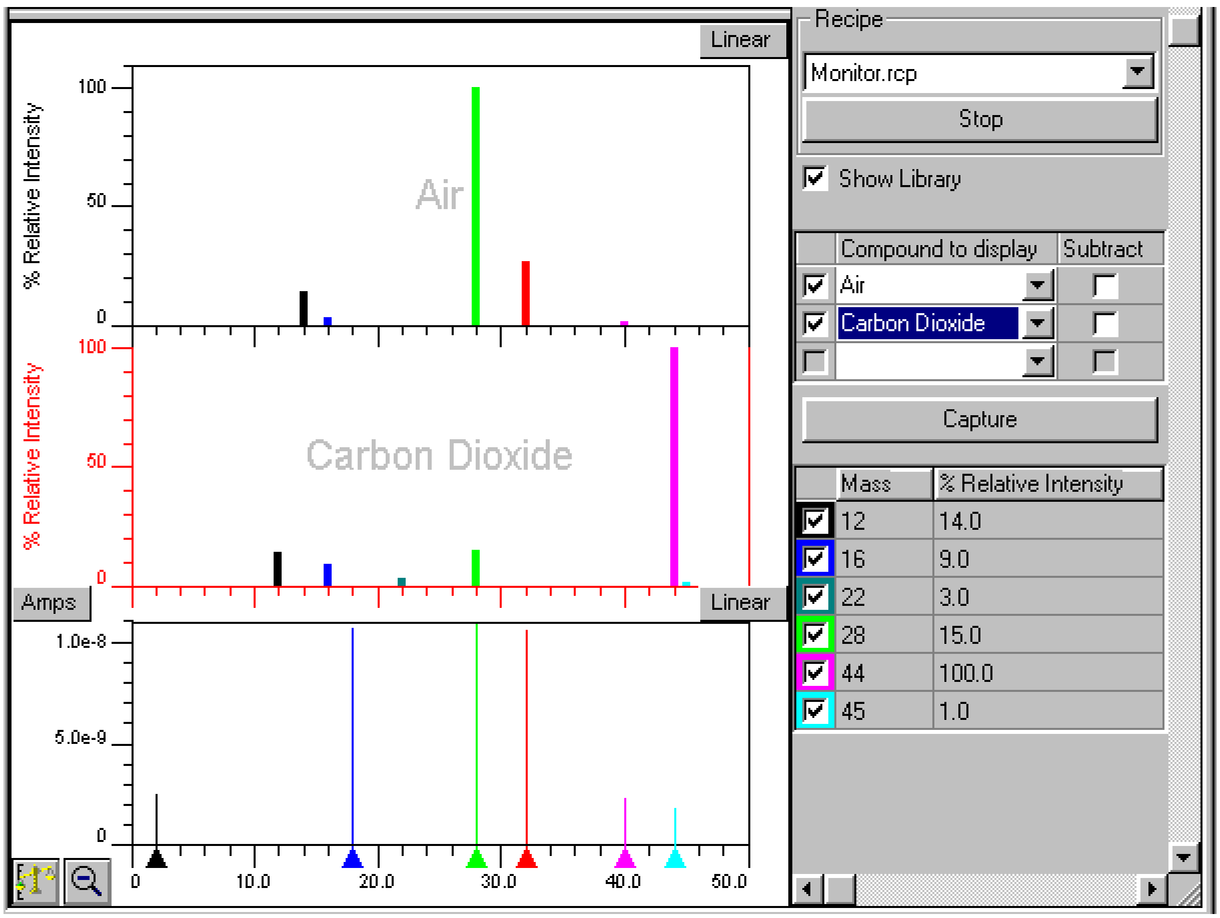
The default Compound displayed, but not subtracted, is Air. Compounds can be selected from the Library using the drop-down list in the Library Compound Grid on the Control Panel. As each Compound is selected from the Library it is automatically displayed as a Spectrum graph and its mass contents are displayed in the Compound Mass Grid. See Figure 11-27.

Any Compound can be subtracted by selecting it for display and then checking the Subtract checkbox.

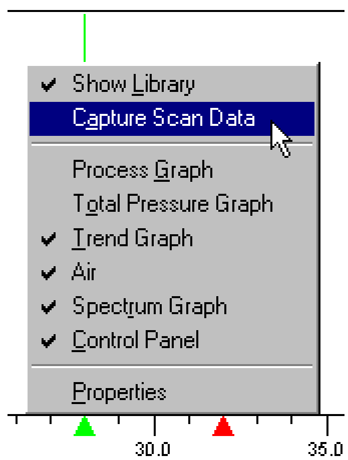
Figure 11-27 Monitor showing Compounds



11.6.1 Capturing Full Scan Data to Create a New Compound

While running Monitor or a Recipe, with the Library shown, the 10 largest ions can be captured from the **Spectrum Graph** as a **New Compound** by right-clicking on the **Spectrum Graph** (see Figure 11-28) and selecting **Capture Scan Data** or by pressing the **Capture** button on the Control Panel. Full scan data can also be captured to replace an existing Compound (see Figure 11-29). Replacing an existing Compound is not recommended unless the integrity of the gas flow in the chamber can be guaranteed.

Figure 11-28 Capture Scan Data selection for New Compound



The relative intensities are calculated (the largest being the 100% peak); the Compound can be stored in the Library upon termination of Monitor or the Recipe. Once the scan data are captured the **Add New Spectrum** dialog is displayed. Enter the name of the new spectrum. See Figure 11-30.

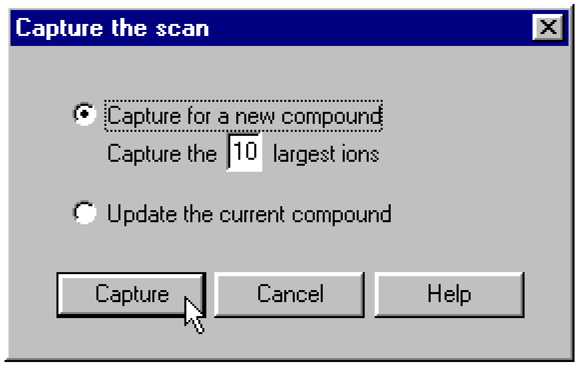
NOTE: If the relative intensity of an ion is less than 0.05%, it will not be entered into the captured spectrum.

NOTE: If less than ten ions are desired then the number of ions can be entered in the dialog (see Figure 11-29).

HINT: The **Spectrum Graph** horizontal axis can be manipulated to display the AMU range from which data will be captured.

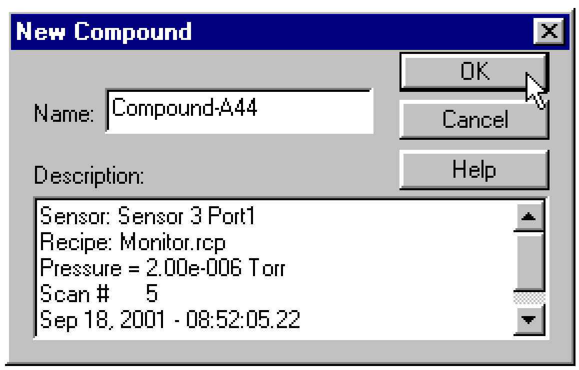
HINT: Spectra can be subtracted from the **Spectrum Graph**. **Capture** will only obtain the intensities for those remaining masses.

Figure 11-29 Capture Scan Data choices



NOTE: If **Update the Current Compound** is selected then the data will be captured for those masses listed in the Compound Mass Grid.

Figure 11-30 Add New Spectrum Name Dialog



The New Spectrum Name is displayed in the Library Compound Grid. See Figure 11-32.

NOTE: If the name entered already exists in the Library then a prompt will ask if the Compound should be replaced (Figure 11-31). Selecting **Yes** will fill the existing Compound with newly captured masses and their relative intensities.

Figure 11-31 Replacing a Compound

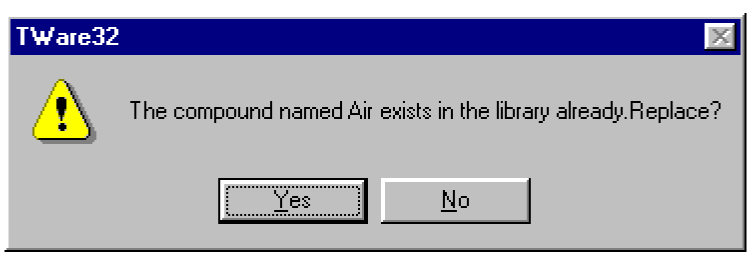


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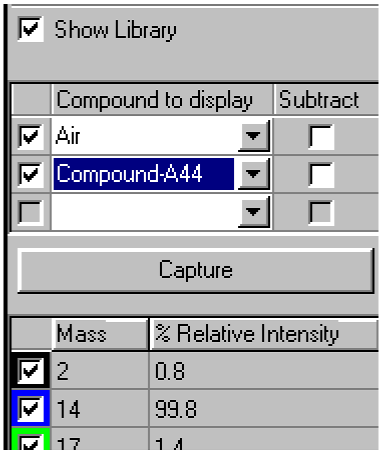
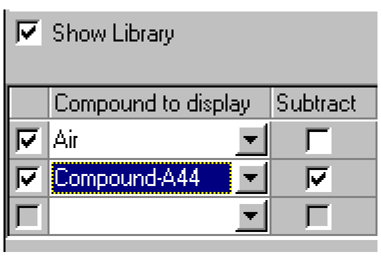
Figure 11-32 New Spectrum Name Displayed In Grid



HINT: **Capture Scan Data** can be used to manipulate the **Spectrum** data. For example, the 100% peak may be so much larger than the others that it is the only peak captured. If this occurs, capture the 100% peak only and save it as a **New Spectrum**, then subtract it from the **Spectrum** graph by checking the **Subtract** box in the Library Compound Grid (see Figure 11-33). If another **Capture Scan Data** is performed, more peaks should be captured into the library spectrum.

Figure 11-33 Select Subtract in the Library Grid



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Chapter 12
Using External Signals with Digital I/O

12.1 Digital I/O

TWare32, through the use of a PCI-bus Digital I/O board installed in the PC (IPNs 911-261-G2 and 911-261-G3), will start and stop recipes based on an external signal. This use of external inputs as a recipe trigger allows the data collection to be more closely synchronized with the process. TWare32 also provides external outputs (relays) for use as signals to indicate when a mass has crossed a recipe-based mass setpoint.

Data collection may be isolated to specific steps in the process by programming one recipe to run during wafer processing, another during the inter-wafer period and a third for the pumpdown cycle. Specifically isolating the data ultimately enhances the data recall and report generation features in TWare32 by synchronizing RGA data collection with process steps.

The Digital I/O board supplied for use with your PC and TWare32 provides eight or 16 channels of optically isolated digital input and eight or 16 channels of electromechanical relay output (the software handles 16 of each). Inputs can be driven by control voltages of 5 to 28 V(dc) (not TTL compatible) and are isolated to 500V. Input response time is typically 5 milliseconds. The outputs are reed relays configured as five form C and three form A with the default setting of normally open for each. The contacts are rated for 6.0 Amps at 120 V(ac) or 28 V(dc) resistive load. Operation time is typically 20 milliseconds.

There are two kit IPNs for the TWare32 Digital I/O Board:

- IPN 911-261-G2 (8 channels), includes the items listed in Table 12-1 on page 12-2 and shown in Figure 12-1 on page 12-2.
- IPN 911-261-G3 (16 channels), includes the items listed in Table 12-2 on page 12-3 and shown in Figure 12-2 on page 12-3.

Table 12-1 Kit IPN 911-261-G2 (8 Channels)

Qty.	Description	IPN
1	Digital Input Board for PCI Bus (PCI-PDISO8)	911-429-P1
1	37 pin screw terminal board (CIO-MINI37)	911-430-P1
1	Plastic enclosure for screw terminal board (ENC-MINI37)	911-431-P1
1	3' (0.9 m), 37 pin cable, female D connector each end (C37FF-3)	911-432-P1
1	PCI-PDISO8 User's Manual	
1	CD with software driver	

Figure 12-1 Kit IPN 911-261-G2 8 Input, 8 Output Board and Accessories

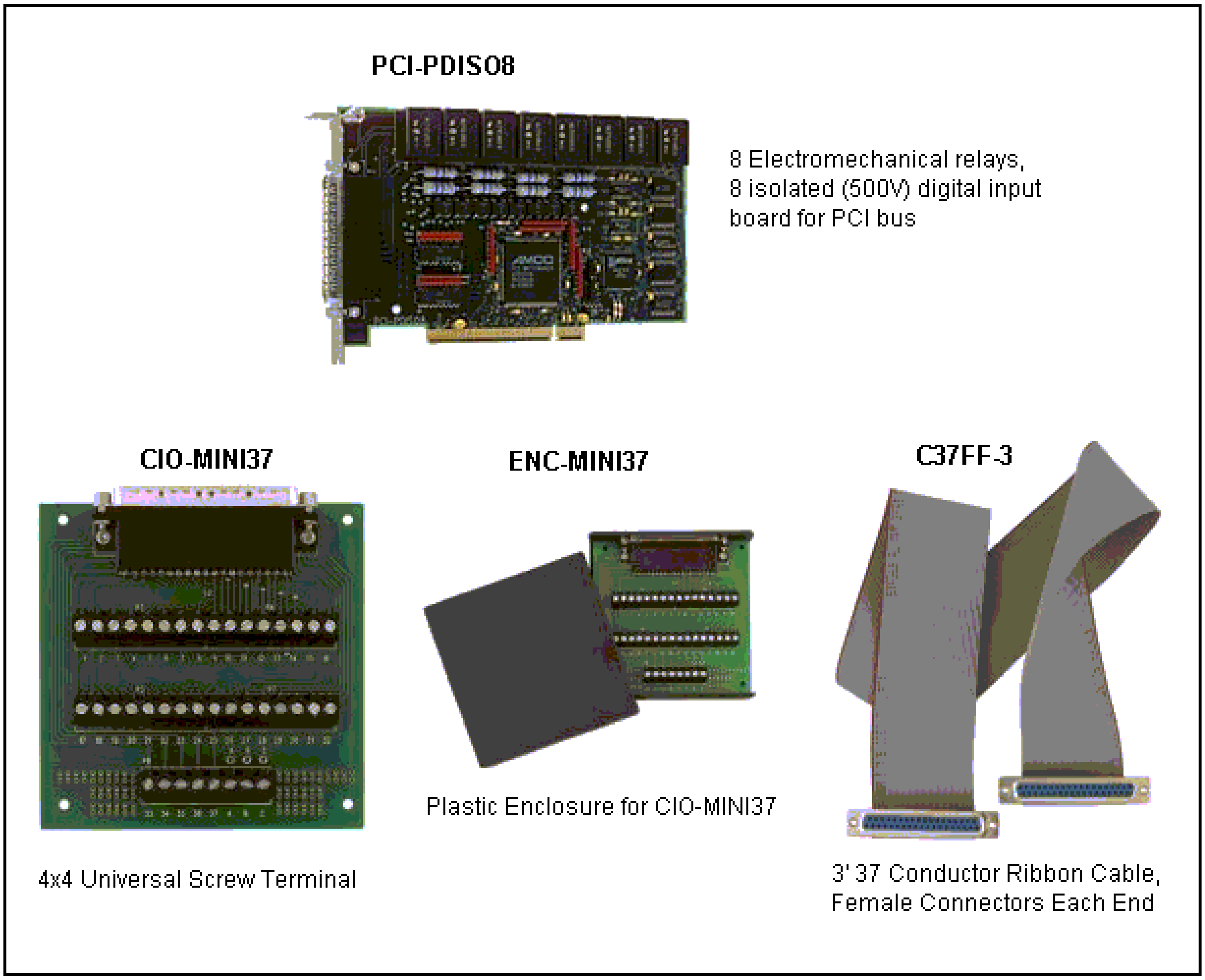

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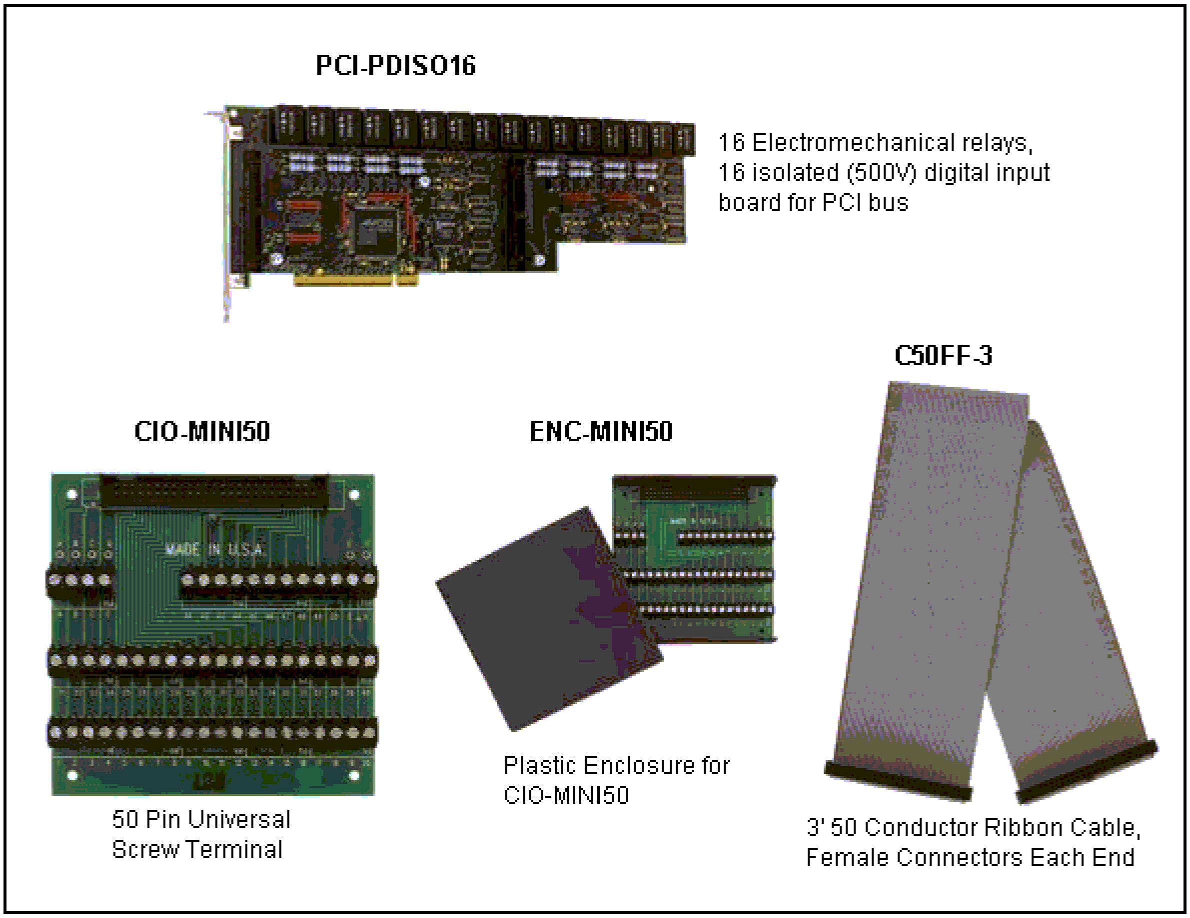
Table 12-2 Kit IPN 911-261-G3 (16 Channels)

Qty.	Description	IPN
1	Digital Input Board for PCI Bus	911-433-P1
2	50 pin universal screw terminal accessory	911-434-P1
2	Plastic enclosure for screw terminal accessory	911-435-P1
2	3 ft., 50 conductor ribbon cable, female connectors each end	911-436-P1
1	PCI-PDISO16 User's Manual	
1	CD with software driver	

Figure 12-2 Kit IPN 911-261-G3 16 Input, 16 Output Board and Accessories



12.2 Basic Installation Instructions for the Digital I/O Board

Refer to the User's Guide supplied with the Digital I/O board for the manufacturer's instructions and precautions on how to install the board in your computer. Detailed installation instructions are provided in section 12.3 on page 12-4 of this Operating Manual.

CAUTION

Anti-static precautions should be taken prior to handling the Digital I/O board and computer.

The Digital I/O board is a PCI-bus board and should be recognized as a plug and play device, by the operating system, after the board is installed. The basic installation procedure is to remove power from the computer, install the Digital I/O cables and board, reapply power and start the computer. The operating system will recognize the Digital I/O board and request that a driver be installed. A CD is supplied with the board to provide the necessary driver.

12.3 Detailed Installation Instructions for the Digital I/O Board

Refer to the User's Guide supplied with the Digital I/O board for the manufacturer's instructions and precautions on how to install the board in your computer.

CAUTION

Anti-static precautions should be taken prior to handling the Digital I/O board and computer.

The installation procedure is as follows:

1. Install TWare32, version 2.50 or greater, on your computer.
2. Shut down the operating system and computer.
3. Remove power from the computer.
4. Remove the access cover from the computer.
5. Locate a PCI slot and remove the cover plate for the slot to provide an opening for the cable to pass through.

6 If installing the 8 input, 8 output board (911-261-G2), go to step 7. If installing the 16 input, 16 output board (911-261-G3) then these extra steps are required. First, feed the proper end of each ribbon cable through the opening in the computer. Next, feed each ribbon cable through the opening in the metal plate attached to the board. Now plug each connector into the appropriate receptacle on the board. Finally, label each cable, at a point outside the computer, to distinguish between the upper and lower 8 channels.

7 Install the Digital I/O board. Ensure that it is properly seated.

8 For the 8 input, 8 output board (911-261-G2) connect the cable to the 37 pin D connector at the back of the board.

9 Put the computer cover on, reapply power and start the computer.

10 Upon restart, the operating system should recognize that new hardware has been installed in the computer. If the Digital I/O board is not recognized then shut down the operating system and computer and check that the board is properly inserted in the PCI slot.

11 When the Digital I/O board is recognized, the operating system will ask to locate and install the software driver for the board. Insert the CD supplied with the board and respond to all prompts provided. In the rare case that the operating system cannot locate the driver then the program **Setup.exe** must be run from the CD.

12 After successful installation of the driver, start TWare32.

12.4 Setup And Test of the Digital I/O

After installation of the board and driver in the PC, use the TWare32 **Tools >> System Properties >> Input/Output** tab to set up and test the Digital I/O board. See Figure 12-3.

If the computer is having trouble communicating with the board, a message will appear. See Figure 12-4.

Figure 12-3 System Properties Input/Output Configuration

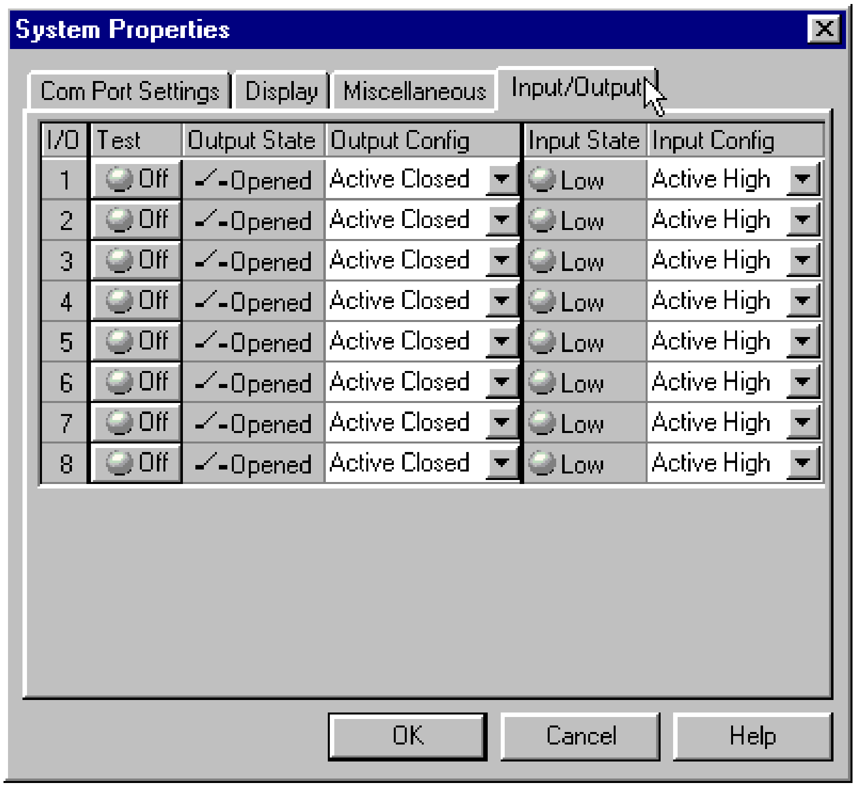
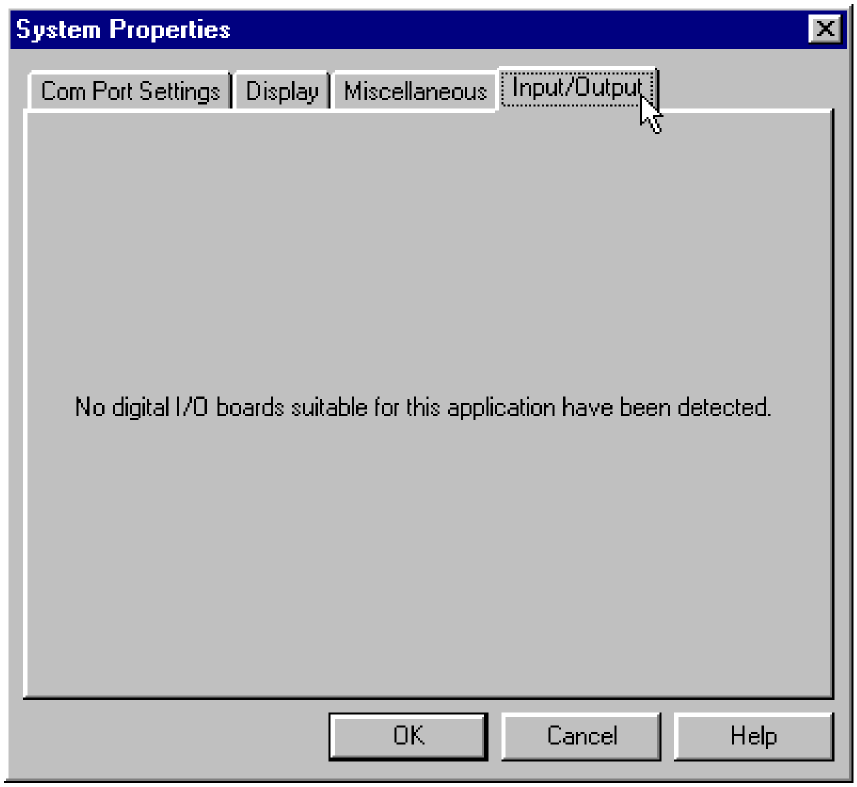


Figure 12-4 Digital I/O Board Not Found



12.4.1 Setting up the I/O

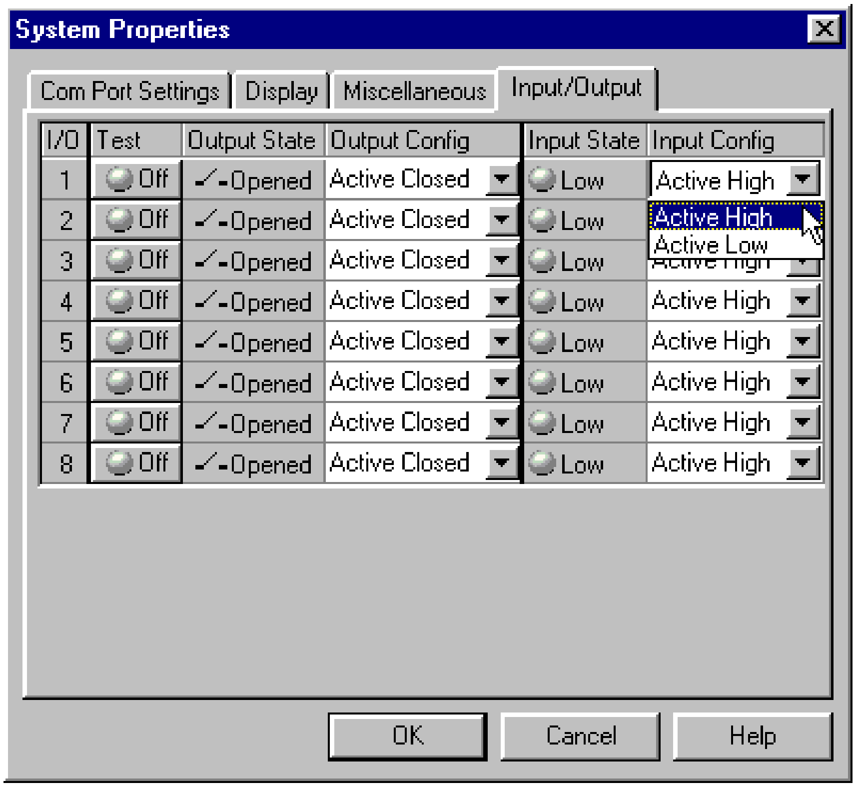
The System Properties Input/Output tab provides the capability to set up each input and output and also **Test** each output. The tab will show the first eight inputs and outputs and the status associated with each.

Each output can be tested by left-clicking the **Test** button corresponding to the output. A column showing the **Output State** is provided to indicate the status.

Each output can be configured as Active Closed or Active Open by making the appropriate selection in the **Output Config** column for the output.

Each input can be configured to trigger on either the active high state or the active low state by making the appropriate selection in the **Input Config** column for the input. A column showing the **Input State** is provided to indicate the status.

Figure 12-5 Setting up the Input Active States



I/O . . . . Indicates the input or output number for the table rows.

Test . . . . Provides a mouse-selectable button to test each output. The text, Off or On, indicates the logical state of the Output Relay in relation to the **Output Config**uration. See Figure 12-6 for examples of the Output Relay states.

Output State . . . . Displays the mechanical state, opened or closed, of each Output Relay.

Output Config. . . . . Allows programming of the desired state of the Output Relay to indicate activity (e.g. a mass setpoint alarm in a running recipe). The **Output Config**uration can be set to Active Closed or Active Open.

Input State . . . . Displays the electrical state, low or high, of each input.

Input Config . . . . Allows programming of the state of the input required to trigger an action (e.g. Recipe Start) by TWare32. The **Input Config**uration can be set to Active High or Active Low.

12.4.2 Testing the I/O

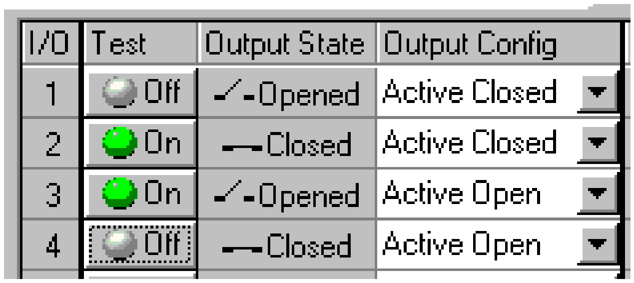
Buttons are provided on the **Tools >> System Properties >> Input/Output** tab to test the outputs. The **Test** column provides a button, with feedback, to activate the output under test and close or open the relay. The **Output State** will show the relay in the Opened or Closed position and the indicator in the **Test** column will be colored green or grey depending on the **Output Config** setting. A noticeable “click” sound can be heard when the relay is opened or closed.

NOTE: TWare32 cannot determine if the relay physically closed; the **Output State** column reflects an electrical feedback from an integrated circuit that indicates “the relay has been commanded to close”, for example.

NOTE: Outputs should not be tested if connected to a point, on an actively processing tool, that indicates an alarm or problem exists. Outputs should only be tested when the tool is in a non-processing mode.

NOTE: The first time an output is tested with the Test button it may not actually close (or open) if the **Output Config** setting has been changed. The first test will set the proper state in the **Test** column. For example, if the output is open and the **Output Config** is changed from Active Closed to Active Open, then the first press of the **Test** button will set the **Test** indicator green and display “On”. The second press of the **Test** button will then close the output and display “Off”.

Figure 12-6 Output Logical State vs. Output Configuration examples



I/O	Test	Output State	Output Config
1	Off	Opened	Active Closed
2	On	Closed	Active Closed
3	On	Opened	Active Open
4	Off	Closed	Active Open

In the Figure 12-6 example, the four possible output states are shown.

Output 1 (I/O 1) is configured to be closed by TWare32 to show activity (e.g. a mass setpoint alarm). In this example, the output relay is open and therefore the logical state is Off (e.g. no alarm exists, the output remains inactive).

Output 2 (I/O 2) is configured to be closed by TWare32 to show activity (e.g. a mass setpoint alarm). In this example, the output relay is closed and therefore the logical state is On (e.g. an alarm exists, the output has been activated).

Output 3 (I/O 3) is configured to be opened by TWare32 to show activity (e.g. a mass setpoint alarm). In this example, the output relay is open and therefore the logical state is On (e.g. an alarm exists, the output has been activated).

Output 4 (I/O 4) is configured to be opened by TWare32 to show activity (e.g. a mass setpoint alarm). In this example, the output relay is closed and therefore the logical state is Off (e.g. no alarm exists, the output remains inactive).

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Figure 12-7 Input Electrical State vs. Input Configuration examples

I/O	Input State	Input Config
1	Low	Active High
2	High	Active High
3	Low	Active Low
4	High	Active Low

In the Figure 12-7 example, the four possible input states are shown.

Input 1 (I/O 1) is configured to trigger TWare32 when the state of the input is high. In this example, the input state is low and therefore inactive (e.g. no action has been taken by TWare32).

Input 2 (I/O 2) is configured to trigger TWare32 when the state of the input is high. In this example, the input state is high and therefore active (e.g. action has been taken by TWare32, e.g. a recipe has been started).

Input 3 (I/O 3) is configured to trigger TWare32 when the state of the input is low. In this example, the input state is low and therefore active (e.g. action has been taken by TWare32, e.g. a recipe has been started).

Input 4 (I/O 4) is configured to trigger TWare32 when the state of the input is low. In this example, the input state is high and therefore inactive (e.g. no action has been taken by TWare32).

NOTE: There is no interface available to test the inputs.

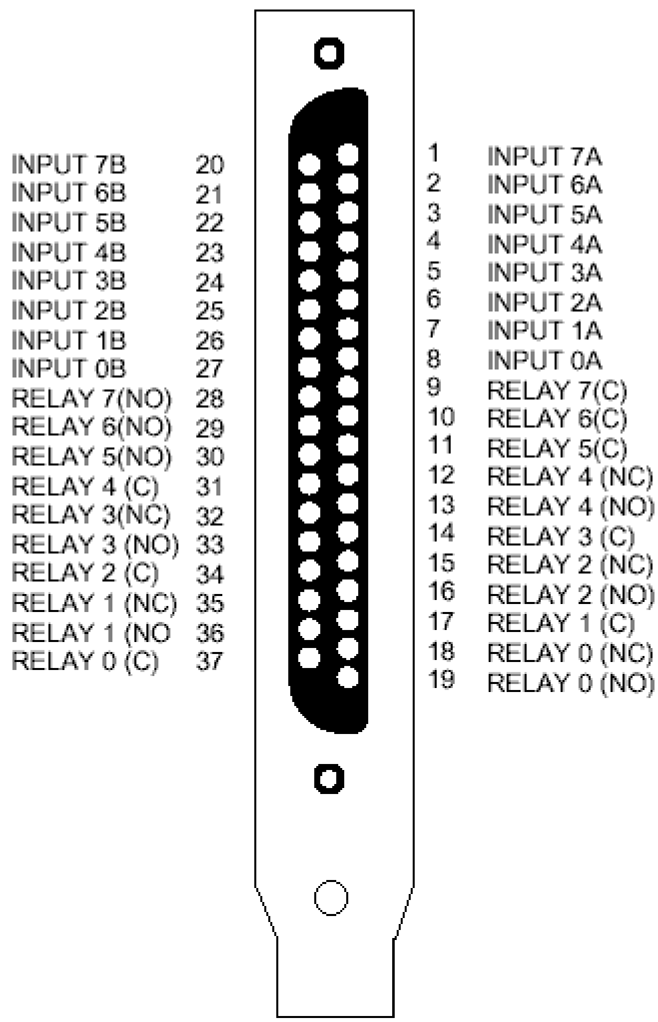
12.4.3 Hardwiring the I/O Board

The following information is provided to assist in hardwiring the Digital I/O board to the external signal source.

Before making any wiring connections, the computer power should be turned off and the source of electrical power should be disconnected from the computer.

The 8 channel card, model PCI-PDISO8, uses a single 37 pin connector. The pinout of the 37 pin connector is shown in Figure 12-8 on page 12-12.

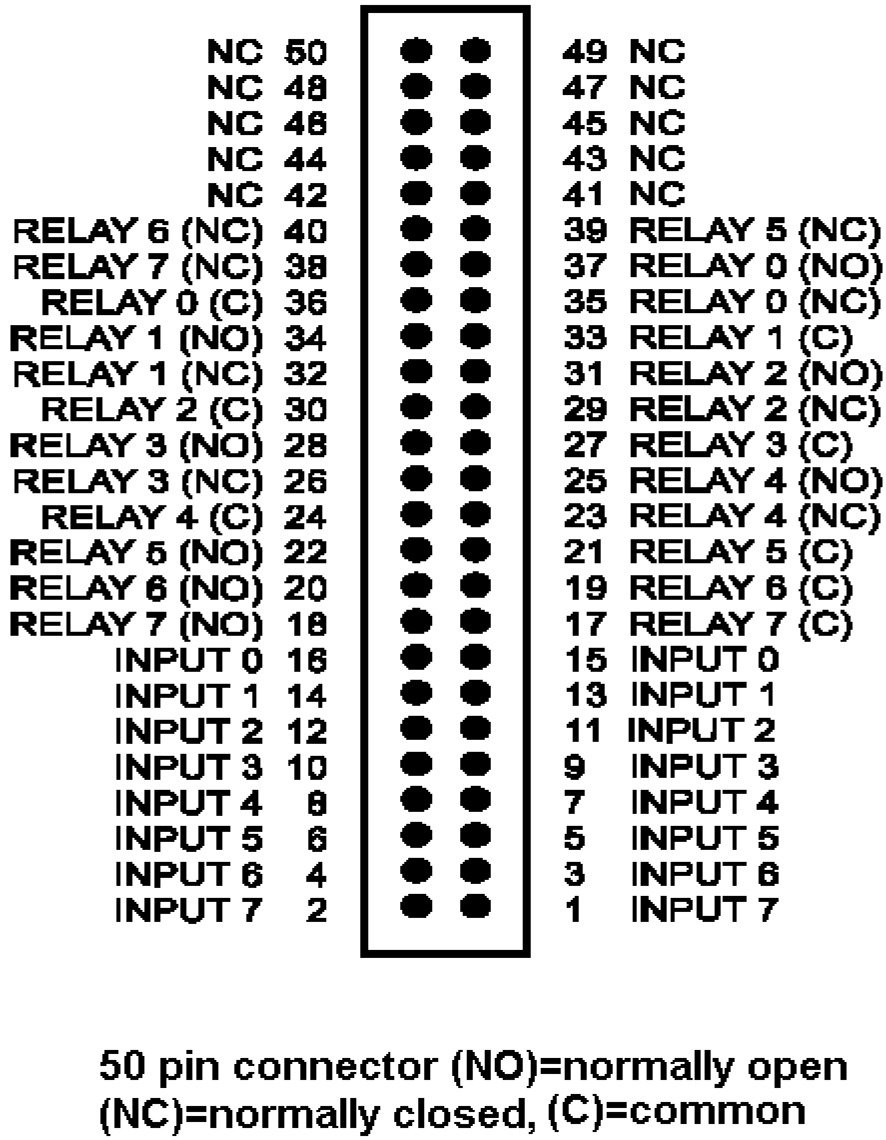
Figure 12-8 Pinout for 37 Pin Connector



37 pin connector, (NO)=normally open
(NC)=normally closed, (C)=common

The 16 channel card, model PCI-PDISO16, uses two 50 pin connectors. The pinout of the 50 pin connector is shown in Figure 12-9 on page 12-13.

Figure 12-9 Pinout for 50 pin connector



NOTE: The upper 8 inputs and outputs use the same pin configuration as shown in Figure 12-9 with Input 8 in the location of Input 0, Input 9 in the location of Input 1, and so on. Relay 8 uses the pins designated by Relay 0.

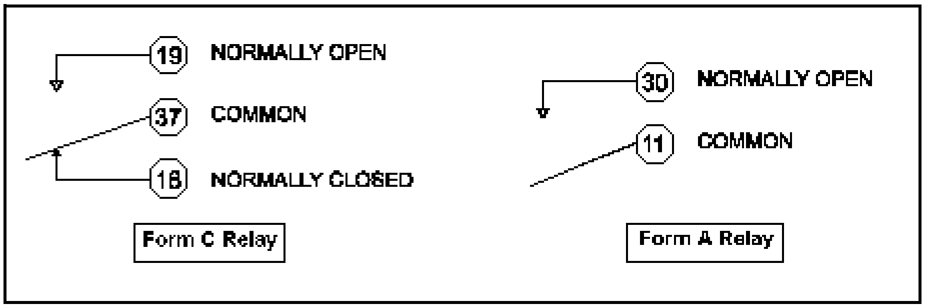
NOTE: Before making any wiring connections to the screw terminals be sure to route all wiring through the opening in the plastic enclosure.

NOTE: Some modifications may be required, to the plastic enclosure, to mount the board or secure the cabling.

Make the appropriate connections for the system to the screw terminals on the CIO-MINI37 (or CIO-MINI50) Terminal Board. Secure the Terminal Board into the enclosure using either the slot (provided in the case) or the standoffs and screws. Attach the C37FF-3 (or C50FF-3) cable(s) so that it connects the Terminal board and the Digital I/O board in the computer.

When using the output relays, refer to Figure 12-10 for relay contact information.

Figure 12-10 Form A and C Relay examples



12.5 How To Edit a Recipe to use Digital I/O

The Recipe Editor can be used to program a recipe to use Digital Inputs as start and stop conditions and Digital Outputs as mass setpoint alarm signals.

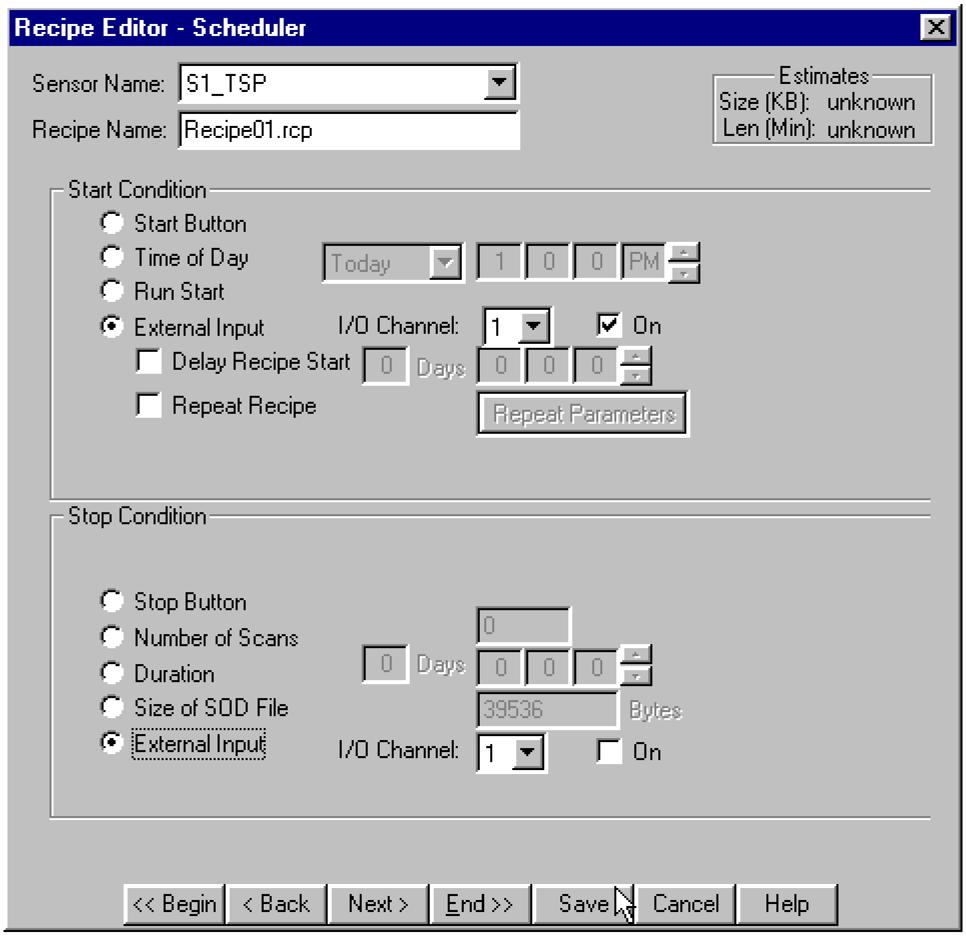
Refer to Chapter 5, Editing Recipes, of the TWare32 Operating Manual for instructions on how to create a recipe and edit each recipe page. Editing the Scheduler page for Start and Stop Conditions other than Digital I/O is also covered in that chapter.

12.5.1 Programming Digital Inputs as Start and Stop Conditions

The Recipe Editor Scheduler page is used to program the Start and Stop Conditions based on Digital Inputs. The example shown in Figure 12-11 displays a recipe programmed to start based on Input 1 turning On and to stop based on Input 1 turning Off.

NOTE: Activation of the Start Condition starts the data collection. The recipe must be loaded using the Run Recipe function prior to the activation of the Start Condition.

Figure 12-11 Programming a Digital Input in the Recipe Editor



To program the Recipe **Start Condition**, select **External Input** and then select an input number (**1-16**). The **On** checkbox is used to determine the condition required to start data collection:

- **checked** — start collecting data when the input is in the active state.
- **not checked** — start collecting data when the input is in the inactive state.

To program the Recipe **Stop Condition**, select **External Input** and then select an input number (**1-16**). The **On** checkbox is used to determine the condition required to stop data collection:

- **checked** — stop collecting data when the input is in the active state.
- **not checked** — stop collecting data when the input is in the inactive state.

NOTE: If the installed Digital I/O board only provides eight inputs then do not select any input 9-16 as a Start or Stop Condition.

12.5.2 Programming Digital Outputs as Mass Setpoint Alarms

The Recipe Editor I/O Relays page is used to program Mass Setpoint Alarm relays for a Selected Peaks recipe. The I/O Relays page can be accessed by checking the I/O Relays checkbox on the Selected Peaks page (see Figure 12-12). The example shown in Figure 12-13 displays a recipe programmed to alarm on one mass below a setpoint (Relay 1, Mass 40), one mass above a setpoint (Relay 3, Mass 44), and one mass outside of a setpoint window (Relay 2, Mass 18).

Figure 12-12 Selected Peaks Page, I/O Relays Selection

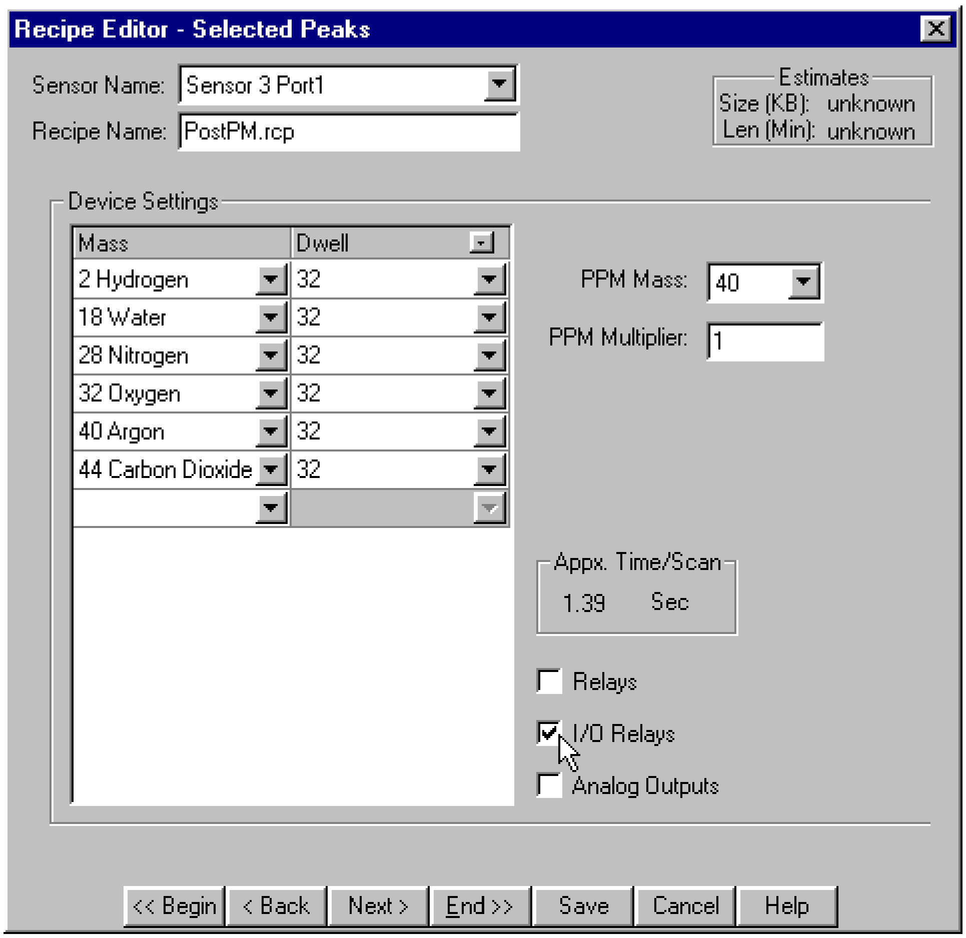
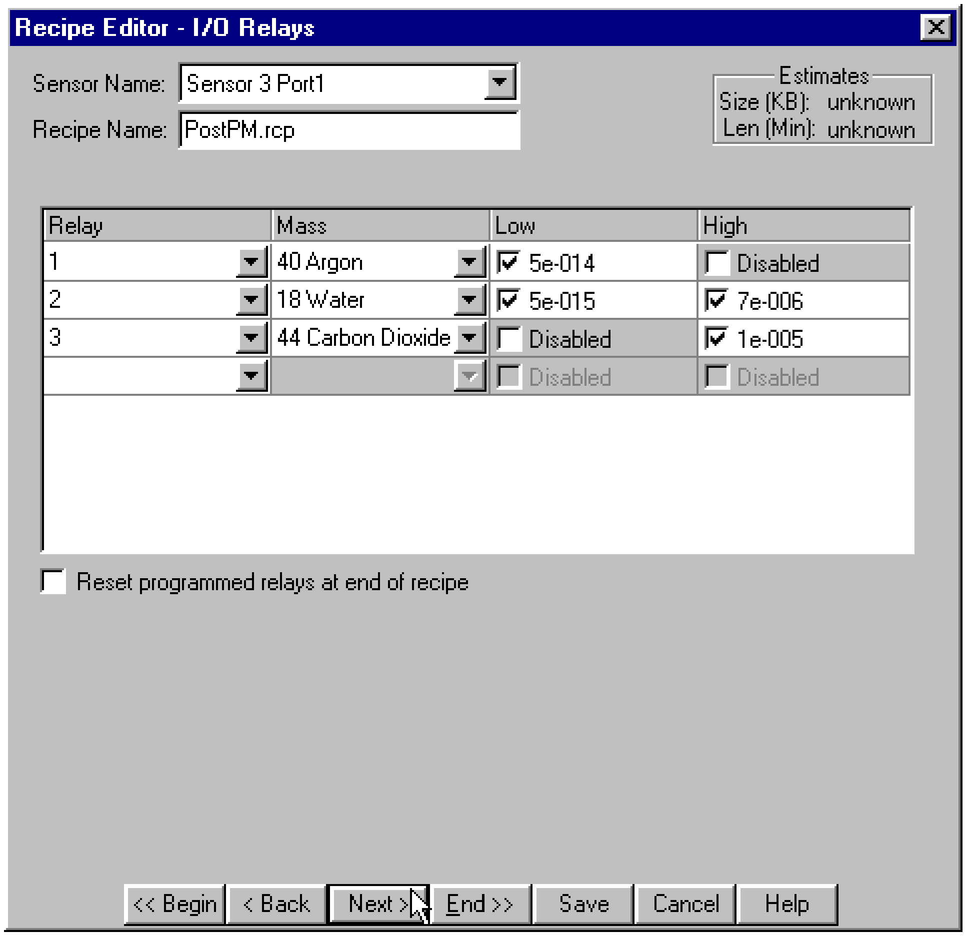


Figure 12-13 Programming a Digital Output in the Recipe Editor



It is allowable to have one relay controlled by more than one mass. In this case the relay state is a logical OR of the specified conditions. Each of the columns in the table is described below:

Relay . . . . Select which relay (1, 2, ...16) will be controlled by the mass on this line. Select the relay number from the pull-down list.

Mass . . . . Masses whose intensities will control the relays. Select a mass from the drop-down list. Possible masses are limited to masses selected in the **Device Settings Grid** on the **Selected Peaks** page. Click **<Back** to go back and add a mass if the mass needed is not in the list.

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Low Setpoint . . . . Lower limit (in Amps) for this channel. When the intensity for a mass drops below this value the relay will be set to the active state. The box must be checked to enable this limit, otherwise the limit is disabled. The default value is 1E-15.

High Setpoint . . . . Upper limit (in Amps) for this channel. When the intensity for a mass rises above this value the relay will be set to the active state. The box must be checked to enable this limit, otherwise the limit is disabled. The default value is 1E-5.

Reset Programmed Relays . . . . . Select this if it is desired to reset all relays to the non-alarm state when the recipe terminates. Do not check this box if it is desired to have relays remain activated after the recipe ends.

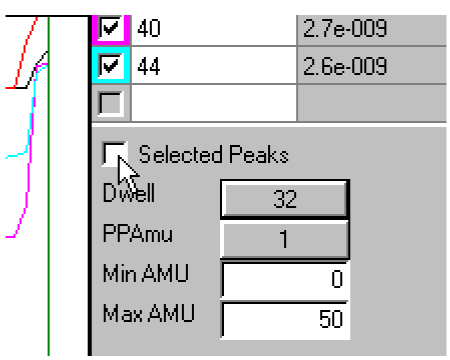
NOTE: If the installed Digital I/O board only provides eight outputs then do not select any output 9-16 as a setpoint relay.

12.6 Using Digital Outputs in Monitor

Digital Outputs can be programmed as mass setpoint alarm signals from Monitor. This allows for development and testing of alarms without the requirement of creating and running a custom recipe.

Monitor must be started first in order to program an output relay as a setpoint alarm from Monitor. Once Monitor is running, it must be changed from Spectrum Mode (the default mode) to Selected Peaks mode. To do this, select the checkbox labeled **Selected Peaks** on the Control Panel. See Figure 12-14. This will restart scanning in the Selected Peaks mode.

Figure 12-14 Changing Monitor to Selected Peaks mode



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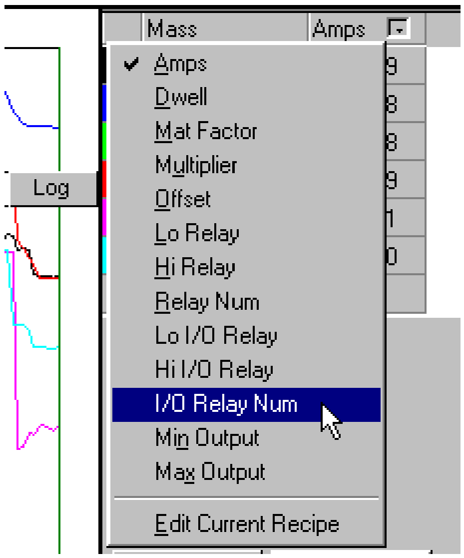
Once Selected Peaks scanning has started, the desired output relay can be selected from the drop-down list in the right column of the Mass Grid. First, the right column must be set to show I/O Relay Numbers by left-clicking on the pulldown arrow and selecting **I/O Relay Num**. See Figure 12-15.

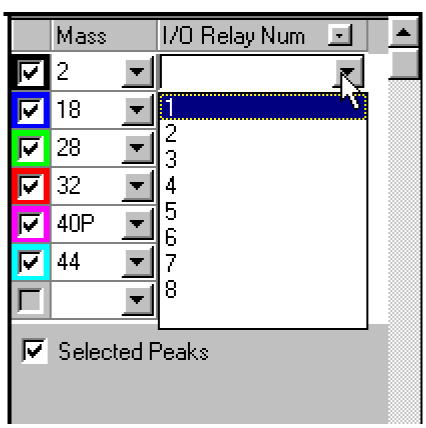
NOTE: Scanning can be stopped, to do this programming, and then restarted again using the Stop/Start button on the Control Panel.

Figure 12-15 Change the column to show I/O Relay Number



Next, the Relay Number can be selected for any mass in the Selected Peaks mass list by selecting the dropdown arrow in the **I/O Relay Num** column for that mass and selecting a Relay number. See Figure 12-16.

Figure 12-16 Assigning an I/O Relay to a Mass



Finally, the Setpoint level (i.e. threshold) can be set for the Mass and Relay Number by left-clicking on the pulldown arrow (in the right-hand column) and selecting **Lo I/O Relay** or **Hi I/O Relay**. Refer to the **Low Setpoint** and **High Setpoint** information in this chapter for details on their settings and actions.

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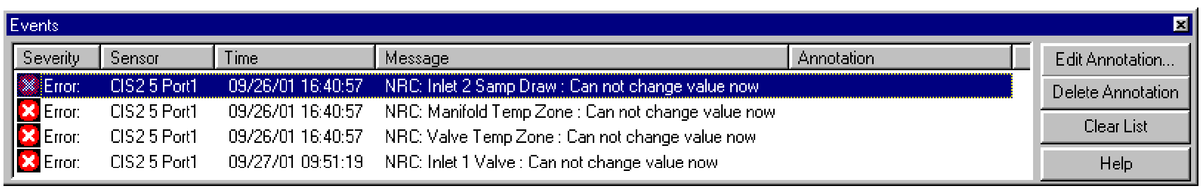
Chapter 13
When Things Go Wrong

13.1 Error Notification

When an error in one of the sensors is detected, an error box is displayed (see Figure 13-1). One or more errors can be displayed in this box and the box will stay displayed until you click **OK** to dismiss it. This allows several errors or warnings to accumulate when no one is watching the screen, that can be viewed, for example, when the operator returns. By default, only errors are displayed in this dialog, however, it is possible to configure the program to include warnings. (Refer to section 3.3, Sensor Configuration and Setup, on page 3-10).

Figure 13-1 Sensor Error Box

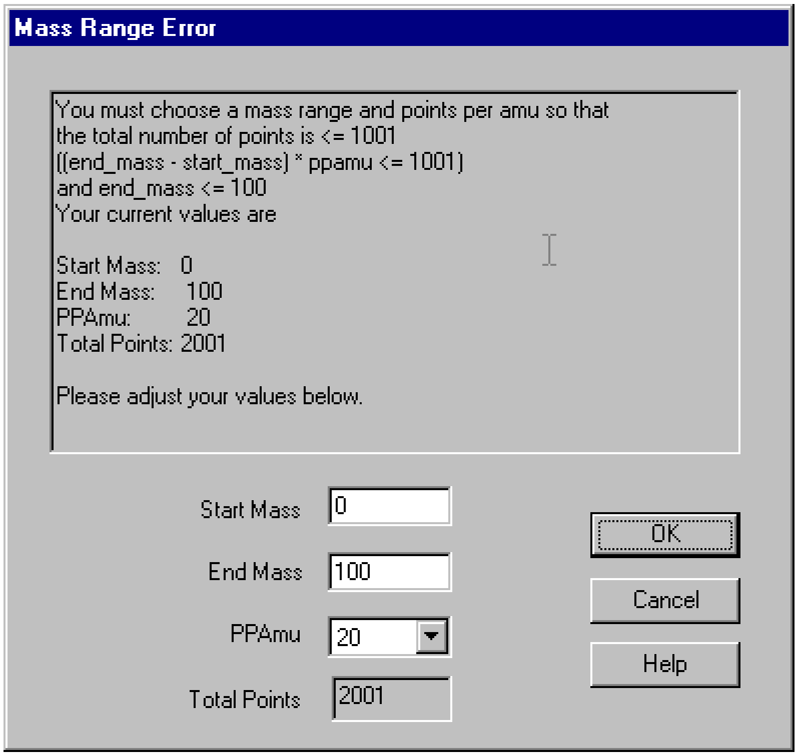


13.2 User Input Errors

Errors which occur due to invalid input or other user action are announced by error boxes with only one error per box. These errors must be dismissed before any further action can be taken by the user. The content of the error boxes varies with the error condition and what needs to be done to remedy the problem. Most of these error messages are self explanatory and are described in more detail in the sections to which they pertain. In many cases there is a **Help** button on the dialog, which will display the appropriate section of the manual.

One error dialog that bears mentioning here is the **Mass Range Error** dialog. Anywhere the scan width or points per AMU can be changed on the fly, a check is made to ensure that the total number of points does not exceed the maximum number of points for the sensor (1001 for newer Transpectors). If the maximum number of points is exceeded then the dialog shown in Figure 13-2 is displayed. This dialog allows you to adjust the **Start Mass**, **End Mass**, and/or **PPAmu** (points per AMU) until the total number of points is within range. This dialog contains a brief explanation of the problem and shows the current parameters and number of points. Any or all of the three parameters can be adjusted to bring the total number of points within range. Click **OK** to accept the modified values. Click **Cancel** to restore the parameter which caused the error to be displayed to its previous value.

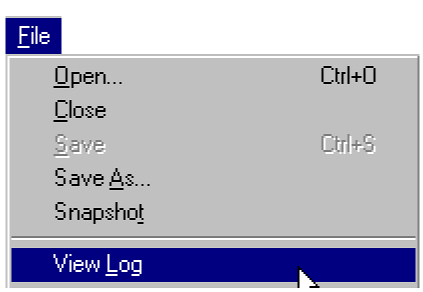
Figure 13-2 Mass Range Error Dialog

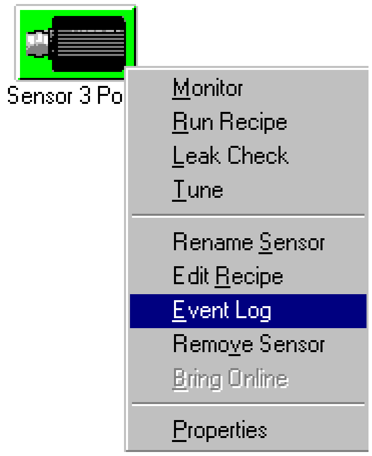


13.3 Viewing the Event Log

Errors, warnings, events and marks are logged in an event file according to the preferences selected in the **Sensor Properties** pages (refer to section 3.3, Sensor Configuration and Setup, on page 3-10). A new log file is created every day with the name Log*yyyymmdd*.evt. Where *yyyy* is the year, *mm* is the month, and *dd* is the day. To view the log file for a sensor select **File >> View Log** or select **Error Log** from the context menu when the cursor is over a sensor icon in the setup page (see Figure 13-3).

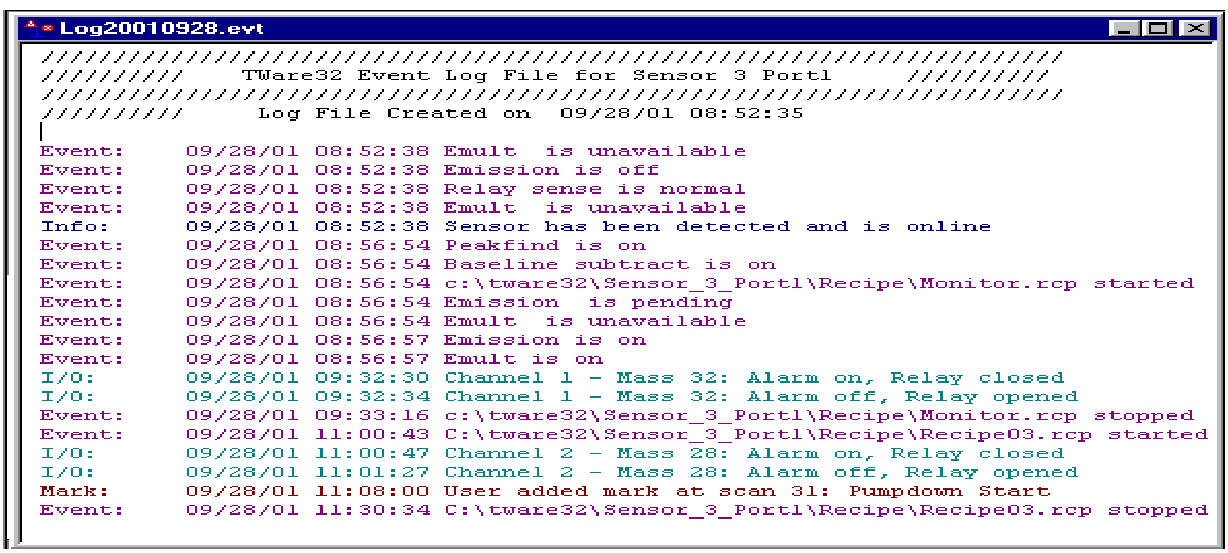
Figure 13-3 Viewing Event Logs





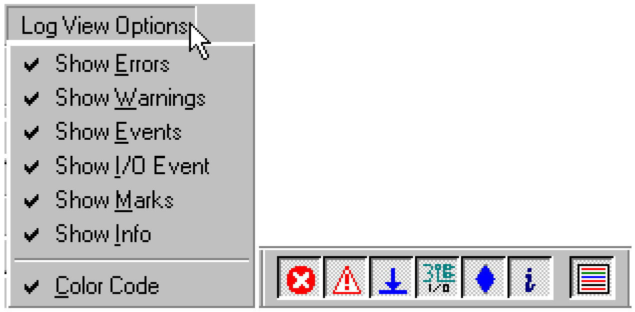
If invoked using the **File >> View Log** command, a file **Open** dialog (refer to section 2.6 on page 2-9) will be displayed to allow the selection of a log file to view. If invoked from the context menu on the **Setup Screen** then the current log file for that sensor will be displayed, for example see Figure 13-4.

Figure 13-4 Sample Event Log File



Log files contain Errors, Warnings, Events, I/O Events, Marks, and Informational messages. It is possible to selectively display or hide these classes of events or to color code them to facilitate locating errors, etc. **The Log View Options** menu and **Log View Toolbar**, shown in Figure 13-5, control these options. The buttons on the toolbar are in the same order as the items in the log view menu.

Figure 13-5 Log View Options



13.4 System Crash or Loss of Power

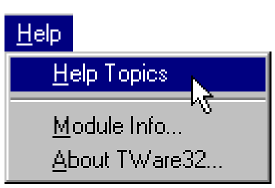
In the event of a system crash or loss of power during data collection, the data that was being collected will be recovered. Temporary files are stored during data collection to allow the system to recover data if necessary. Refer to section 8.10 on page 8-12 for information on Data Recovery.

13.5 Online Help

TWare32 is delivered with the complete Operating Manual (this document) on disk. Clicking on the **Help** button on most dialogs will open a window displaying the section of the manual which describes that dialog. Selecting **Help >> Help Topics** (see Figure 13-6) will display an index from which a desired topic can be selected. TWare32 uses the standard Windows Help system which is described in numerous books about Windows.

NOTE: When TWare32 is delivered on CD this manual is also on the CD as a .PDF file in the \Manuals folder.

Figure 13-6 Invoking Help



Under certain circumstances, you may experience a problem which is difficult to isolate or duplicate. In these cases the Technical Support representative may request additional information about the versions of the parts of the program. See section 13.6.1, Obtaining Version Information, on page 13-5.

NOTE: The Help file is graphic intensive and will consume system resources as it is used (when multi-page scrolling, for example). Use of Help should be limited when collecting data or performing critical tasks within TWare32.

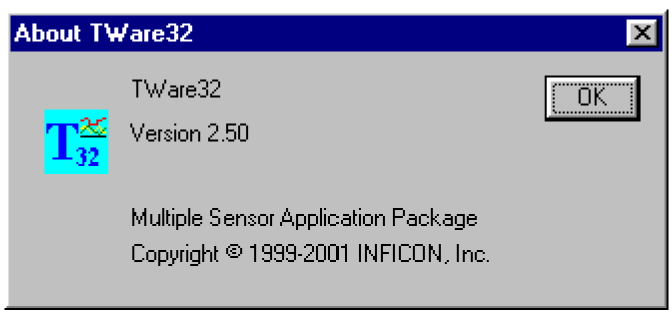
13.6 Troubleshooting

The following table lists several common problems that you may encounter and explains what can be done to remedy the situation. If after consulting this section the problem is still not solved, you will need to contact the Technical Support department or your local INFICON representative (refer to section 1.1.1, How To Contact Customer Support, on page 1-2).

13.6.1 Obtaining Version Information

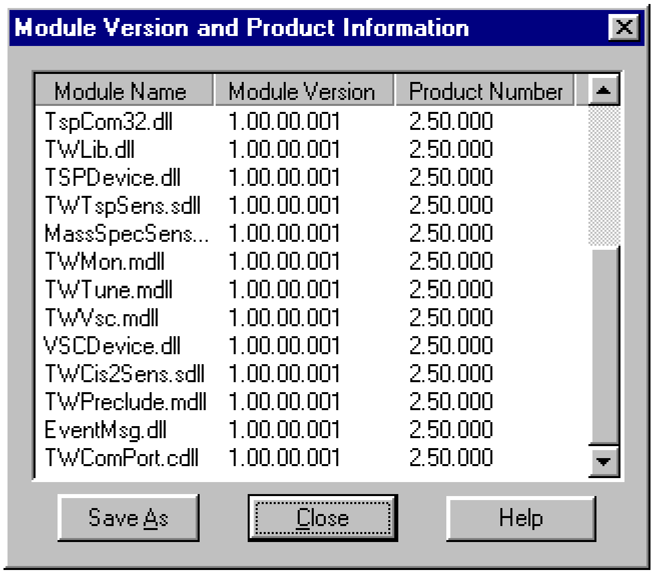
Selecting **Help >> About TWare32...** will display the program version information and identify it as either Multi Sensor or Single Sensor. Figure 13-7 is an example of an **About TWare32** dialog box. The information in this dialog is important in identifying and correcting problems. Please include the complete version number and identify the sensor application as either Multiple or Single whenever reporting a problem to Technical Support.

Figure 13-7 About TWare32 Dialog Box



In some cases, Technical Support may request detailed Module information. To obtain detailed Module information, select **Help >> Module Info...** from the **Help** menu. The dialog shown in Figure 13-8 is an example of this information. You can scroll through the list to obtain the specific module version, or click **Save As...** to save the complete list to a file. The resulting file is plain text which can be viewed and printed using any text editor such as Notepad, or e-mailed to the Technical Support staff.

Figure 13-8 Detailed Module Information



13.6.2 General Problems

Table 13-1 General Problems

PROBLEM	CAUSE	REMEDY
Mouse and keyboard don't work	Windows resources have been monopolized by TWare32. It is busy dealing with the display updates and data collection and therefore it never gets the time to respond to the keyboard or mouse.	If you are currently running a process, data is still being stored and some functionality will return after the Run is finished
		Turn off unnecessary graphs.
	Program is spending too much time refreshing the screen	Decrease range displayed in horizontal axis of graphs.
		Limit the number of simultaneous Processes.

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Table 13-1 General Problems (continued)

PROBLEM	CAUSE	REMEDY
	Data being acquired faster than program can process it.	Increase Dwell times where applicable.
		In the advanced functions dialog of the recipe editor, make sure Peak Lock and Baseline are on for all sensors.
Delayed keyboard and mouse response	Windows puts priority on display updates and data collection and therefore it has little time to respond to the keyboard or mouse.	Turn off unnecessary graphs.
		Decrease range displayed in horizontal axis of graphs.
		Limit the number of simultaneous Processes.
	Data being acquired faster than program can process it.	Increase Dwell times where applicable.
		In the advanced functions dialog of the recipe editor, make sure Peak Lock and Baseline are on for all sensors.
<filename> could not be reviewed in TWare32 **message**	The requested file does not exist, has been damaged, was not stored successfully, or is not a TWare32 file.	This file cannot be accessed by TWare32.
Sensor is Busy message	A communication anomaly caused a sensor to remain busy after a process was terminated.	Reset the Transpector and then bring it back on-line in Setup.
Monitor Recipe Error List message box when running a recipe	A parameter in the selected recipe is invalid for the selected sensor.	Select **Edit** and correct the problem or select **Cancel** and select another recipe.

Table 13-1 General Problems (continued)

PROBLEM	CAUSE	REMEDY
Recipe stopped due to file size limit message	Maximum file size of a SOD file is 10Mb or the maximum available space on your disk, whichever is less.	Reduce the number of scans in the Recipe.
		Reduce the ppAMU in the Recipe.
Cannot adjust EM any Further message when calibrating EM	Either the maximum or the minimum voltage for the EM was reached before the target signal was achieved.	If signal is adequate accept and use the last voltage.
		If signal is not adequate the Transpector may need service (see next section).
Cannot Converge message when calibrating EM	Unable to obtain three measurements within the specified tolerance.	Increase the tolerance.
		If signal is too noisy the Transpector may need servicing (see next section).

13.6.3 Transpector Issues

NOTE: A sensor *warning* is triggered when a system parameter in the Transpector falls outside its nominal operating conditions. Three *warnings* constitute an *error* condition.

Table 13-2 Transpector Issues

PROBLEM	CAUSE	REMEDY
Over Temperature Warning/Error Message	Transpector internal ambient temperature is >75 °C.	Make sure unit is installed properly, and the ambient temperature is <50 °C.
		Verify that there are no heat sources in local proximity.
	CPU card malfunction.	Replace CPU card.
Measurement Board Warning/Error Message	Measurement board CPU failure.	Replace Measurement board.

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Table 13-2 Transpector Issues (continued)

PROBLEM	CAUSE	REMEDY
Power Supply Warning/Error Message	Power Supply card failure.	Replace Transpector power supply card.
Over Pressure Warning/Error Message	Insufficient vacuum.	Verify pressure is less than 1e-4 Torr.
Anode Warning/Error Message	Defective Sensor, Anode shorted.	Check Transpector with Ohm meter for shorts. See Transpector Manual for sensor pin-outs.
	Power Supply card failure.	Replace Transpector power supply card.
Electron Multiplier Warning/Error Message	Defective Sensor, MCP or EM shorted.	Check Transpector with Ohm meter for shorts. See Transpector Manual for sensor pin-outs.
	Power Supply card failure.	Replace Transpector power supply card.
Emission Warning/Error Message	Defective sensor filament, open or shorted.	Check Transpector with Ohm meter for shorts. See Transpector Manual for sensor pin-outs.
		Replace Sensor or filament.
	Power Supply card failure.	Replace Transpector power supply card.
	Insufficient vacuum.	Verify pressure is less than 1e-4 Torr.
	Sensor operating voltages incorrect.	Verify correct settings. See Transpector manual for nominal sensor settings.
	Transpector not fully engaged on sensor.	Make sure Transpector unit is pushed all the way on to the sensor.
RF Warning/Error Message	Defective Sensor, RF leads open.	Fix or replace sensor.
	RF/DC card fault.	Replace RF/DC card.

Table 13-2 Transpector Issues (continued)

PROBLEM	CAUSE	REMEDY
Control Board Warning/Error Message	CPU board failure.	The CPU board failure type can be determined by the number of CPU LED flashes. Consult the Symptom Check List in the Transpector manual.
Peakfind Warning/Error Message	No peak can be found, or peak is too small for one or more of the masses in the Spectrum scan or the Selected Peaks mass list.	This is usually not a hardware problem. It is a normal occurrence in a functional sensor.
High noise level	Poor system grounding.	Verify Vacuum system is grounded.
	Damaged signal input.	Replace Transpector Measurement card.
	Output spring contact on sensor damaged or shorted.	Fix or replace. See your Transpector Manual.
	Transpector not mounted properly on sensor.	Push the Transpector all the way on the sensor.
	Transpector MCP or EM defective.	Replace MCP or EM assembly or sensor. See Transpector Manual.
	Scan speed too fast for gain setting.	Increase the dwell setting for your process.

13.6.4 Communications Errors

NOTE: Messages from the Sensor refer to an individual Transpector. Messages from the Master Node refer to the general communications link or driver.

Table 13-3 Communications Errors

PROBLEM	CAUSE	REMEDY
Time-out status from Sensor/Master Node	Configuration of Transpector address DIP switches incorrect.	Refer to Transpector Manual Section 1 (Installation).
	Baud Rate incorrect.	Check Baud rate selection on Transpector and in System properties page.
	Improper cable connections.	Make sure power and serial communications cables are connected to proper connectors. Refer to Transpector Manual's section on Installation.
	Incorrect COM port selected.	Select correct COM port in System properties page.
	Incorrect or damaged communications card.	Replace communications card in computer.
	Incorrect communications protocol.	Make sure Transpector and TWare32 are using the same communications protocol. RS-232 or RS-485.
Communications Overrun from Sensor/Master Node	Data is arriving faster than it can be handled.	Decrease the volume of communications.
Bad Checksum from the Sensor/Master Node	Noise in the communications system caused a corruption of the information that was being sent.	Reduce Cable lengths.
		Isolate External noise sources.
		Verify that two Transpectors do not have the same address.

Table 13-3 Communications Errors (continued)

PROBLEM	CAUSE	REMEDY
Fatal Communication error message	An unrecoverable communication error occurred.	The sensor has been thrown off-line and communications must be reset to resume. To bring the sensor back on-line go to the system setup screen, right-click on the appropriate sensor icon, and select **Bring Online**.
Sensor off-line and cannot be brought back on-line	Inconsistencies in internal sensor handling.	Save all data, close and restart TWare32.

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