Applied Systems Engineering, Inc.

ASE2000 Communication Test Set
User Guide

Document Version 2.2.1

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INTRODUCTION

Welcome to the ASE2000 Communication Test Set (ASE2000)—your key to reliable communication testing.

ASE2000 allows you to monitor and test communication between a primary station (also called a master or controlling station) and one or more secondary stations (also called slaves, RTUs, IEDs, or controlled stations). ASE2000 can both monitor communication between stations and simulate either type of station. ASE2000 also provides a variety of ways to meaningfully display messages and point information.

ABOUT THIS MANUAL

ASE2000 Communication Test Set User Guide provides detailed information about ASE2000 displays and commands. Use it as a reference tool when you work with ASE2000.

Before using this guide, you need to install ASE2000 by following the instructions in *ASE2000 Communication Test Set Getting Started*.

ASE2000 Communication Test Set User Guide is organized into the following chapters:

- Chapter 1 gets you up and running with ASE2000. It explains how to set up ASE2000 to simulate a primary station and to monitor a communication line between a primary station and one or more secondary stations.
- Chapter 2 describes the ASE2000 views and commands in detail.
- Chapter 3 is for the experienced ASE2000 user. It explains advanced operations, such as how to simulate a secondary station.
- Appendix A provides protocol-specific information and special procedures for certain protocols.

TECHNICAL SUPPORT

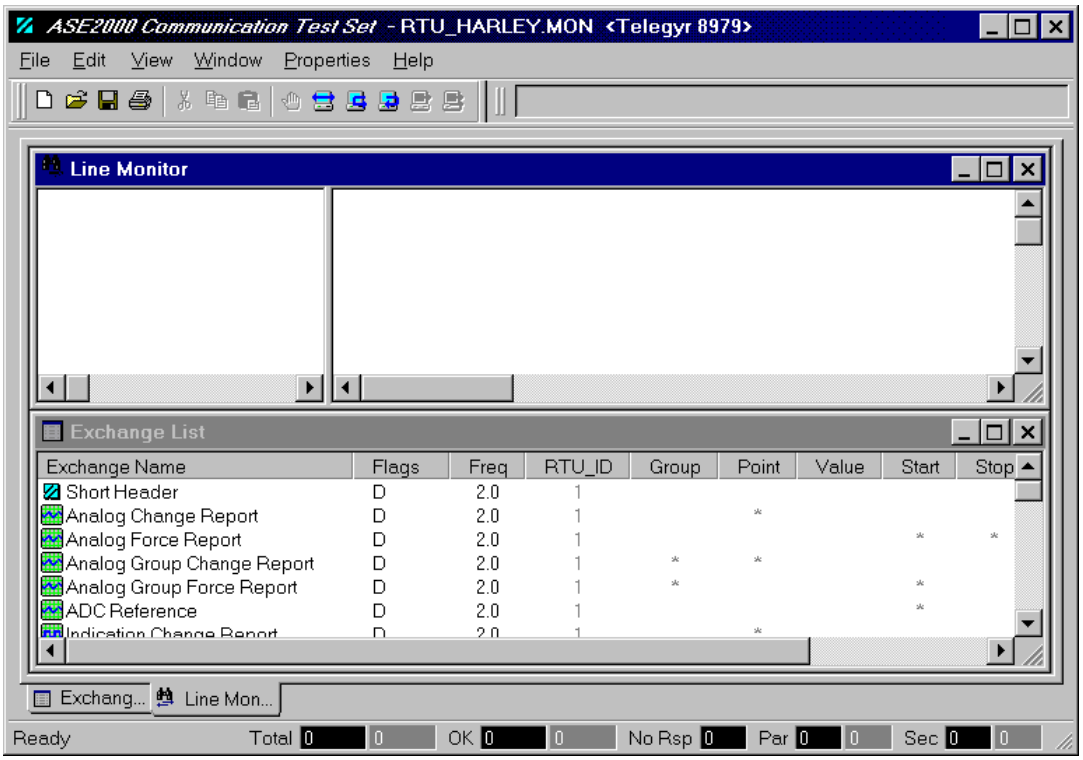
Please see the cover page of this document for Technical Support contact information.

CHAPTER 1: BASIC OPERATIONS

This chapter provides a quick tour of the most commonly used ASE2000 features. It explains how to monitor communication between primary stations and secondary stations and how to simulate a primary station.

ABOUT THE ASE2000 PROGRAM WINDOW

The ASE2000 program window includes a command bar at the top of the window and a work area for displaying messages and point information and for generating requests and responses. An optional toolbar provides shortcuts to ASE2000 commands. An optional status bar at the bottom of the window displays program status and summary information about the messages you are generating and monitoring.



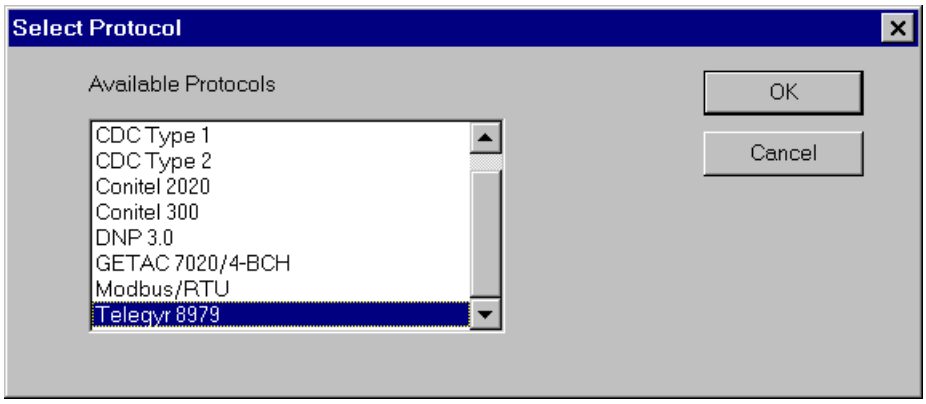
Chapter 2, “Working with Views,” explains the ASE2000 program window in more detail.

SELECTING A PROTOCOL

If the product package includes more than one protocol, you must select the protocol that the target station (the station you want to monitor or simulate) is using.

To select a protocol:

1. Choose File>Select Protocol. The Select Protocol dialog box appears with a list of the protocols included in the product package.



2. Select a protocol from the list; then click OK. ASE2000 displays the name of the selected protocol at the top of the program window and adjusts protocol-dependent settings and views, such as the Exchange List view, to reflect the selected protocol.

ASE2000 uses the selected protocol when monitoring and simulating messages.

OPENING A VIEW

The ASE2000 work area is organized into the following views:

- **Line Monitor – Raw.** Displays the messages exchanged between stations in a raw format, that is, a format in which each data word has a numeric representation. This view appears in the Line Monitor window of the work area.
- **Line Monitor – Interpreted.** Displays the messages exchanged between stations in an interpreted format, that is, a format that includes message names, point values, and other high-level information. This view appears in the Line Monitor window of the work area. When both the Line Monitor – Interpreted and Line Monitor – Raw views are open, the Raw view appears to the left of the Interpreted view in the Line Monitor window.
- **Point Values.** For each secondary station, displays input-point information in a tabular format and updates it in real time. This information optionally includes user-specified secondary-station names, point names, alarm limits, and the raw and converted value of each point, where the conversion coefficients and engineering units are also user-specified. For more information, see "Working with the Point Values View" in Chapter 2.
- **Exchange List.** Lists exchange templates. By default, this list includes an entry for each type of exchange that the selected protocol supports (such as

scan or trip/close). ASE2000 uses the exchange templates to display exchanges (requests and responses) in the Line Monitor – Raw, Line Monitor – Interpreted, and Timeline views, and to generate requests and responses when simulating a primary or secondary station. For more information on the Exchange List view, see "Simulating a Primary Station" later in this chapter.

- **Line Analyzer**. Charts carrier-detect and receive-data signals in real time for troubleshooting low-level communication problems, in particular, modem timing problems.
- **Event Log File.** Displays event information that ASE2000 previously captured in a file. If ASE2000 is currently logging events, the view displays the new events as they are logged. For more information about events, see "Generating Events" in Chapter 3.
- **Analog Control.** Lets you build and send a series of analog control requests, where you specify only the start and stop points, the start and stop output values, and a step factor; ASE2000 interpolates the rest of the output values.
- **Digital Control.** Lets you build and send a series of digital control requests, where you specify the types of requests (such as trip or close) and the start and stop indices of the range of target points.
- **Timeline.** Charts exchanges and carrier signals against a timeline.

Use the following procedure to open or close a view.

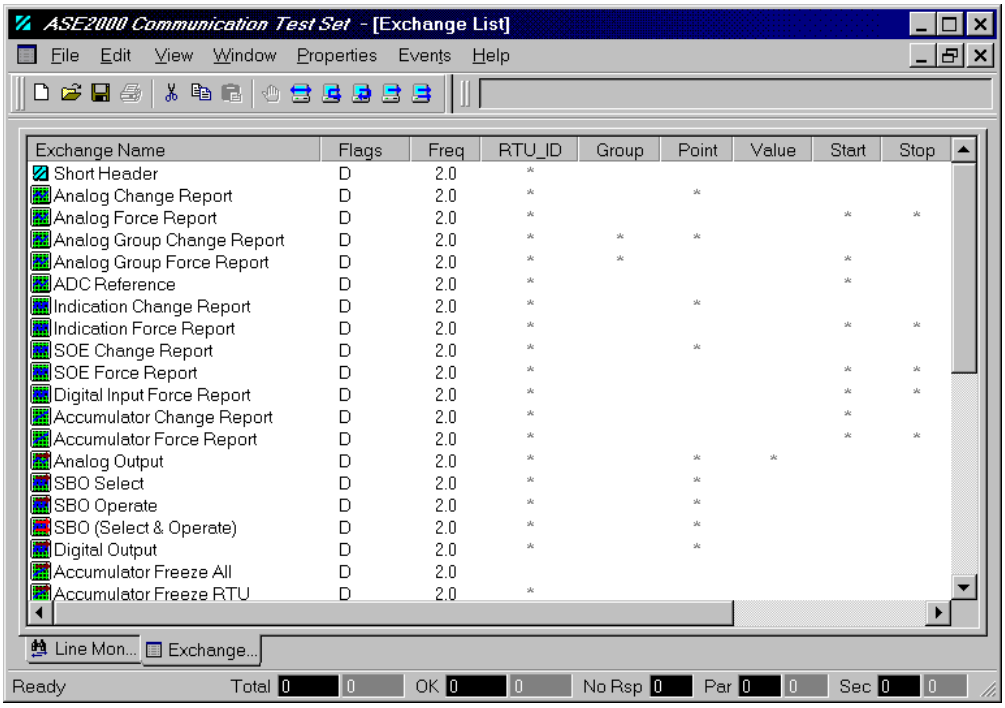
To open or close a view:

1. Click View on the command bar. The menu of ASE2000 views appears. A checkmark next to a view name indicates that the view is currently open (it may be minimized or hidden under other open views in the work area).
2. Click the name of the view you want to open or close. If you click the name of a closed view, ASE2000 opens the view and a checkmark appears beside the view name in the menu. If you click the name of an open view, ASE2000 closes the view and removes the checkmark from the view name in the menu.

You can open multiple views. You can adjust the size of a view by dragging the edges or lower right corner of the view. To expand a view to fill the entire work area, click the maximize icon in the upper right corner of the view. Labeled view tabs at the bottom of the work area let you page through expanded views.

To page through expanded views:

1. Choose View>Workbook to show (or hide) the view tabs. A checkmark next to Workbook in the View menu indicates that tabs are visible.
2. Select the tab of the view you want on top.



To make a view active, click on the view, select the view tab, or choose the Window command and select from the menu of open view names. The ASE2000 commands available to you change depending on the active view.

Chapter 2, “Working with Views,” explains each ASE2000 view in detail.

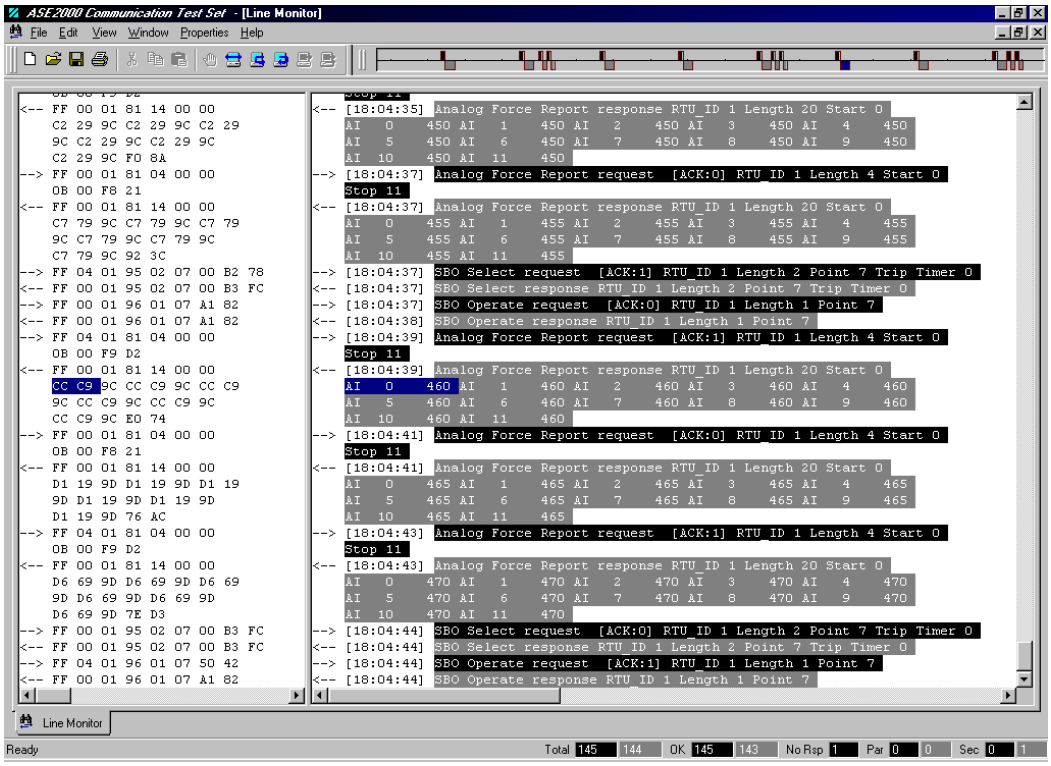
ABOUT THE LINE MONITOR VIEWS

The Line Monitor – Raw and Line Monitor – Interpreted views share the Line Monitor window in the work area. When ASE2000 monitors the communication (comm) line or simulates a station, it displays the comm-line messages in these views.

Both views display the same messages, but in different formats. In both views, a right arrow (→) precedes messages from the primary station, and a left arrow (←) precedes messages from the secondary station. The background color also indicates the source of the message (by default, messages from the primary station have a black background and messages from the secondary station have a dark gray background). In the Line Monitor – Interpreted view, each message is labeled with the name of the exchange, as specified in the Exchange List view.

The Display Properties dialog box (Properties>Display) lets you specify the raw data format and other display characteristics. “Working with the Line Monitor Views” in Chapter 2 describes setting display properties in detail.

If you select part of a message in one view, ASE2000 highlights the corresponding portion of the message in the opposite view. For example, if you select an analog point field in the Interpreted view, ASE2000 highlights the bytes containing the analog point data in the Raw view.



MONITORING A COMMUNICATION LINE

If you have the ASE2000 monitoring hardware installed (see *ASE2000 Communication Test Set Getting Started* for installation instructions), you can monitor the communication line using the following procedure.

To monitor the comm line:

1. Select the protocol that the target stations are using, following the procedure described in "Selecting a Protocol" earlier in this chapter.
2. Open the Line Monitor – Raw, Line Monitor – Interpreted, and Point Values views, following the procedure described in "Opening a View" earlier in this chapter.
3. Choose File>Monitor or click the Monitor icon on the toolbar to start monitoring.

As ASE2000 detects messages on the comm line, they appear in the Line Monitor views. If the messages contain input-point information, ASE2000 updates the Point Values view with the point data (see "Working with the Point Values View"

in Chapter 2 for more information). To stop monitoring, click the Stop icon on the toolbar or choose File>Stop.

Troubleshooting:

- ***No data.*** *If message data does not appear in the Line Monitor window, check the following:*
  - ***Cabling.*** *Make sure that the equipment is cabled correctly, as described in the* Getting Started *manual.*
  - ***Bell-202 modem.*** *If you are using the Bell-202 modem, make sure that only the yellow and black wires are connected.*
  - ***Monitor-adapter cable.*** *If you are using the RS-232 monitor-adapter cable, make sure you have connected the four DB-25 connectors correctly.*
- ***Wrong direction.*** *If you see data, but the messages appear to be coming from the wrong direction (for example, messages from the secondary station appear to be coming from the primary station), choose Properties>Communication>Channel and switch the A and B channel assignments.*
- ***Communication errors.*** *If you are getting a lot of parity or security errors (see the communication error statistics at the bottom of the program window for error counts), choose Properties>Communication>Line and check the baud rate setting.*

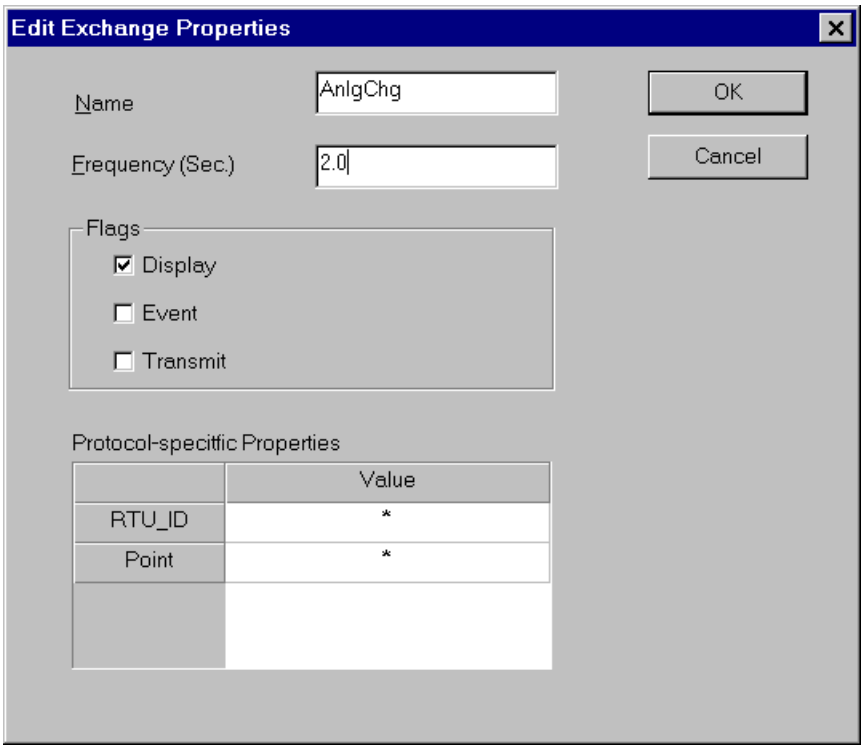
SIMULATING A PRIMARY STATION

If you have the ASE2000 hardware connected to a secondary station (see *ASE2000 Communication Test Set Getting Started* for installation instructions), you can send requests to the secondary station and monitor its responses. The following procedure provides a quick and easy way to generate requests.

To simulate a primary station:

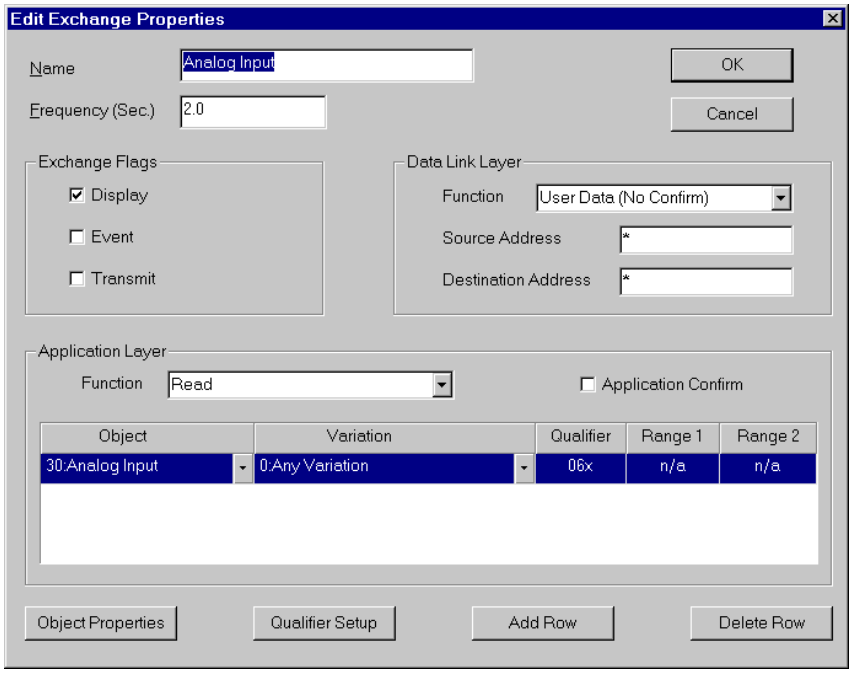
1. Select the protocol that the target primary station is using, following the procedure described in "Selecting a Protocol" earlier in this chapter.
2. Open the Line Monitor – Raw, Line Monitor – Interpreted, and Point Values views following the procedure described in "Opening a View" earlier in this chapter. You can use the Line Monitor views to monitor the transmission of requests and the secondary-station responses to them. ASE2000 updates the Point Values view with secondary-station input-point information as it detects the data on the comm line.
3. Open the Exchange List view. The Exchange List view displays a list of exchange templates. By default, this list includes one template for each exchange type that the selected protocol supports. You need this view to generate requests.

4. Double-click the exchange template that you want to use for the request, such as a scan template. The Edit Exchange Properties dialog box appears with a list of properties that apply to the template. For all protocols except DNP 3.0, the dialog box looks like this:



5. For protocols other than DNP 3.0, enter values for the properties that are listed in the section of the dialog box labeled Protocol-specific Properties (for DNP 3.0, see the following paragraph). Note that these properties vary depending on the selected protocol and exchange type; they may include secondary-station ID, group, point number, and so on. For the time being, do not change the other fields in the dialog box (Name, Frequency, Display, Event, and Transmit). Click OK to exit the dialog box. "Working with the Exchange List View" in Chapter 2 explains the Edit Exchange Properties dialog box in detail.

   The following figure shows the Edit Exchange Properties dialog box for DNP 3.0. If you are using DNP 3.0, enter the appropriate values into the Source Address and Destination Address fields. ASE2000 provides valid data for the other fields.



6. With the target exchange template selected, build and transmit the request using one of the following options:

- **Send Once.** Click the Send Once icon on the toolbar or choose File>Send Once. ASE2000 builds a request from the information in the selected exchange template and sends the request only once to the secondary station specified in the template.
- **Send Continuously.** Click the Send Continuously icon on the toolbar or choose File>Send Continuously. ASE2000 builds a request from the information in the exchange template and sends the request at the frequency specified in the template until you choose File>Stop or click the Stop icon on the toolbar. The default frequency is every two seconds.

Troubleshooting: *If message data does not appear in the Line Monitor window, check the following:*

- ***Cabling.*** *Make sure that the equipment is cabled correctly, as described in the* Getting Started *manual.*
- ***Channel assignment.*** *Make sure that the ASE2000 secondary-station channel assignment is correct. By default, ASE2000 assigns channel A to the secondary station and channel B to the primary station. If you cabled channel B to the secondary station, assign channel B to the secondary station using the Channel Properties dialog box (choose Properties >Communication>Channel).*

- ***Monitor-adapter cable.*** *Do not use the monitor-adapter cable when simulating.*
- ***Bell-202 modem.*** *If you are using the Bell-202 modem, make sure you are using only one channel. For that channel, make sure that the red and green wires are connected to the secondary-station receiver and that the yellow and black wires are connected to its transmitter.*

If ASE2000 is transmitting requests (request messages appear in the Line Monitor window), but the secondary station is not responding (response messages do not appear in the window), check the following:

- ***Secondary-station ID.*** *Make sure you are using the correct secondary-station ID in the requests. You can do this by checking the Line Monitor – Interpreted view, which displays the target secondary-station ID for each request. If the ID is incorrect, open the exchange template and enter the correct ID in the secondary-station ID field, as described in Step 2 above.*
- ***Null modem adapter.*** *If you are using RS-232 communication, make sure you have installed a null modem adapter, as described in* ASE2000 Communication Test Set Getting Started.

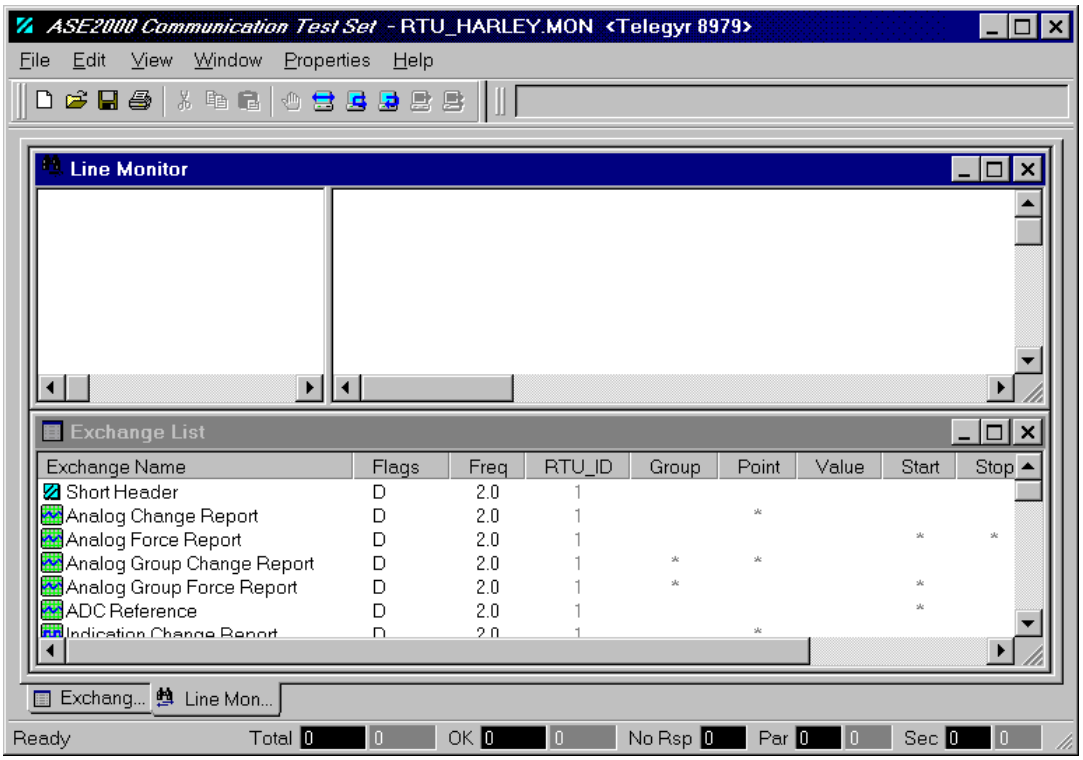
To send a series of requests of different types, see "Working with the Exchange List View" in Chapter 2.

CHAPTER 2: WORKING WITH VIEWS

This chapter describes the ASE2000 program window, work area, and views in detail. ASE2000 uses the work area to display views. Views let you

- See comm-line messages in real time
- Create requests and responses
- View input-point data in real time
- Review event logs
- Troubleshoot communication

TAKING A CLOSER LOOK AT THE PROGRAM WINDOW



The ASE2000 program window includes the following components:

- **Command bar.** Bar of ASE2000 commands, including
  - **File.** Create, open, close, or save files; enable monitoring or simulation; select a protocol; view a capture file; exit the program.
  - **Edit.** Edit elements of the active view.

Note: *ASE2000 also displays the view-specific Edit menu when you click the right mouse button in the view.*

- **View.** Open or close a view; show or hide the toolbar, status bar, timeline view, view tabs.
- **Window.** Organize the work area or select a view.
- **Properties.** Assign values to ASE2000 properties, such as display and communication properties.
- **Help.** Get command-specific help.

The command bar always appears at the top of the program window. Menu items in each category change dynamically, depending on the state of the work environment and the active view. Dimmed items are not selectable.

- **Toolbar.** Shortcuts to applicable ASE2000 commands. The toolbar icons change depending on the active view and selection. By default, the toolbar appears below the command menu; however, you can drag and dock it anywhere on the monitor screen. You can show or hide the toolbar by choosing View>Toolbar.
- **Timeline.** View of carrier signals and exchanges against a timeline. This view is implemented as a toolbar; so you can drag and dock it anywhere on the monitor screen. You can show or hide the Timeline view by choosing View>Timeline Bar. Exchanges appear in the Timeline view as ASE2000 detects them on the communication line. For more information on the Timeline view, see "Working With the Timeline View" later in this chapter.
- **Work area.** Area in which open views appear. The work area always appears below the command bar in the program window. The View command lets you open and close views. You can re-arrange views in the work area by choosing Window>Cascade or Window>Tile.
- **View tabs.** Tabs that allow you to page through expanded views. The view tabs appear below the work area. You can show or hide the view tabs by choosing View>Workbook.
- **Status bar.** Bar that shows program status and summary information about the messages that you are monitoring. The status bar appears at the bottom of the program window. You can show or hide it by choosing View>Status Bar. Summary message information includes the following:
  - **Total.** The number of requests, followed by the number of responses, that ASE2000 has detected during the current work session.
  - **OK.** The number of error-free requests, followed by the number of error-free responses, detected during the current work session.
  - **No Rsp.** The number of requests for which ASE2000 expected a response, but did not receive one during the current work session.

- **Par.** The number of requests with parity errors, followed by the number of responses with parity errors, detected during the current work session.
- **Sec.** The number of requests with security errors, followed by the number of responses with security errors, detected during the current work session.

As ASE2000 displays messages in the Line Monitor views, it updates these fields. To reset them, choose Edit>Reset Statistics with the Line Monitor window active.

SAVING YOUR WORK

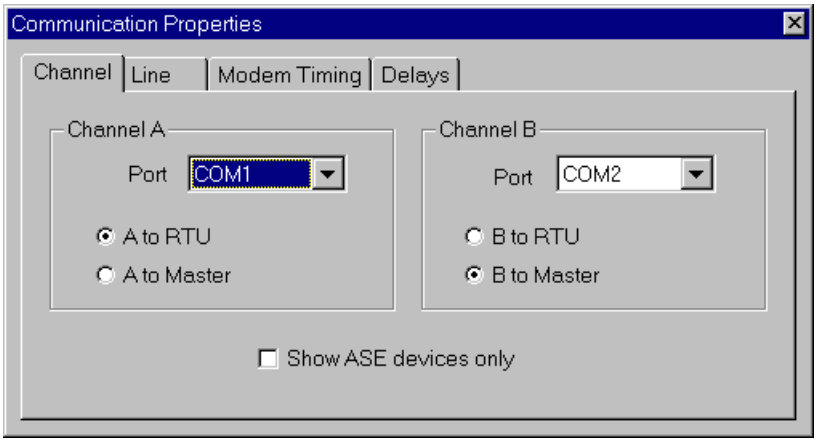
ASE2000 lets you save and reload the following components of the program environment:

- **ASE2000 settings.** When you run ASE2000 without specifying a file name, the program opens a new file with a default filename. You can save the application environment you are creating, that is, the changes that you make to the default ASE2000 settings, by choosing File>Save or File>Save As. These work like standard Windows commands. When you run ASE2000 and open a file that you previously saved, ASE2000 loads the settings contained in the file. You can modify these settings, save, and reload them.
- **Point configurations.** You can also save the point configurations displayed in the Point Values view. See "Working with the Point Values View" in this chapter for more information.

SETTING COMMUNICATION PROPERTIES

ASE2000 communication properties provide access to communication hardware parameters, such as baud rate and port assignments. To assign values to communication properties, choose Properties>Communication. The Communication Properties dialog box appears with the following tabs:

- **Channel.** ASE2000 channel and PC comm port assignments.
- **Line.** Baud rate, carrier control, and serial line settings.
- **Modem Timing.** Modem signal adjustments.
- **Delays.** Coarse timing adjustments for slow-responding stations.



Use the following procedures to set communication properties.

To assign ASE2000 channels and comm ports:

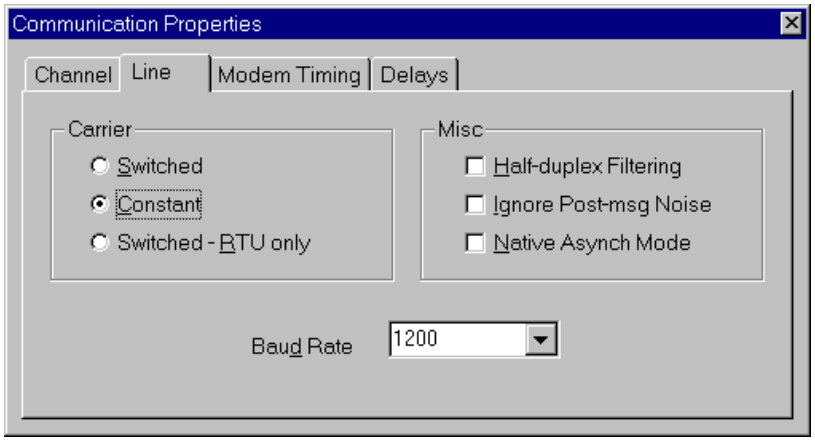
1. Select the Channel tab of the Communication Properties dialog box. The Channel Properties dialog box appears.
2. Assign values to the channel properties as follows:
   - **Assign a port to channel A.** In the box labeled Channel A, select a port from the list of ports provided.
   - **Assign a port to channel B.** In the box labeled Channel B, select a port from the list of ports provided.

     Note: *To see only the ASE comm ports (that is, the comm ports on the ASE communication card) in the comm port lists, checkmark Show ASE devices only. ASE comm ports support both bit and byte protocols and provide an interface to the ASE Bell-202 modem. Other PC comm ports support only byte protocols, and you cannot use them with the Bell-202 modem.*
   - **Assign channel A to a station.** By default, ASE2000 assigns channel A to the secondary station. However, if you connected the channel A hardware to the primary station, click A to Master in the box labeled Channel A.
   - **Assign channel B to a station.** By default, ASE2000 assigns channel B to the primary station. However, if you connected the channel B hardware to the secondary station, click B to RTU in the box labeled Channel B.

To set line properties:

Important Note: *If you are using standard PC COM ports, there are certain properties that cannot be changed*

1. Select the Line tab of the Communication Properties dialog box. The Line Properties dialog box appears.



2. Assign values to line properties as follows:

- **Carrier.** Set carrier to one of the following:
  - **Switched.** For transmission, ASE2000 turns on the carrier signal only when it sends a message and turns off the signal after transmission. For reception, ASE2000 requires a carrier signal before processing received data (data with no carrier is discarded as noise).

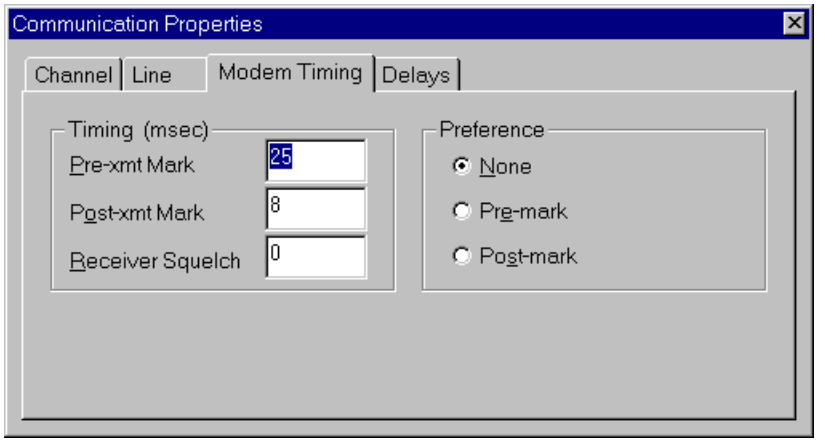
    Important Note: *If you are using standard PC COM ports and the Windows 95 or 98 operating system, the communication channel operates only in Constant Carrier mode. This is due to an error in the Microsoft standard COM port device driver. Windows NT does support this option correctly with standard COM ports.*
  - **Constant.** For transmission, ASE2000 turns on the carrier signal and leaves it on all the time. For reception, ASE2000 processes all data received, regardless of incoming carrier status. This is the default setting.
  - **Switched – RTU only.** ASE2000 treats the primary-station line as constant (see previous bullet), and the secondary-station line as switched (see first bullet). **NOTE: See comment above under Switched.**
- **Half-duplex Filtering.** Checkmark this box if you want ASE2000 to ignore incoming messages when transmitting. If you are using a half-duplex comm line, this prevents ASE2000 from hearing the echo of its own transmission.
- **Ignore Post-msg Noise.** Checkmark this box if you want ASE2000 to ignore input after detecting the logical end of an incoming message. ASE2000 discards all subsequent data until the incoming carrier has dropped or some reasonable period of time has elapsed (the length of this interval varies depending on baud rate, selected protocol, and other factors).

- **Native Asynch Mode.** Checkmark this box if you are having communication problems with an asynchronous byte protocol. This property applies to ASE2000 hardware (PCMCIA and BCOM) only (other hardware always operates in native asynch mode). This feature is useful when communicating with older, slower devices that cannot maintain communication at a constant speed. Note that if you checkmark this box, you may lose some accuracy in pre-transmission and post-transmission marks.
- **Baud Rate.** Set the baud rate to the baud rate of the comm line. You can choose a standard baud rate from the menu or enter a non-standard rate.

To set modem timing properties:

Important Note: *Modem timing properties (pre-transmission mark, post-transmission mark, and receiver squelch times) require ASE hardware (PCMCIA or BCOM2) and are not supported on the COM model.*

1. Select the Modem Timing tab of the Communication Properties dialog box. The Modem Timing Properties dialog box appears.



2. Assign values to the modem-timing properties as follows:

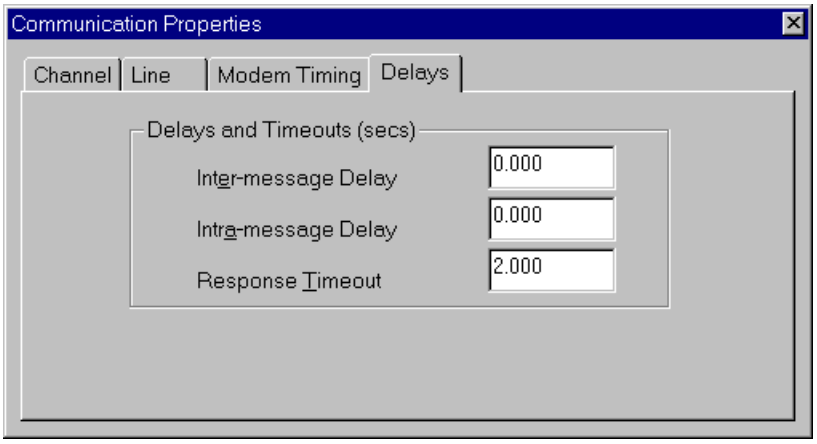
- **Pre-xmt Mark.** Enter a pre-transmission mark in milliseconds (default is 25). ASE2000 leaves the carrier signal on for at least the specified interval before transmitting a request or response.
- **Post-xmt Mark.** Enter a post-transmission mark in milliseconds (default is 8). ASE2000 leaves the carrier signal on for at least the specified interval after transmitting a request or response.

  Note: *The Pre-xmt Mark and Post-xmt Mark only apply to messages that ASE2000 transmits when simulating a station; they do not apply to messages that ASE2000 receives from a station.*

- **Receiver Squelch.** Enter receiver squelch in milliseconds (default is 0). ASE2000 ignores input for the specified interval after it detects an incoming carrier signal. This property applies only if the incoming carrier is switched.
- **Preference.** Indicate which mark should be accurate to one bit-time. The other mark may exceed the specified time by up to seven bit-times. (None is the default, that is, either mark may exceed the specified time by up to seven bit-times.)

To set message delays and response timeout:

1. Select the Delays tab of the Communication Properties dialog box. The Delays and Timeout Properties dialog box appears.



2. Set delay and timeout properties as follows:
   - **Inter-message Delay.** Enter an inter-message delay interval in seconds. You can specify up to three decimal places; the default is 0.000. When simulating a primary station, ASE2000 waits the specified interval after receiving a response from the secondary station and before sending the next request (of a new exchange).
   - **Intra-message Delay.** Enter an intra-message delay interval in seconds. You can specify up to three decimal places; the default is 0.000. When simulating a primary station, ASE2000 waits the specified interval after receiving a response from the secondary station and before sending the continuation request of the same exchange. For example, ASE2000 applies this delay between the select and operate steps of a control output exchange.
   - **Response Timeout.** Enter a response timeout interval in seconds. You can specify up to three decimal places; the default is 2.000. ASE2000 waits the specified interval for the secondary station response to a request before declaring a timeout error. When a timeout occurs, ASE2000 prints

"Response Timeout" in the Response field of the Line Monitor – Interpreted view and increments the response-timeout running total displayed in the status bar of the program window. You can also instruct ASE2000 to generate an event on timeout. For more information about events, see "Generating Events" in Chapter 3.

WORKING WITH THE LINE MONITOR VIEWS

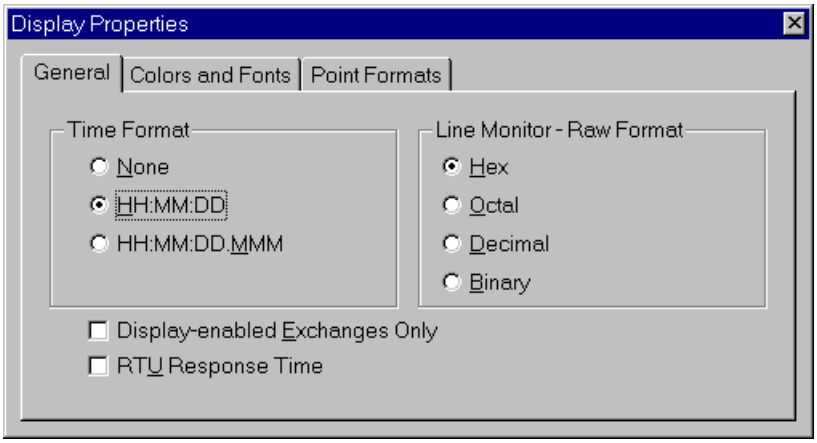
The Line Monitor – Raw and Line Monitor – Interpreted views display messages as ASE2000 detects them on the communication line. Both views appear in the Line Monitor window of the work area. See "About the Line Monitor Views" in Chapter 1 for an introduction to these views.

This section explains how to set the display properties used in the Line Monitor views and describes the commands available to you when the Line Monitor window is active.

Setting Display Properties

To specify how you want ASE2000 to display messages in the Line Monitor views, choose Properties>Display. The Display Properties dialog box appears with the following tabs:

- **General.** General display properties, such as time and raw data formats.
- **Colors and Fonts.** Color and font properties.
- **Point Formats.** Format setting for each point type.



Set display properties using the following procedures.

To specify the format of the timestamp used in the Line Monitor – Interpreted view:

1. Select the General tab of the Display Properties dialog box.

2. In the Time Format box, select a format, or None, if you do not want timestamps displayed. HH:MM:DD is the default.

To display secondary-station response time in the Line Monitor – Interpreted view:

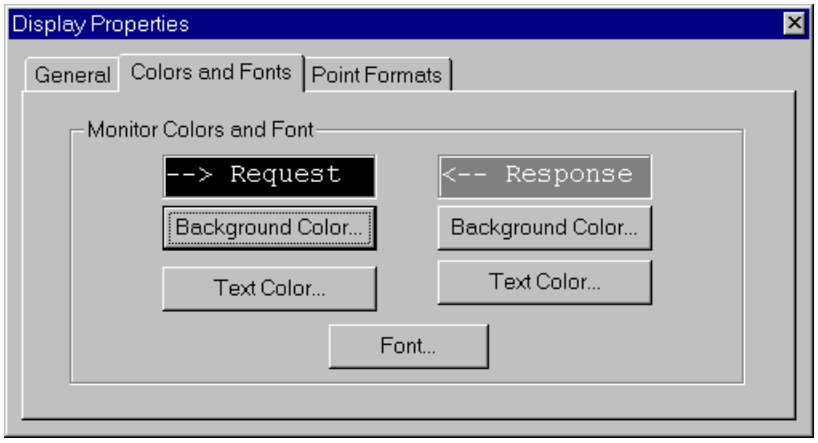
1. Select the General tab of the Display Properties dialog box.
2. Checkmark the box labeled RTU Response Time. When this box is checkmarked, for each response, ASE2000 displays the interval (in milliseconds) between the time it detects the last bit of a request and the first bit of the corresponding response. By default, this box is not checkmarked (ASE2000 does not display response time).

To specify the format used in the Line Monitor – Raw view:

1. Select the General tab of the Display Properties dialog box.
2. In the Line Monitor – Raw Format box, select a format. Hex is the default.

To set color and font properties for the Line Monitor views:

1. Select the Colors and Fonts tab of the Display Properties dialog box.

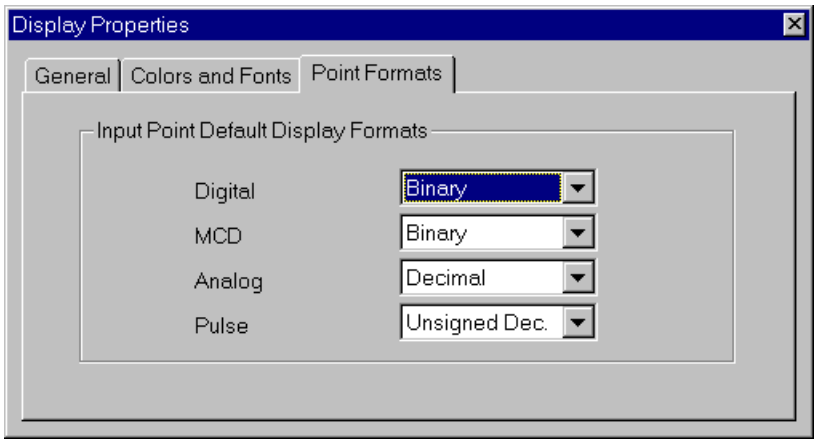


2. Assign values to color and font properties as follows:
   - **Request background.** To set the background color for requests, click the Background Color button under the Request display; then select a color from the color palette and click OK. Black is the default.
   - **Request foreground.** To set the foreground color for requests, click the Text Color button under the Request display; then select a color from the color palette and click OK. White is the default.
   - **Response background.** To set the background color for responses, click the Background Color button under the Response display; then select a color from the color palette and click OK. Dark gray is the default.

- **Response foreground.** To set the foreground color for responses, click the Text Color button under the Response display; then select a color from the color palette and click OK. White is the default.
- **Font.** To set the font used in messages, select the Font button; then select the font, font style, and point size from the menus provided and click OK.

To specify formats for point values in the Line Monitor – Interpreted view:

1. Select the Point Formats tab of the Display Properties dialog box.



2. For each type of point listed, select a format from the menu. ASE2000 uses the specified formats when displaying point values in any view, including the Line Monitor – Interpreted view.

   Note: *If you select the Volts/ma format from the Analog menu, ASE2000 displays analog input values in volts or milliamps (ma) according to the secondary-station A/D converter range. Choose Properties>Point Configuration >Analog Point Info to specify the A/D converter range. "Viewing Point Configuration" in Chapter 3 describes point configuration properties in more detail.*

ASE2000 uses the exchange names that appear in the Exchange List view to label matching requests and responses in the Line Monitor – Interpreted view. If ASE2000 cannot match a request or response to an exchange template, it labels the message Unknown. The default exchange name reflects the exchange type. You can change the exchange name using the following procedure; however, the exchange type remains the same.

To specify the exchange names used in the Line Monitor – Interpreted view:

1. Open the Exchange List view.
2. For each name you want to specify, double-click the exchange template in the Exchange List view and enter a new name in the Name field of the Edit

Exchange Properties dialog box; then click OK. The new name appears in the exchange template, and ASE2000 uses it to label corresponding requests and responses in the Line Monitor – Interpreted view.

Finding a Message

ASE2000 provides several options for finding a message in the Line Monitor views. You can mark a message; then tell ASE2000 to find a matching message. You can also search for messages by name, by timestamp, or by event.

To mark a message:

Select the message that you want to mark in the Line Monitor – Raw or Line Monitor – Interpreted view and choose Edit>Mark Message, or right-button click the message and choose Mark Message. ASE2000 highlights the marked message.

To find a message in the Line Monitor views:

1. With monitoring and simulating stopped, position the top of the Line Monitor vertical scroll bar to the message at which you want the search to begin. ASE2000 searches for a match starting at that position in the message list and moving forward in time (oldest to newest).
2. With the Line Monitor window active, choose Edit>Find Message or right-button click anywhere in the view and choose Find Message. The Find Message dialog box appears.
3. Select a search method from the options in the Search On box:
   - **Time.** Enter a timestamp in the Time field. ASE2000 locates the first message with the specified timestamp. If there is not an exact match, ASE2000 locates the closest match detected earlier than the specified time.
   - **Name.** Select an exchange name from the menu. ASE2000 locates the first message with the specified exchange name.
   - **Mark.** You must first mark the message you want to match using the procedure described earlier in this section. ASE2000 locates the marked message.
   - **Event.** ASE2000 locates the first message that triggered an event. See "Generating Events" in Chapter 3 for more information about events.

   Click OK. ASE2000 searches the message list for the first matching message and displays it at the top of the view.

To find the next message that matches the search criteria:

With the Line Monitor window active, choose Edit>Find Next, or right-button click anywhere in the view and choose Find Next. ASE2000 looks for the next message that matches the criteria you specified in the Find Message dialog box.

Clearing Messages from the Views

Use the following procedure to clear the Line Monitor – Raw and Line Monitor – Interpreted views.

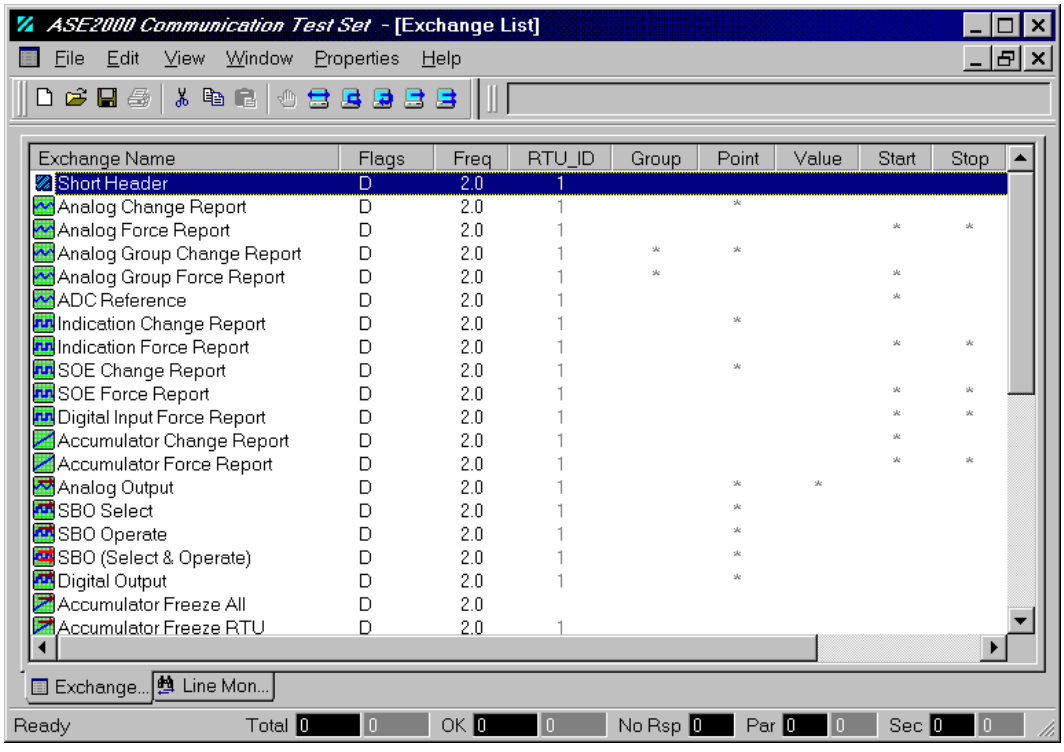
To clear all messages from the Line Monitor window:

With the Line Monitor window active, choose Edit>Clear All Messages, or right-button click anywhere in the window and choose Clear All Messages. ASE2000 deletes all the messages in the Line Monitor window.

WORKING WITH THE EXCHANGE LIST VIEW

An exchange is an instance of a request/response message pair; for example, a primary-station scan request and the secondary-station response to that request constitutes an exchange. Exchanges appear in the Line Monitor – Raw, Line Monitor – Interpreted, and Timeline views as ASE2000 detects them on the communication line.

When you create a new file (File>New) or select a protocol (File>Select Protocol), ASE2000 provides a default list of exchange templates in the Exchange List view. In the default list, there is a one-to-one correspondence between the exchange templates and the exchange types that the selected protocol supports (such as scan or freeze). ASE2000 uses information in the exchange templates to display corresponding exchanges in other views and to create requests or responses when simulating a station. This section explains how to edit exchange templates to generate requests and customize displays.

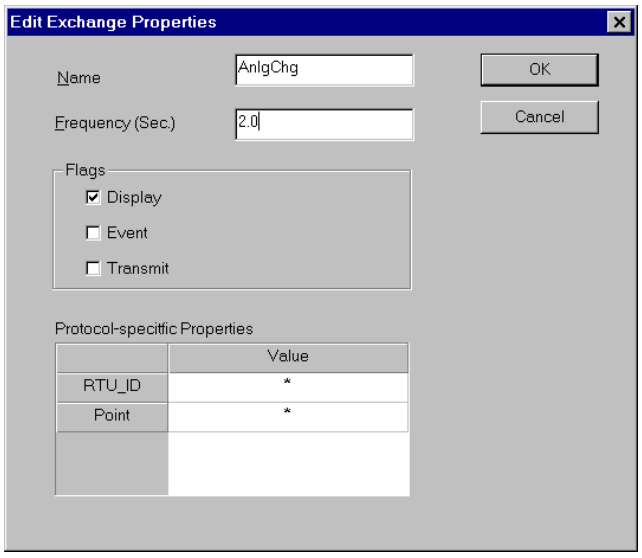


Generating Requests

"Simulating a Primary Station" in Chapter 1 provides a simple procedure for simulating a primary station using ASE2000. This section presents all of the options available to you for generating requests. The following procedure assumes that you have selected the correct protocol and opened the Exchange List view, as described in "Simulating a Primary Station" in Chapter 1.

To generate requests:

1. Use an existing exchange template or add a new one to the list:
   - **Use an existing exchange template.** Select the exchange template that you want to use for the request from the default list of templates displayed in the Exchange List view.
   - **Create a new exchange template.** With the Exchange List view active, choose Edit>Create Exchange Template or right-button click anywhere in the view and choose Create Exchange Template. The Create Exchange Template dialog box appears. Select an exchange type from the list; then click OK. A new exchange template of the selected type appears in the Exchange List view.
   - **Copy an existing exchange template.** Select the exchange template that you want to copy, click the Copy icon on the toolbar or choose Edit>Copy, and then click the Paste icon on the toolbar or choose Edit>Paste. A duplicate of the selected template appears below it in the Exchange List.
2. Double-click the exchange template you want to use for the request, or select the template and choose Edit>Edit Exchange Properties, or right-button click the template and choose Edit Exchange Properties. The Edit Exchange Properties dialog box appears with a list of exchange properties. For all protocols except DNP 3.0, the dialog box looks like this:



Note that the section of the dialog box labeled Protocol-specific Properties appears for all protocols except DNP 3.0, and that the properties that appear in this section vary depending on the selected protocol and exchange type.

Assign values to exchange properties as follows:

- **Name.** Enter a new name for this exchange template or use the default name. This name appears in the Exchange List view. When ASE2000 detects messages that match this exchange template (including the requests that it generates), it uses this name to label the message in the Line Monitor – Interpreted view and optionally in the Timeline view.

  Note: *The default exchange name reflects the exchange type. You can change the name, but the type remains the same.*

- **Frequency.** Enter the frequency (in seconds) at which you want ASE2000 to send the request generated from this template. If you enter 0, ASE2000 sends the request only once when you activate master simulation (see Step 4). By default, ASE2000 sends the request every two seconds.

- **Display.** Checkmark this box if you plan to use the ASE2000 selective-display feature, and you want messages that match this exchange template to be displayed in the Line Monitor – Raw, Line Monitor – Interpreted, and Timeline views. See "Selectively Displaying Exchanges" in Chapter 3 for more information on the selective-display feature. When this box is checkmarked, a D appears in the exchange template's Flags field in the Exchange List view. By default, ASE2000 flags all exchange templates for display.

- **Event.** Checkmark this box to flag this exchange template for event processing. If this box is checkmarked, when ASE2000 encounters messages that match this template (including requests that it generates), it performs special, user-specified processing. When this box is checkmarked, an E appears in the exchange template's Flags field in the Exchange List view. By default, ASE2000 does not flag exchange templates for event processing. (For more information about event processing, see "Generating Events" in Chapter 3.)

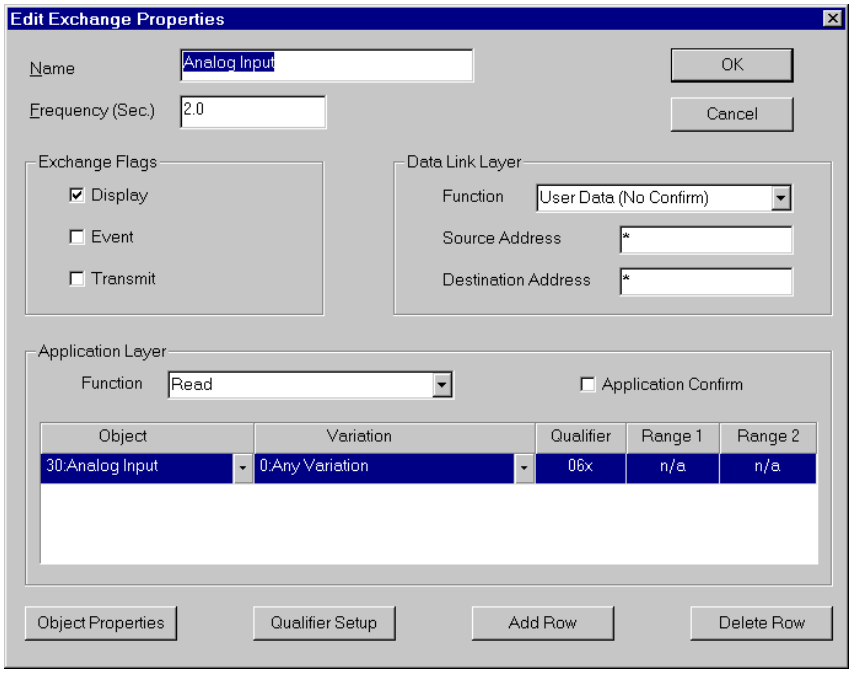
- **Transmit.** Checkmark this box to flag the exchange template for master simulation. Note that this is necessary only if you intend to transmit requests corresponding to more than one exchange template. When you activate master simulation (see Step 4), for each flagged template, ASE2000 uses the information in the template to build and send a request. When this box is checkmarked, an M appears in the exchange template's Flags field in the Exchange List view. By default, ASE2000 does not flag exchange templates for master simulation.

- **Protocol-specific Properties.** Apply to all protocols except DNP 3.0. These properties vary by protocol and exchange type. They can include secondary-station ID, group, point ID, and point value, among others. Enter a value for each property.

Notes:

- *You can optionally assign default values to the protocol-specific properties following the procedure in "Setting Exchange Property Default Values" in this chapter. ASE2000 uses the default value if you do not enter a specific value into the field.*
- *An asterisk in any of these fields indicates that no default value is defined and no specific value has been entered. If a default value is defined for the property, it appears dimmed in the field.*
- *If you enter a value into the field, it overrides the default value and is displayed at normal brightness.*
- *If you have not defined a default value for the property and you do not enter a specific value, ASE2000 uses a value of zero for the property when generating the request.*

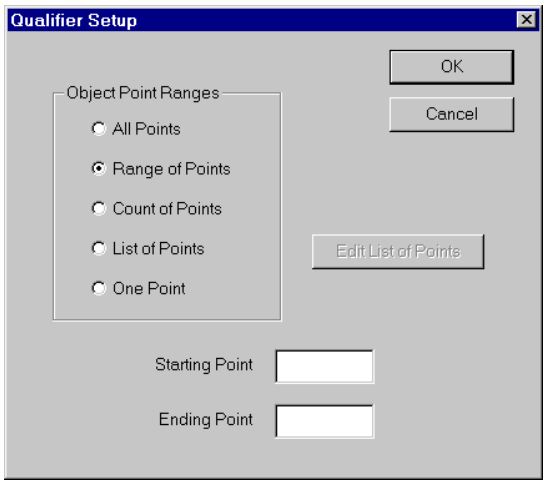
For the DNP 3.0 protocol, the Edit Exchange Properties dialog box looks like this:



For DNP 3.0, assign values to Name, Frequency, Display, Event, and Transmit as described above. The remaining properties are DNP-specific properties. Application Layer properties do not apply to all DNP exchange types. Typically, the user enters values for Source Address, Destination Address, Quality, Range 1, and Range 2. ASE2000 provides valid values for the rest of the DNP-specific properties. However, you can change these

values, if, for example, you have extended the protocol to support additional commands. Enter values for DNP-specific properties as follows:

- **Data Link Layer Function.** ASE2000 provides a valid value for this property. However, you may want to switch this function from User Data (Confirm) to User Data (No Confirm). Select from the menu or enter a numeric value for this property.
- **Source Address.** Enter a source address for this property. You can assign a default Source Address value using the procedure in "Setting Exchange Property Default Values" in this chapter.
- **Destination Address.** Enter a destination address for this property. You can assign a default Destination Address value using the procedure in "Setting Exchange Property Default Values" in this chapter.
- **Application Layer Function.** ASE2000 provides a valid value for this property. However, you can select from the menu or enter a numeric value for this property.
- **Application Confirm.** Check this box if you want an Application Layer confirmation.
- **Object.** ASE2000 provides a valid value for this property. However, you can select from the menu or enter a numeric value for this property.
- **Variation.** ASE2000 provides a valid value for this property. However, you can select from the menu or enter a numeric value for this property.
- **Qualifier.** Click the Qualifier Setup button. The Qualifier Setup dialog box appears.



Specify the target points by selecting one of the options listed in the Object Point Ranges box:

- **All Points.**

- **Range of Points.** Enter a Starting Point and Ending Point in the boxes provided.
- **Count of Points.** Enter the number of points in the box provided.
- **List of Points.** Click the Edit List of Points button. The List of Points dialog box appears. For each point that you want to specify, click Add and enter the point ID. Then click OK.
- **One Point.** Enter the point ID.

Click OK. Based on your selections, ASE2000 assigns the appropriate values to Qualifier, Range 1, and Range 2.

- **Range 1.** Enter a value for this property or use the Qualifier Setup dialog to set this property.
- **Range 2.** Enter a value for this property or use the Qualifier Setup dialog to set this property.

Click OK. ASE2000 assigns the specified values to the Exchange Properties.

Important Note: *See "Working with Protocol-specific Properties," in Chapter 3, "Advanced Operations," for other properties that you can set for specific protocols that can affect the display and generation of requests.*

3. Flag the exchange templates for master simulation. If you want to generate requests from more than one exchange template, you must flag the exchange templates you want to use. Double-click the exchange template in the Exchange List view; then checkmark the Transmit box in the Edit Exchange Properties dialog box, and click OK. An M for Master appears in the Flags field of the exchange template, indicating that the exchange template has been flagged for master simulation.
4. Send requests using one of the following:

- **One selected template.** Select the exchange template that you want to use for the request, and then click the Send Once icon or the Send Continuously icon on the tool bar or choose File>Send Once or File>Send Continuously. ASE2000 builds a request from the information in the exchange template. If you click the Send Once icon or choose File>Send Once, ASE2000 sends the request only once to the secondary station specified in the template. If you click the Send Continuously icon or choose File>Send Continuously, ASE2000 sends the request at the frequency specified in the exchange template until you choose File>Stop or click the Stop icon on the toolbar.

  Note: *When using this method, you may select any template, whether or not you flagged it for master simulation.*

- **All flagged templates.** Choose File>Simulate Master or click the Simulate Master icon on the toolbar. For each exchange template that you

flagged for master simulation (see Step 3), ASE2000 uses the information you provided in the template to build a request, and then sends it to the specified secondary station, at the specified frequency. ASE2000 continues to cycle through the flagged templates, building and sending requests, until you choose File>Stop or click the Stop icon on the toolbar.

You can monitor the requests and responses using the Line Monitor – Raw, Line Monitor – Interpreted, and Timeline views. For troubleshooting tips, see "Simulating a Primary Station" in Chapter 1.

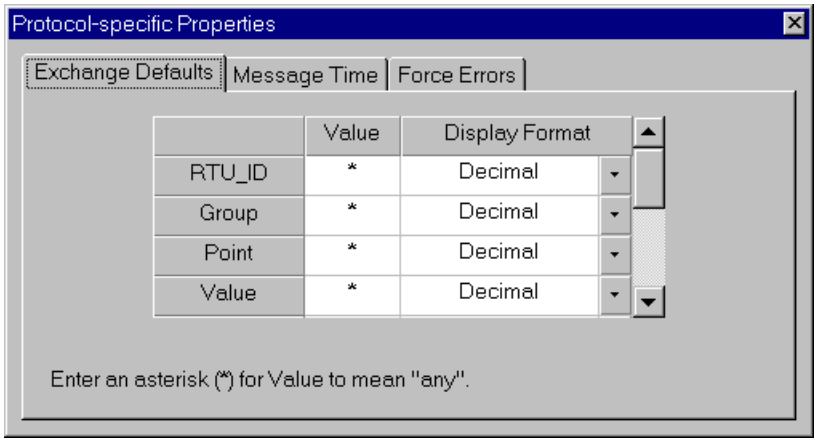
Setting Exchange Property Default Values

It is sometimes convenient to define default values for exchange properties, such as secondary-station ID. When creating requests or displaying exchanges, ASE2000 uses the default value if you have not assigned a value to the corresponding property in the exchange template (see "Generating Requests" in this chapter for information on assigning values to exchange properties).

Use the following procedure to set the exchange property default values.

To set exchange property default values:

1. Choose Properties>Protocol-specific. The Protocol-specific Properties dialog box appears.



2. Select the Exchange Defaults tab and assign default values to the exchange properties that are listed (note that these properties vary depending on the selected protocol). An asterisk indicates that the default value is undefined.

   The default values of the properties appear in the Exchange List view until you assign values to the corresponding properties in the exchange template, which override the defaults. ASE2000 displays default values at half-brightness and exchange template-specific values at normal brightness.

   When generating requests, if no default value is defined for a property and you have not assigned a template-specific value to the property, ASE2000 uses a value of zero for the property.

When displaying exchanges, ASE2000 treats an asterisk like a wild card. For example, an asterisk in the secondary-station ID field of a scan exchange template tells ASE2000 to display scan requests and responses for all secondary stations.

Modifying the Exchange List

Use the following procedure for organizing the exchange templates in the view.

To organize exchange templates in the view:
With the Exchange List view active, choose View; then select one of the options:

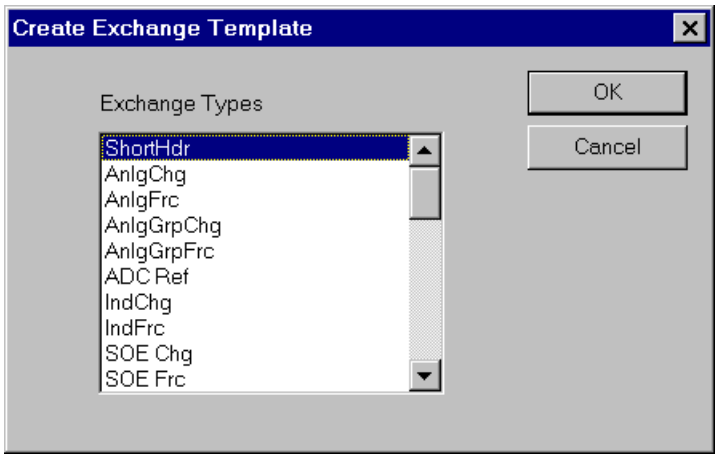
- **Large icons.** Displays large icons and exchange names across the view. The icons reflect the type of points addressed by the exchange.
- **Small icons.** Displays small icons and exchange names across the view. The small icons are smaller renditions of the large icons.
- **List.** Displays the small icons and exchange names in a list format.
- **Details.** Displays all the exchange properties in a list format. This is the default.

ASE2000 displays the exchange templates using the specified option.

You can add and delete exchange templates using the following procedures.

To add an exchange template to the view:

1. Select the exchange template above which you want the new template to appear and choose Edit>Create Exchange Template, or right-button click the template and choose Create Exchange Template. The Create Exchange Template dialog box appears.



2. Select an exchange type from the list and click OK. A new exchange template of the specified type appears in the view, above the selected template.

You can also copy a template and paste it into the Exchange List view, creating two templates of the same type.

To copy an exchange template:

Select the exchange template you want to copy and choose Edit>Copy or click the Copy icon on the toolbar, or right-button click the template and choose Copy. ASE2000 copies the template to the clipboard.

To paste an exchange template into the view:

Select the exchange template where you want the template on the clipboard to appear and choose Edit>Paste or click the Paste icon on the toolbar, or right-button click the template and choose Paste. ASE2000 pastes the template on the clipboard into the view, above the selected template.

To delete an exchange template:

Select the template you want to delete and choose Edit>Delete or Edit>Cut or click the Cut icon on the toolbar, or right-button click the template and choose Delete or Cut. ASE2000 deletes or cuts the selected template from the list.

To delete all the exchange templates from the view:

With the Exchange List view active, choose Edit>Clear All Exchanges or right-button click anywhere in the view and choose Clear All Exchanges. ASE2000 deletes all the exchange templates from the view.

To restore the default list of exchange templates:

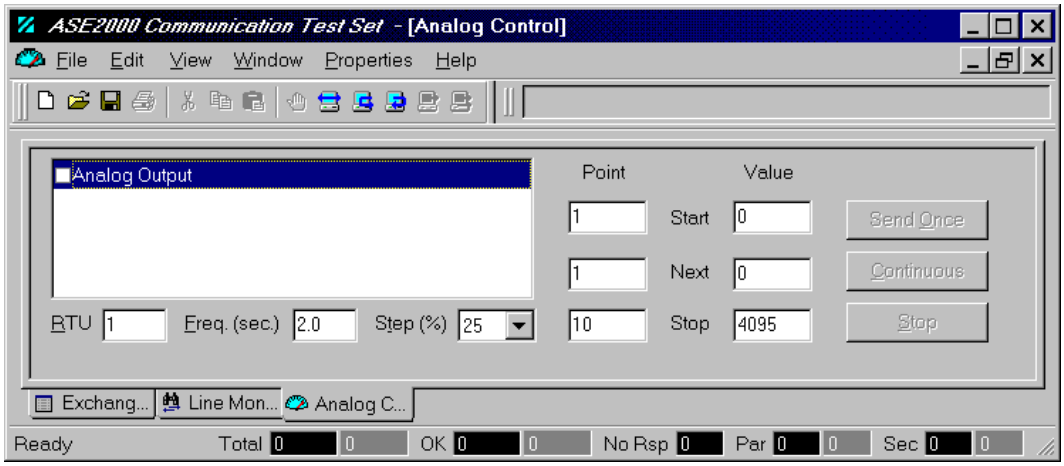
You have two options for restoring the default list of templates to the Exchange List view:

- **Choose File>New.** ASE2000 closes the current file and opens a new one with all the ASE2000 default settings, including the default exchange list for the selected protocol.
- **Choose File>Select Protocol and re-select the target protocol.** Whenever you select a protocol, ASE2000 refreshes the Exchange List view with the default list of exchange templates supported by the protocol.

WORKING WITH THE ANALOG CONTROL VIEW

The Analog Control view lets you output a series of control requests targeting one or more analog output points (also called setpoints) at the secondary station. This is useful for testing the secondary-station hardware, point by point.

The view displays the list of control request types that operate on analog output points. This list is protocol dependent. The other fields in the view allow you to set other request properties.



Use the following procedure to build and send analog control requests.

To build and send a series of analog control requests:

1. Select a request type from the list by checkmarking the box next to it.
2. Enter the target secondary-station ID in the RTU field.
3. Enter the point number of the first point in the series in the Start Point field and the point number of the last point in the series in the Stop Point field.
4. Enter the valid range of values for the points, by entering the low limit in the Start Value field and the high limit in the Stop Value field. Note that ASE2000 can typically determine these limits from the selected protocol; however, the user hardware may not support the same range. If this is the case, override the values displayed in these fields.
5. Enter a percentage in the Step field. Each time ASE2000 completes a write operation, it increments the last value it wrote by the percentage you enter. After all increments, including the Start and Stop values, are written to one point, ASE2000 reverts to the Start value and proceeds to write to the next point in the series. For example, if you specify a step of 25% and the point value range is 0—100, ASE2000 writes 0, 25, 50, 75, and 100 to the first point, and then proceeds to write the same sequence to the second and subsequent points in the series.
6. Enter a frequency (in seconds) in the Freq. field. ASE2000 waits the specified interval before sending the next request in the series.

7. Double-click the exchange type to bring up a copy of the corresponding exchange template and enter values for any other protocol-specific properties, following the instructions in Step 2 of "Generating Requests" in this chapter.

   Note: *ASE2000 uses the values you enter here only for the Analog Control requests that you generate using this view; these values do not replace the values of the template properties listed in the Exchange List view. ASE2000 preserves these temporary values as long as the Analog Control view is open. When you close the view, ASE2000 discards the values.*

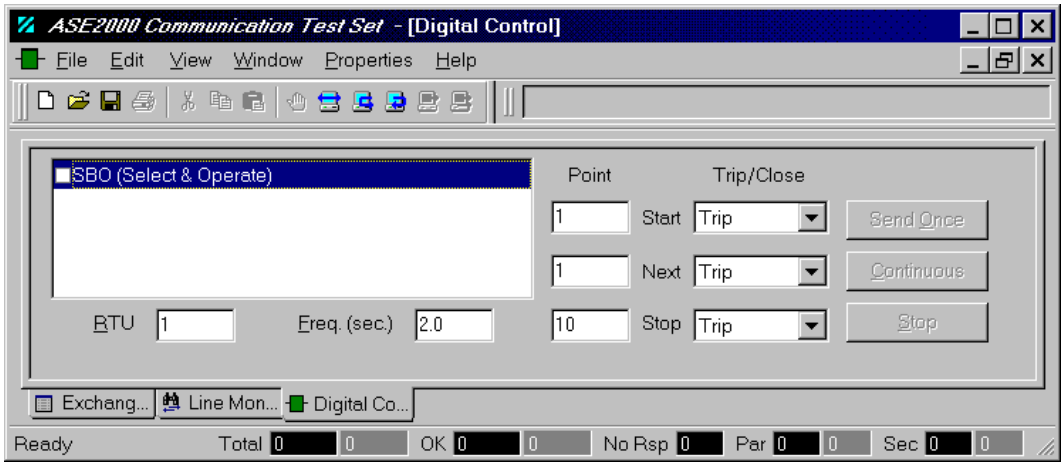
8. You have two options for sending the requests:

   - **Send Once.** When you click Send Once, ASE2000 sends the specified request using the point number and point value specified in the Next Value and Next Point fields. You can override these calculated values to double-check a point.
   - **Send Continuously.** When you click Continuous, for each point in the specified range, ASE2000 sends the specified request with the specified data (point number and value) to the secondary station. As ASE2000 sends a request, it displays the target point number and point value in the Next Point and Next Value fields. ASE2000 continues cycling through the points, generating requests until you click the Stop button.

WORKING WITH THE DIGITAL CONTROL VIEW

The Digital Control view lets you send a series of control requests targeting one or more digital output points at the secondary station. This is useful for testing the secondary-station hardware, point by point.

The view displays the list of control request types that operate on digital output points. This list is protocol dependent. The other fields in the view allow you to set other request properties.



Use the following procedure to build and send digital control requests.

To build and send a series of digital control requests:

1. Select one or more request types from the list, by checkmarking their checkboxes.
2. Enter the target secondary-station ID in the RTU field.
3. Enter the point number of the first point in the target range in the Start Point field and the point number of the last point in the range in the Stop Point field.
4. Enter a frequency (in seconds) in the Freq. field. ASE2000 waits the specified interval before sending the next request in the series.
5. Double-click the exchange type to bring up a copy of the corresponding exchange template and enter values for any other protocol-specific properties, following the instructions in Step 2 of "Generating Requests" in this chapter.

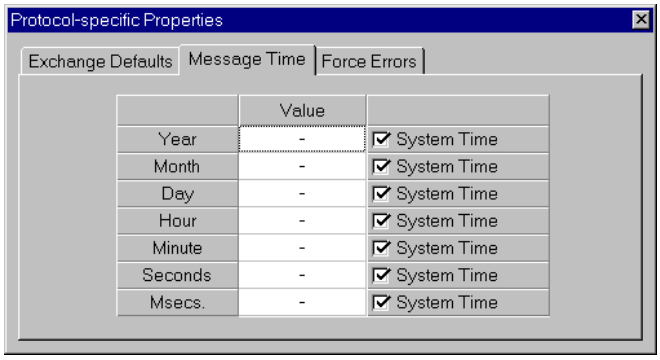
   Note: *ASE2000 uses the values you enter here only for the Digital Control requests that you generate using this view; these values do not replace the values of the template properties listed in the Exchange List view. ASE2000 preserves these temporary values as long as the Digital Control view is open. When you close the view, ASE2000 discards the values.*
6. You have two options for sending the requests:
   - **Send Once.** When you click Send Once, ASE2000 sends the specified request to the point specified in the Next Point field. You can override the value in this field to double-check a point.
   - **Send Continuously.** When you click Continuous, for each point in the specified range, ASE2000 sends the specified requests. As ASE2000 sends a request, it displays the target point number in the Next Point field. ASE2000 continues cycling through the points, generating requests until you click the Stop button.

SPECIFYING MESSAGE TIME

Some protocols require timestamps in messages. For these protocols, use the following procedure to specify the timestamp that ASE2000 uses when simulating a station.

To specify the time that ASE2000 uses in messages:

1. Choose Properties>Protocol-specific>Message Time. The Message Time dialog box appears.



2. For each field listed, enter a value for the field or checkmark the System Time box if you want ASE2000 to use the system time for that field. Click the Exit icon in the upper right corner to exit the dialog box.

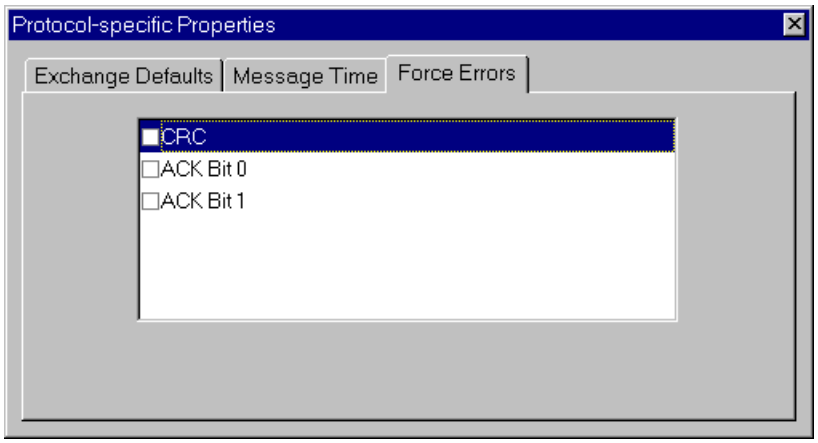
   ASE2000 uses the specified time when generating requests and responses that require timestamps. If you checkmark the System Time box, ASE2000 uses the current time according to the computer system clock. By default, ASE2000 uses the system time for each field.

FORCING MESSAGE ERRORS

Use the following procedure to force errors in the messages that ASE2000 generates when simulating a station.

To force errors in the messages that ASE2000 generates:

1. Choose Properties>Protocol-specific>Force Errors. The Force Errors dialog box appears with a list of error types that apply to the selected protocol.

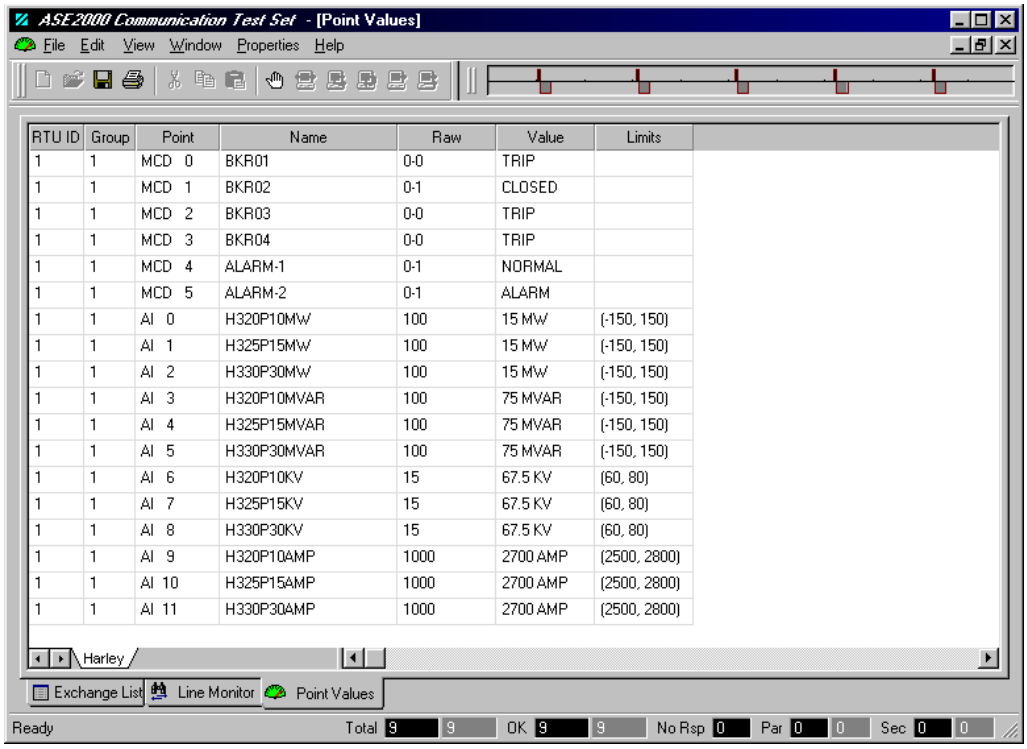


2. Checkmark the types of errors that you want ASE2000 to generate. Click the Exit icon in the upper right corner to exit the dialog box.

For each message that ASE2000 generates, it forces the specified errors. See Appendix A for the types of errors supported for each protocol.

WORKING WITH THE POINT VALUES VIEW

The Point Values view displays input-point information, including the raw and converted values of the points. The view includes a separate page for each secondary station on the comm line; use the tabs at the bottom of the window to page through point information for each secondary station. ASE2000 optionally organizes the point information by group (if applicable) and point number. As ASE2000 monitors the communication line, it automatically adds points to the view and updates point values using the engineering units and conversion settings that you specify.



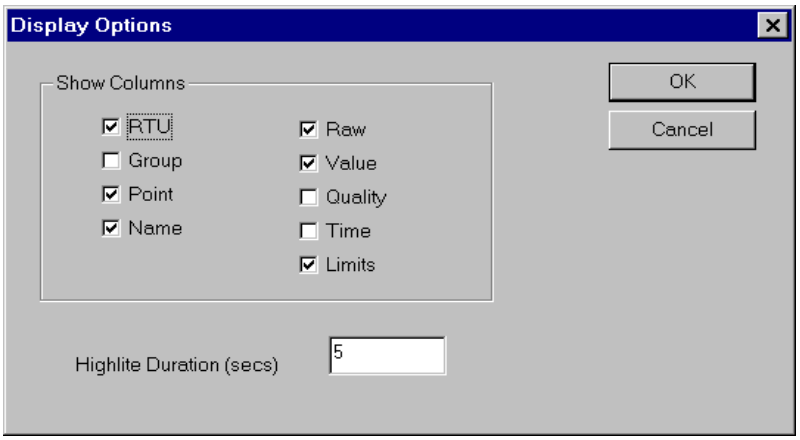
This section explains how to specify which point properties are displayed in the view and the conversion settings that ASE2000 applies to each point. It also explains how to save point configuration data for re-use.

Setting Display Properties

You can specify what information appears in the Point Values view, as well as other display characteristics, using the Point Values Display Options dialog box, as described in the following procedures.

To specify the point properties that appear in the view:

1. With the Point Values view active, choose Edit>Options. The Display Options dialog box appears.



The Show Columns box lists the point properties that the selected protocol supports. The following properties apply to all or more than one protocol:

- **RTU ID.** Applies to all protocols. ID of the secondary station on which the point resides. (Note that not all protocols refer to the secondary station as an RTU; therefore, the name of this field may vary depending on the selected protocol.)
- **Group.** Does not apply to all protocols. Group to which the point belongs.
- **Point.** Applies to all protocols. Point number.
- **Name.** Applies to all protocols. Name of the point.
- **Raw.** Applies to all protocols. Raw value of the point.
- **Value.** Applies to all protocols. Converted value of the point (for digital points, the user-specified state name; for analog and pulse points, the converted value in user-specified engineering units).
- **Quality.** Does not apply to all protocols. Point quality codes reported by the secondary station.
- **Time.** Does not apply to all protocols. Time the point last changed value as reported by the secondary station.
- **Limits.** Applies to all protocols, but to analog points only. High and low alarm limits.

2. In the Show Columns box, checkmark the properties that you want displayed in the view. ASE2000 includes each checkmarked property in the view.

To specify the duration that point values are highlighted after they change:

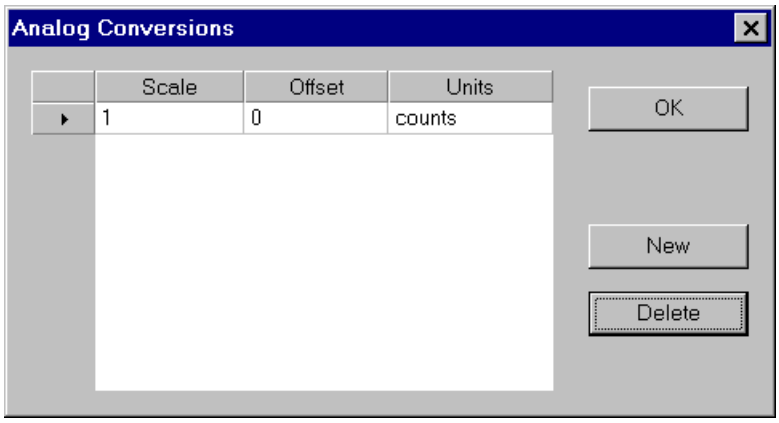
With the Point Values view active, choose Edit>Options. The Display Options dialog box appears. In the Highlight Duration field, enter the number of seconds that you want ASE2000 to highlight point values after they change (default is 5 seconds). When a point value changes, ASE2000 highlights it for the specified duration.

Specifying Conversion Settings

You can specify sets of conversion values, and then assign the appropriate set to a point using the Edit>Modify command (see "Assigning Conversion and Alarm Settings to Points" in this chapter for more information). ASE2000 uses the specified conversion settings to convert the raw point value, and then displays the converted value in the point's Value field in the Point Values view.

To specify analog conversion settings:

1. With the Point Values view active, choose Edit>Analog Conversions. The Analog Conversions dialog box appears. The Analog Conversions dialog box appears with a list of analog conversion settings.

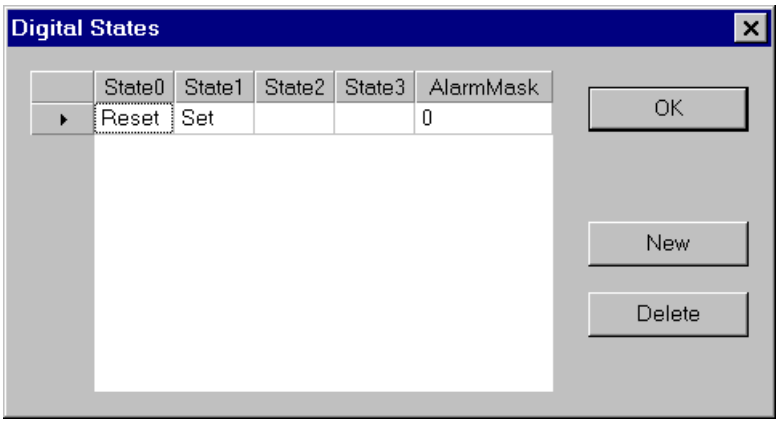


2. Modify the list as follows:

   - **Add a set of conversion values to the list.** Click New; then enter the scale, offset, and type of units you want to include in the set and click OK. The new set appears in the list. ASE2000 multiplies analog values by the specified scale setting and then adds the specified offset. Once you assign conversion settings to a point, the converted value appears in the Value field of the point's entry in the Point Values view. The specified type of units appears next to the value.
   - **Delete a set of conversion values from the list.** Select the set of conversion values that you want to delete; then click Delete. The set disappears from the list.

To specify digital states:

1. With the Point Values view active, choose Edit>Digital States. The Digital States dialog box appears with a list of digital states and an alarm mask.

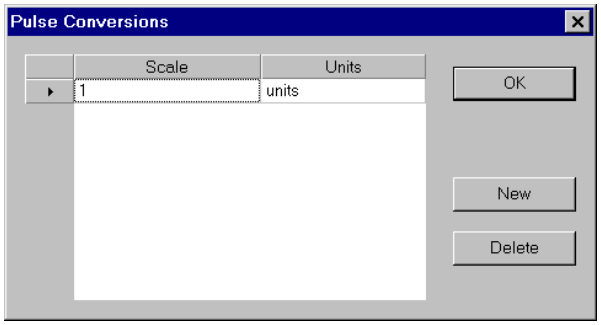


2. Modify the list as follows:

   - **Add a set of name/state pairs to the list.** Click New; then enter names for the pertinent states (0, 1, 2, 3). You can also indicate if any state triggers an alarm by entering an alarm mask. Then click OK. The new set of name/state pairs appears in the list. The name that corresponds to the value of the point appears in the Value field of the point's entry in the Point Values view. If ASE2000 detects a point that is in an alarm state, it displays the name of the state in red.
   - **Delete a set name/state pairs from the list.** Select the set that you want to delete; then click Delete. The set disappears from the list.

To specify pulse conversion settings:

1. Choose Edit>Pulse Conversions. The Pulse Conversions dialog box appears with a list of pulse conversion settings.



2. Modify the list as follows:

   - **Add a set of conversion values to the list.** Click New; then enter a value for scale and a value for units and click OK. The new set appears in the

list. ASE2000 multiplies pulse values by the specified scale setting. The converted value appears in the Value field of the point's entry in the Point Values view. The specified type of units appears next to the value.

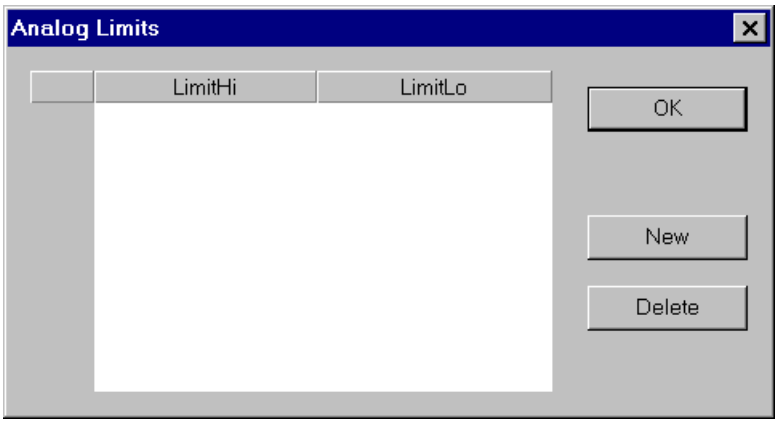
- **Delete a set of conversion values from the list.** Select the set of conversion values that you want to delete; then click Delete. The set disappears from the list.
- **Modify an entry on the list.** Double-click the entry you want to modify or select the entry and click Modify. Then change the values and click OK. The new values appear in the list.

Specifying Analog Alarm Limits

You can specify sets of analog alarm limits, and then apply the appropriate set to an analog point using the Point Properties dialog box (see "Assigning Values to Point Properties" in this chapter for more information on the Point Properties dialog box). ASE2000 displays the alarm limits in the point's Limits field in the Point Values view. When the point value is less than or equal to the low limit or greater than or equal to the high limit, ASE2000 displays the point value in red.

To specify analog alarm limits:

1. With the Point Values view active, choose Edit>Analog Limits. The Analog Limits dialog box appears with a list of alarm limit settings.



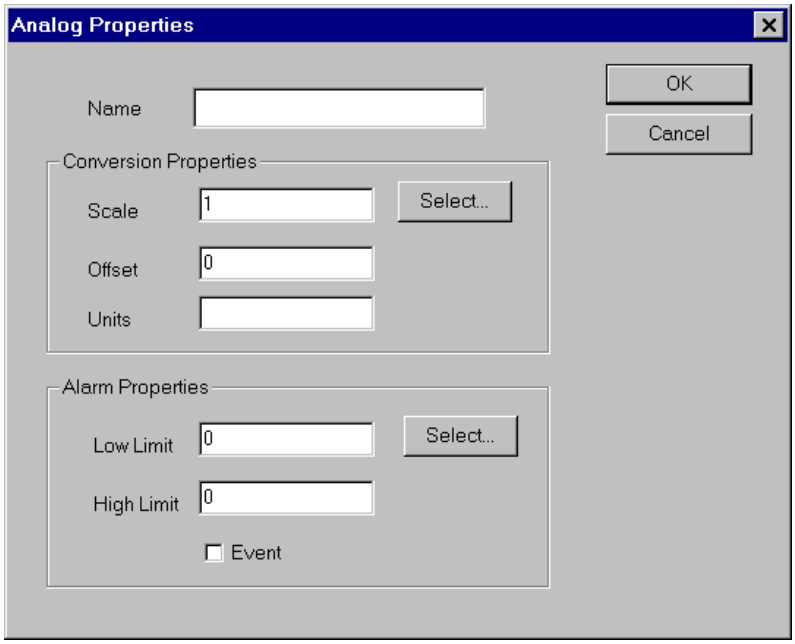
2. Modify the list as follows:
   - **Add a set of limits to the list.** Click New; then enter a value for the low limit and a value for the high limit and click OK. The new set appears in the list.
   - **Delete a set of limits from the list.** Select the set of limits that you want to delete; then click Delete. The set disappears from the list.
   - **Modify an entry on the list.** Click the field you want to modify, enter the new data, and click OK.

Assigning Values to Point Properties

Point properties include point name, conversion settings, and alarm limits. You can assign values to these properties using the following procedure.

To assign values to point properties:

1. Double-click any field of the target point in the Point Values view, or select any field of the target point and choose Edit>Modify, or right-button click any field of the target point and select Modify. The Point Properties dialog box appears.



2. Assign values to point properties as follows (note that properties vary by point type):

   - **Point Name.** Applies to all point types. Enter a name for the point. The new point name appears in the Name field of the point's entry in the Point Values view.
   - **Conversion.** Applies to analog and pulse points only. Enter conversion settings or click Select to choose from a list of conversion settings previously entered using the Edit>Analog Conversions or Edit>Pulse Conversions command, as described in "Specifying Conversion Settings" in this chapter. ASE2000 uses the settings to convert the raw point value to the converted value that appears in the Value field of the point's entry in the view. The engineering units you specify appear next to the converted value.
   - **States (0/1).** Applies to digital points only. Enter a state pair or click Select to choose from a list of state pairs previously entered using the

Edit>Digital States command, as described in "Specifying Conversion Settings" in this chapter. ASE2000 displays the state that corresponds to the value of the point in the Value field of the point's entry in the view.

- **Alarm (low, high).** Applies to analog points only. Enter alarm limits or click Select to choose from a list of alarm limits previously entered using the Edit>Alarm Limits command, as described in "Specifying Analog Alarm Limits" in this chapter. The alarm limits appear in the Limits field of the point's entry in the view. When the point value is less than or equal to the low limit or greater than or equal to the high limit, ASE2000 displays the point value in red.
- **Event.** Applies to analog points only. Checkmark this box to flag the point for inclusion in event processing. See "Generating Events" in "Chapter 3, Advanced Operations," for more information on this function.

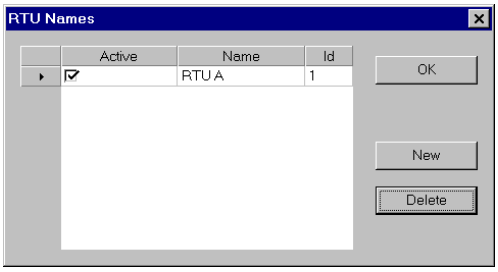
Click OK. ASE2000 uses the assigned values when displaying point data in the view.

Defining and Activating a Secondary Station

You can predefine secondary stations prior to starting communication or ASE2000 will automatically define the secondary stations as it detects them on the communication line. Note that ASE2000 automatically saves point configuration data for predefined secondary stations only. ASE2000 stores this data in a Microsoft™ Access file called pointlist.mdb. Point configuration data includes point type, group (if applicable), point number, point name, conversion settings (analog and pulse points only), states (digital points only), and alarm limits (analog points only) for each point at the secondary station.

To define a secondary station:

1. Prior to starting communication and with the Point Values view active, choose Edit>Define/Activate RTU. The RTU Names dialog box appears.



2. Click New and enter values for Name and ID; then click OK.

To activate a secondary station:

1. With the Point Values view active, choose Edit>Define/Activate RTU. The RTU Names dialog box appears.

2. Checkmark the Active checkbox of the secondary station that you want to activate and click OK. A new tab with the specified secondary-station name appears at the bottom of the view, and ASE2000 loads any corresponding point configuration data from the file pointlist.mdb into the view.

To delete a secondary station:

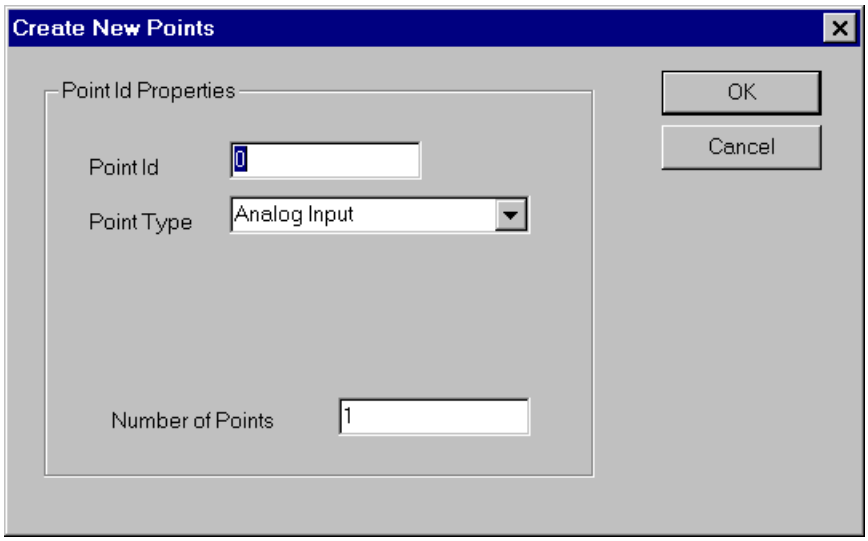
1. With the Point Values view active, choose Edit>Define/Activate RTU. The RTU Names dialog box appears.
2. Select the secondary station you want to delete and click Delete. The secondary-station tab and data disappears from the view.

Adding Points to the View

Sometimes it is useful to preconfigure the Point Values view, that is, to specify points and assign values to point properties prior to monitoring the comm line. You can add points to the view and delete points from the view using the following procedures.

To add points to the view:

1. With the Point Values view active, select the target secondary-station tab; then choose Edit>Add Points or right-button click anywhere in the view and choose Add Points. The Create New Points dialog box appears.



2. Enter values for the point properties that appear in the dialog box. Note that these properties vary depending on the selected protocol. The following properties apply to all or more than one protocol:
   - **Point ID.** Applies to all protocols. Number of the first point in the sequence of points that you want to add to the view.

- **Type.** Applies to all protocols. Point type of the points that you want to add to the view (select from the list provided).
- **Group.** Does not apply to all protocols. Group to which the points belong. The name of this field may vary depending on selected protocol.
- **Number of points.** Applies to all protocols. The number of consecutive points that you want to add to the view. ASE2000 numbers the points starting with the value you enter in the Point field.

Click OK. The specified points appear in the view.

To delete a point from the view:

Select any field of the point entry in the view and then choose Edit>Delete, or right-button click any field of the point entry and choose Delete. The point disappears from the view.

To clear all the points from the view:

With the view active, choose Edit>Delete All, or right-button click any field in the view and choose Delete All. ASE2000 clears the view.

Saving a Snapshot of Point Data

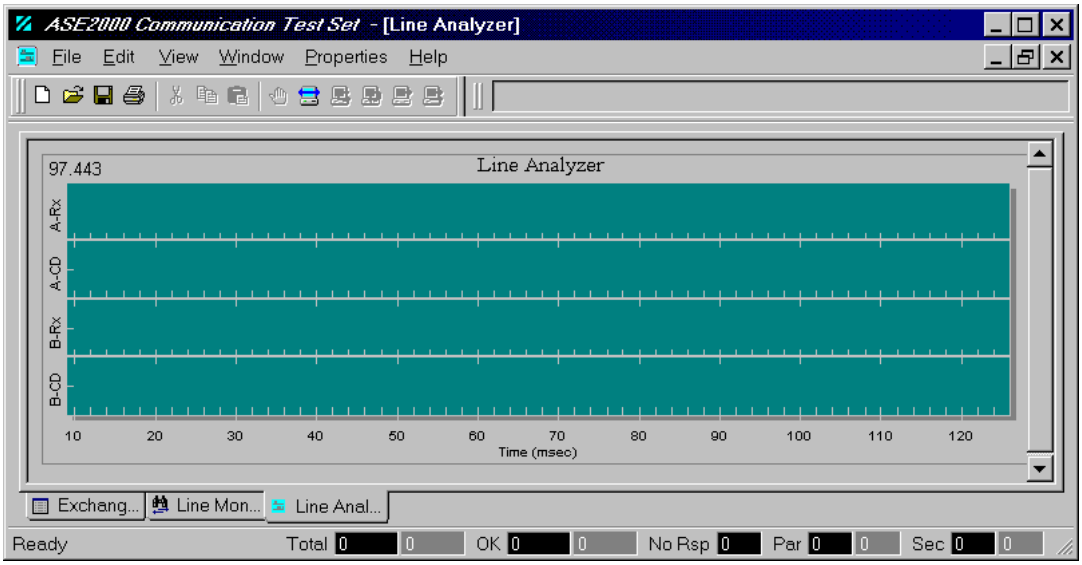
Use the following procedure to save a snapshot of point data, including values, quality, and timestamps, for offline analysis. Note that this data is not reloaded when you activate the secondary station.

To save a snapshot of point data:

On the Point Values view, click the secondary-station tab that corresponds to the data you want to save. Then choose Edit>Save All. ASE2000 writes the data to the Microsoft Access database file pointlist.mdb.

WORKING WITH THE LINE ANALYZER VIEW

The Line Analyzer View lets you create a digital graph of four input signals: Receive Data (Rx) and Carrier Detect (CD) on channels A and B. You make Channel A/B assignments using the Communication Properties dialog box (Properties>Communication>Channel). Plot resolution is 1 millisecond.



Creating a Graph

Use the following procedure to create a graph.

1. Connect cables to one or both input channels.
2. Choose Edit>Options to enter a timeout duration in milliseconds. Default is 2000.
3. Click the Monitor icon or choose File>Monitor to start collecting the data to be graphically displayed. Data collection starts on the rising edge of the CD or Rx signal on either channel and stops when the specified timeout duration expires. The Line Analyzer view displays the data after all of it has been collected.

Time information in the upper left-hand corner of the view reflects the position of the cursor. To determine the duration between points, move the cursor over the graph coordinates of each point.

To print or save graph information, click the right mouse button and choose Export Dialog.

WORKING WITH THE TIMELINE VIEW

The Timeline view charts carrier signals and messages against a timeline as ASE2000 detects them on the communication line. The view is implemented as a toolbar, so you can drag and drop it anywhere on the screen. Each tickmark on the timeline represents a one-second interval. Requests appear above the line and responses appear below the line.

Use the following procedure to set Timeline properties.

To set Timeline properties:

1. Choose Properties>Timeline. The Timeline Properties dialog box appears.
2. Assign values to Timeline properties as follows:
   - **Scroll Speed.** Set the speed at which messages scroll across the view by dragging the Scroll Speed slider.
   - **Show Messages.** Checkmark this box if you want messages shown in the view. When the box is checkmarked, ASE2000 displays messages in black, that is, a black-filled rectangle appears when ASE2000 detects a message. The width of the rectangle indicates the duration of the message. By default, this box is checkmarked (ASE2000 displays messages).
   - **Show Message Name.** Checkmark this box if you want the exchange name (as defined in the Exchange List view) to appear next to the message. By default, this box is not checkmarked (ASE2000 does not display exchange names).
   - **Show Carrier.** Checkmark this box if you want the carrier signals shown in the view. When the box is checkmarked, ASE2000 displays a square wave indicating when the carrier signal is on (peaked) and off (flat). By default, this box is checkmarked (ASE2000 displays carrier signals).

CAPTURING MESSAGES IN A FILE

It is often useful to capture the messages you are monitoring in a file. Later, you can use the information in the capture file for troubleshooting.

To capture messages in a file:

1. Choose Properties>Auxiliary Files>Capture. The Capture File Properties dialog box appears.
2. Enter the name of a new or existing capture file in the File Name field or click the browse button (labeled "...") to locate and select an existing file.
3. Enter a maximum file size in bytes. When ASE2000 reaches the specified maximum, it writes over the oldest data in the file.
4. Checkmark the Reset File Each Time box if you want ASE2000 to discard the file data and start over each time you enable message capture. If this box is not checkmarked, ASE2000 will continue where it left off in the file each time you enable message capture. Click the Exit icon in the upper right corner to exit the dialog box.
5. Choose File>Capture Enabled to start capturing messages. A checkmark appears next to the command, indicating that message capture is enabled. When ASE2000 detects a message that corresponds to a display-enabled exchange, it writes the message to the capture file. When writing messages to

the file, ASE2000 uses the same display properties that it uses for the Line Monitor views.

When you want to stop capturing messages, choose File>Capture Enabled. The checkmark next to the command disappears, indicating that message capture is disabled.

Viewing a Capture File

To view a capture file:

1. Open the view in which you want the captured messages to appear: Line Monitor – Raw, Line Monitor – Interpreted, or both.
2. Choose File>View Capture File. The file browser appears.
3. Select a capture file and click Open. ASE2000 displays the captured messages in the Line Monitor window. When you start monitoring or simulating messages, ASE2000 automatically closes the capture file and clears the views.

Converting a Capture File to a Text File

ASE2000 currently does not support converting a capture file directly to an ASCII text file. However, following is simple procedure to create a text file that you can view, edit, and print using Microsoft Word, Wordpad, or Notepad. Note that this procedure requires that the Windows 2000 operating system is installed.

To convert a capture file to a text file:

1. Install the "Generic / Text Only" printer driver that comes with Windows 95, 98, ME, and NT 4.0. If it is not already installed, use the following procedure:
   - **a.** Choose Settings>Printers, and then select Add Printer. The Add Printer wizard appears.
   - **b.** Install as a "Local Printer."
   - **c.** Select "Generic" under Manufacturer and "Generic / Text Only" under Printers.
   - **d.** Follow the instructions for installing the Text Only printer.
   - **e.** When prompted to designate a port, select FILE: This will cause a test file to be created from the print operation.
2. Once the "Generic / Text Only" printer is installed, Choose File>Print while viewing a capture file, and then choose the Text Only printer option for the destination printer. The dialog box prompts you for a file name.
3. Enter the file name (such as capture.prn). The system creates the specified text file. Once the text file has been created, you can open the file using Microsoft Word, Wordpad, or Notepad.

Note: *If you want to print the text version of the capture file, you may want to change the font, font size, and page setup (margins) for a better-looking printed result.*

PRINTING A VIEW

You can print the contents of the following views:

- Line Monitor – Raw
- Line Monitor – Interpreted
- Point Values
- Line Analyzer

If a view supports printing, the Print and Print Preview commands in the File menu appear at normal brightness when the view is active. If the active view does not support printing, the Print commands are dimmed.

To print the contents of a view:

1. Select the view you want to print (the view must be open and active). See "Opening a View" in Chapter 1 for an introduction to views.
2. With the view active, choose File>Print. ASE2000 prints the active view.

   Note: *If both the Line Monitor – Raw and the Line Monitor – Interpreted views are open in the Line Monitor window when you select the Print command, ASE2000 intersperses the raw and the interpreted data when printing.*

CHAPTER 3: ADVANCED OPERATIONS

This chapter describes ASE2000 functions for advanced users. Before reading this chapter, you should be familiar with ASE2000 basic operations and the Exchange List view. This chapter covers the following topics:

- Selectively displaying exchanges
- Generating events
- Simulating a secondary station
- Modifying point configuration
- Extending a protocol

SELECTIVELY DISPLAYING EXCHANGES

By default, ASE2000 displays all the messages that it detects on the communication line (including the messages that it generates when simulating a station). However, it is sometimes useful to limit the messages that ASE2000 displays. For example, you may want to see only the messages to and from a particular secondary station or only the messages that correspond to a particular exchange type, such as a scan.

ASE2000 supports two properties that together control the display of messages:

- **Exchange template Display flag.** Each exchange template listed in the Exchange List view supports a Display flag (checkbox). When this flag is set (checkmarked), the exchange template is display enabled. By default, this flag is set.
- **Display-enabled Exchanges Only**. When true (checkmarked), this property tells ASE2000 to display only those messages that match exchange templates whose Display flag is set (checkmarked). When false, this property tells ASE2000 to display all of the messages it detects on the comm line, whether or not the corresponding exchange template is display enabled. By default, the Display-enabled Exchanges Only property is false (not checkmarked)—ASE2000 displays all messages.

The following procedures explain how to use these properties.

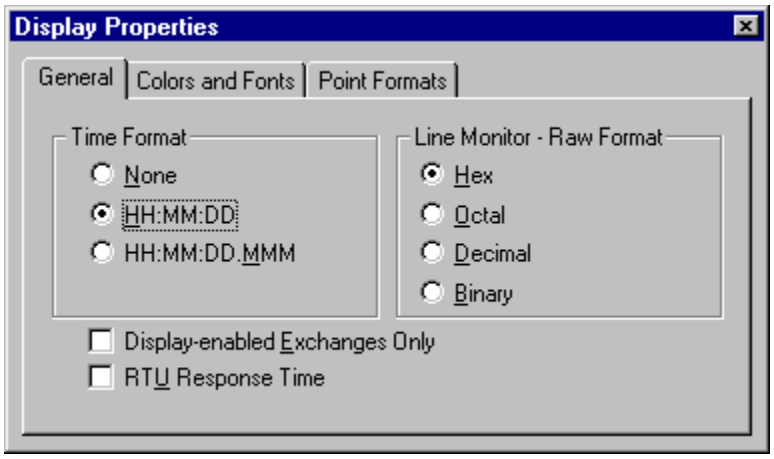
To display-enable or display-disable an exchange template:

1. Double-click the exchange template that you want to display-enable or display-disable, or select the template and choose Edit>Edit Exchange Properties, or right-button click the template and choose Edit Exchange Properties. The Edit Exchange Properties dialog box appears.
2. Click the Display checkbox to enable or disable the display of exchanges matching this template. When this box is checkmarked, the exchange template

is display enabled and a D for Display appears in the template's Flags field in the Exchange List view.

To display messages corresponding to display-enabled exchanges only:

1. Choose Properties>Display, and then select the General tab of the Display Properties dialog box.



2. Checkmark the box labeled Display-enabled Exchanges Only. When this box is checkmarked, ASE2000 displays only messages that match exchange templates that are flagged for display, that is, templates with a D in the Flags field of the Exchange List view. This filters out exchanges that are not display enabled, as well as unknown messages on the comm line.

To display messages corresponding to only one exchange type:

1. Delete all the exchange templates in the Exchange List view (see "Modifying the Exchange List" in "Working with the Exchange List View" in Chapter 2 for instructions).
2. Create an exchange template of the target type (see "Generating Requests" in "Working with the Exchange List View" in Chapter 2 for instructions).
3. Checkmark the Display-enabled Exchanges Only checkbox as described earlier in this section.

To display messages from only one secondary station on a party line:

1. Set the default value of the secondary-station ID exchange property to the ID of the target secondary station (see "Setting Exchange Property Default Values" in "Working with the Exchange List View" in Chapter 2 for instructions). Note that ASE2000 uses the default value only if you have not entered a specific value for the property in the exchange template.
2. Checkmark the Display-enabled Exchanges Only checkbox as described earlier in this section.

GENERATING EVENTS

You can instruct ASE2000 to generate an event when it detects the following:

- **Exchange match.** A message matches an exchange template that you have flagged for event processing.
- **Analog point in alarm or out of alarm.** The value of an analog input point that you have flagged for event processing has gone out of the range or come back into the range that you specified for it.
- **Digital point change.** The value of a digital input point that you have flagged for event processing has changed.
- **Communication error.** A security error, parity error, or response timeout (no response within a specified period) has occurred.

When ASE2000 detects the specified condition, it performs the processing that you specified in the Enable Events dialog box (see "Specifying and Enabling Event Processing" in this chapter for a description of this dialog box).

Flagging an Exchange Template for Event Processing

Use the following procedure to flag an exchange template for event processing.

To enable or disable event processing for an exchange template:

1. Double-click the target exchange template, or select the template and choose Edit>Edit Exchange Properties, or right-button click the template and choose Edit Exchange Properties. The Edit Exchange Properties dialog box appears.
2. Click the Event checkbox to enable or disable event processing for the selected template. When this box is checkmarked, event processing is enabled and an E for Event appears in the template's Flags field in the Exchange List view.

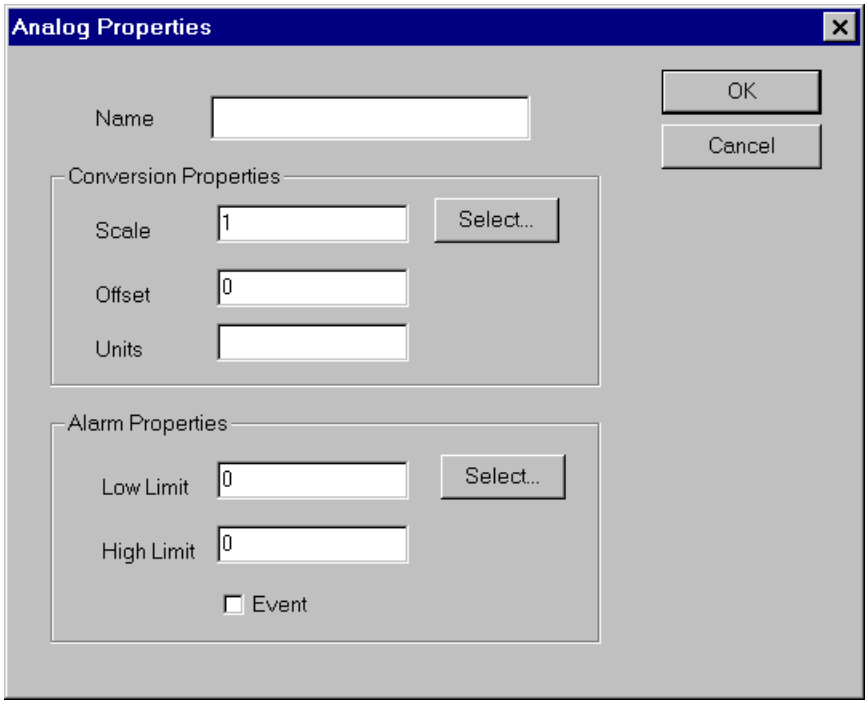
   When ASE2000 detects a message that matches a flagged exchange template, it performs the event processing that you specified in the Enable Events dialog box (see "Specifying and Enabling Event Processing" in this chapter for more information on specifying event processing).

Flagging an Analog or Digital Input Point for Event Processing

Use the following procedure for flagging points for event processing.

To flag an analog or digital input point for event processing:

1. Select an analog or digital point on the Point Values view and choose Edit>Modify. The Point Properties dialog box appears including a list of alarm properties for the specified point.



2. Assign values to the alarm properties:

- **Event.** Checkmark this box to trigger event processing for the point when alarm conditions are met, as described in the following bullets.
- **Low limit.** Applies to analog points only. Enter the valid range low limit or click Select to choose from a list of alarm limits previously entered using the Edit>Alarm Limits command, as described in "Specifying Analog Alarm Limits" in Chapter 2. If the point value is less than or equal to the specified low limit, ASE2000 performs the specified event processing. When the point value returns to the acceptable range, ASE2000 also performs the event processing.
- **High limit.** Applies to analog points only. Enter the valid range high limit or click Select to choose from a list of alarm limits previously entered using the Edit>Alarm Limits command, as described in "Specifying Analog Alarm Limits" in Chapter 2. If the point value is greater than or equal to the specified high limit, ASE2000 performs the specified event processing. When the point value returns to the acceptable range, ASE2000 also performs the event processing.
- **Alarm 0—3.** Applies to digital points only. Checkmark the states that trigger an alarm.

Click OK. For points with checkmarked Event boxes, when ASE2000 detects data that matches the specified alarm criteria, it performs the event processing that you specified using the Enable Events dialog box (see "Specifying and

Enabling Event Processing" in this chapter for more information on specifying event processing).

Flagging Communication Errors for Event Processing

ASE2000 automatically detects security and parity errors for the selected protocol. If you enable communication-error event processing (see "Specifying and Enabling Event Processing"), ASE2000 generates an event each time it detects a security error, parity error, or response timeout. You can specify a response timeout interval by following the procedure described in "Setting Communication Properties" in Chapter 2.

Specifying and Enabling Event Processing

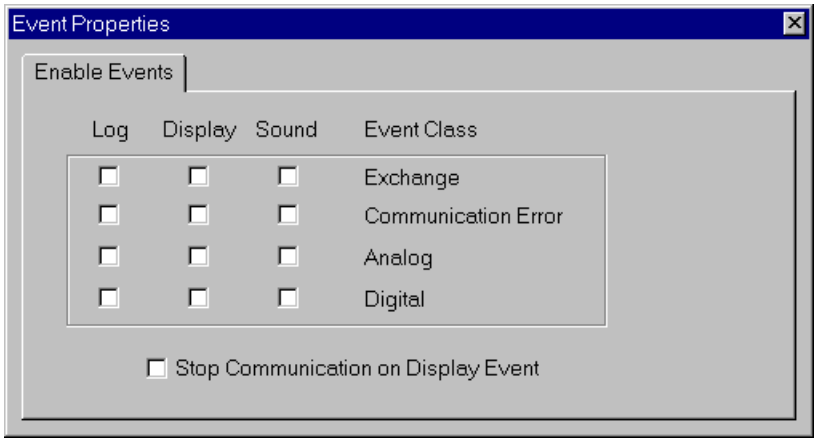
ASE2000 supports three types of event processing:

- Log
- Display
- Sound

You can assign one or more types of processing to each event class: exchange, communication error, analog in alarm/out of alarm, or digital change. Use the following procedure to specify and enable event processing.

To specify and enable event processing:

1. Choose Properties>Events. The Enable Events dialog box appears with a table of event classes and event processing types.



2. Specify the types of event processing you want for each class of event (exchange, communication error, analog in alarm/out of alarm, digital change), by checkmarking one or more of the following in each category:

   - **Log.** When event criteria are met for the specified event class, ASE2000 writes an event message to the specified event log file. For more

information on event log files, see "Working with Event Log Files" in this chapter.

- **Display.** When event criteria are met for the specified event class, ASE2000 displays an event message in the Line Monitor – Interpreted view. Note that this is the same message that ASE2000 writes to the event log file, when log-event processing is enabled.
- **Sound.** When event criteria are met for the specified event class, ASE2000 issues an audio alert (the sound assigned to Exclamation in the Windows Sounds dialog box).

As you specify the type of event processing you want for the class, you also enable it.

3. Checkmark the "Stop Communication on Display Event" checkbox if you want ASE2000 to stop all communication activity after it displays an event in the Line Monitor – Interpreted view. If this box is checkmarked, it has the same effect as clicking the Stop icon when a display-event occurs, that is, ASE2000 stops monitoring or simulating when it detects display-event criteria.

To disable event processing:

Remove the checkmarks from the boxes of the event classes and event processing types that you want to disable.

Working with Event Log Files

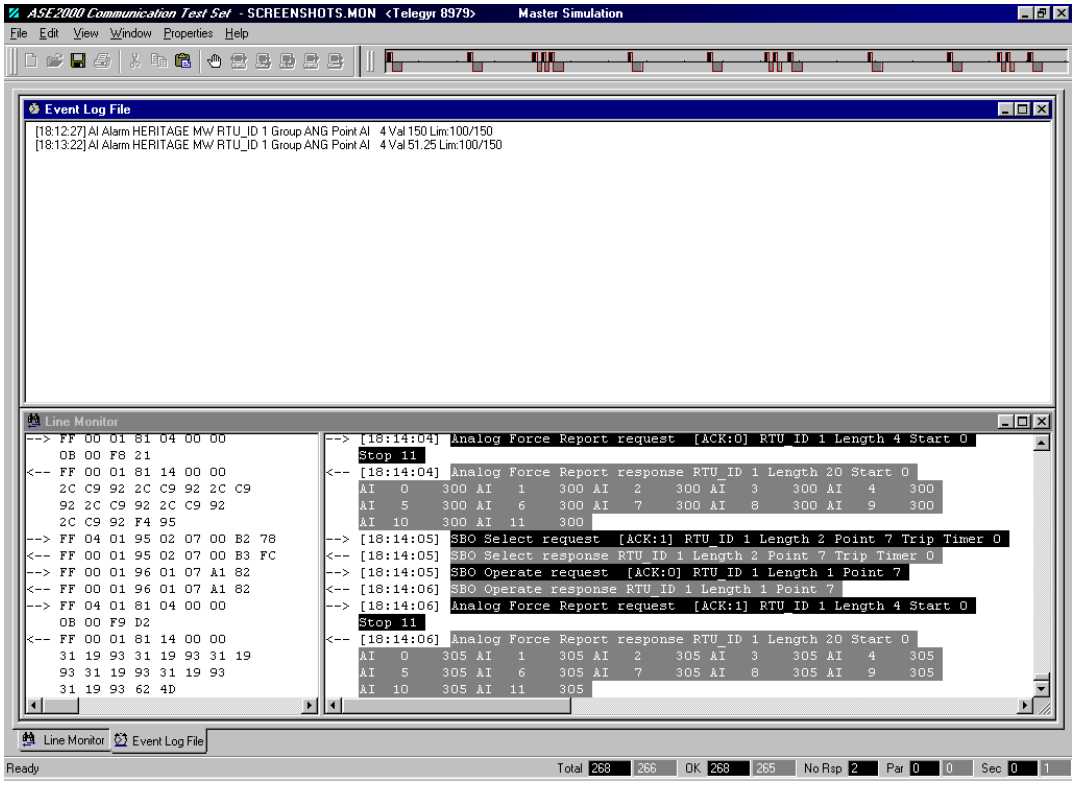
If you instruct ASE2000 to log events as they occur (see "Specifying and Enabling Event Processing" in this chapter), you must specify an event log file for ASE2000 to use. The following procedures describe creating, opening, viewing, and clearing an event log file.

To specify an event log file:

1. Choose Properties>Auxiliary Files>Event Log. The Event Log dialog box appears.
2. Enter a filename or click the browse button (labeled "..."), select a file, and click Open.
3. Enter a maximum file size in bytes. When ASE2000 reaches the specified maximum, it stops writing events to the file and writes the message, "Maximum file size reached" at the bottom of the file.
4. Checkmark the Reset File Each Time box if you want ASE2000 to discard the file data and start over each time you enable monitoring (File>Monitor) or simulating (File>Simulate Master or File>Simulate RTU). If this box is not checkmarked, ASE2000 continues where it left off in the file the next time you enable monitoring or simulating.

To view the contents of an event log file:

Choose View>Event Log File. ASE2000 displays the contents of the event log file that you specified in the Event Log dialog box. If ASE2000 is currently logging events, it updates the view to include the new events. For more information about the Event Log dialog box, see “To specify an event log file” in this section.



To clear an event log file:

Choose Edit>Clear Log File with the Event Log view active. ASE2000 clears the event log file.

WORKING WITH PROTOCOL-SPECIFIC PROPERTIES

Some hardware set-ups and protocols require atypical property settings. ASE2000 supports tabs in the Protocol-specific Properties dialog box to accommodate this. The tabs vary depending on the selected protocol (tabs do not appear for all protocols). The values you enter affect the way ASE2000 displays or generates messages.

To set protocol-specific properties:

1. **Find the target tab. C**hoose Properties>Protocol-specific. A tab labeled with the name of the target protocol appears at the far right for protocols for which ASE2000 supports this feature.

2. **Enter values for protocol-specific properties.** Select the tab on the far right and enter values for the displayed properties. The values you enter become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.

For the list of properties that appear for a given protocol and an explanation of each property, see Appendix A.

SIMULATING A SECONDARY STATION

When simulating one or more secondary stations, ASE2000 monitors the comm line for requests. When ASE2000 detects a request, it searches the Exchange List for the exchange template that matches the request, and then builds a response using information from the corresponding exchange definition (or from the object properties for DNP 3.0) and the request.

The following sections explain how to

- Specify the data that ASE2000 uses in a response
- Limit simulation to one or more stations on a party line
- Generate responses

For an introduction to the Exchange List, see "Working with the Exchange List View" in Chapter 2.

Specifying the Data in a Response

You may want to specify the data that ASE2000 uses when simulating a secondary station. ASE2000 supports two procedures for specifying data in a response message: One procedure applies to all protocols except DNP 3.0; the other procedure applies to DNP 3.0. This section describes both procedures.

Editing an Exchange Definition

For all protocols except DNP 3.0, ASE2000 supports an exchange definition for each exchange template listed in the Exchange List view. The exchange definition defines the messages (requests and responses) and message elements that comprise the exchange.

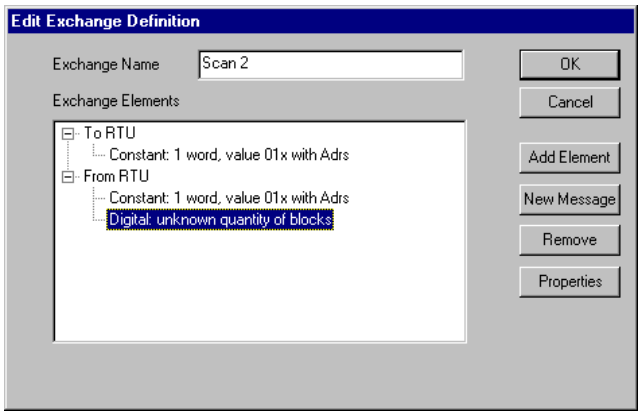
ASE2000 references exchange definitions primarily when generating responses. Typically, the only time you need to modify an exchange definition is when you want to specify the data that ASE2000 includes in an analog, pulse, or digital scan response or block file transfer, or if you want to force an error in an ASE2000 response. For all other types of exchanges, ASE2000 can usually generate a satisfactory response using the response structure from the exchange definition and the data from the actual request.

Note: *Some protocols require other types of modifications to exchange definitions. If any of these protocols are included in the product package, Appendix A provides more information.*

The following procedure describes how to edit an exchange definition to specify the data that ASE2000 includes in a response message.

To specify the data in a response:

1. **Open the exchange definition.** In the Exchange List view, select the exchange template for which you want to define response data. For example, select a scan exchange template. Then choose Edit>Edit Exchange Definition, or right-button click the template and choose Edit Exchange Definition. The Edit Exchange Definition dialog box appears.



   The dialog box shows the exchange name, the messages that comprise the exchange, and the elements that comprise each message. The messages are listed in the order in which they occur. Each message is tagged either To RTU or From RTU. The message elements appear below these designations.

   Note: *Many exchange types support only two messages: a request (a message to a secondary station) and a response (a message from the secondary station). Some exchange types support more than two messages; for example, the Conitel 2020 Trip Select exchange consists of three messages: request, response, request.*

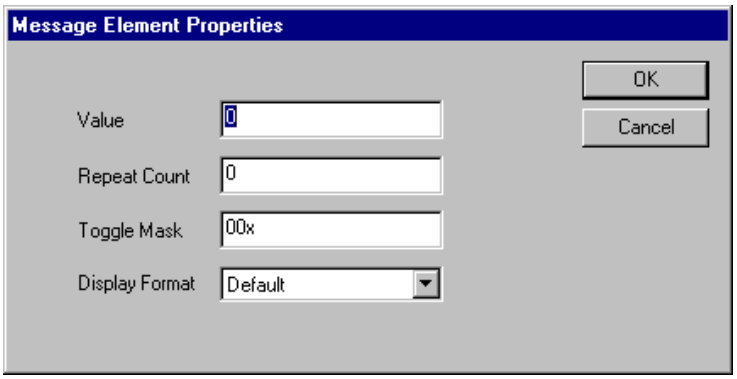
2. **Remove the generic Point Data message element, if present.** Some protocols, such as Conitel 2020 and Harris 5000/6000, do not specify the point types included in a scan response. For these protocols, ASE2000 uses the generic Point Data message element as a place-holder in the exchange definition. If Point Data is an element of the response message (From RTU), remove this element by selecting it and clicking Remove; then proceed to Step 5.

3. **Select an input-point message element.** Input-point message elements can be one of the following: Analog, Digital, Digital (MCD), Pulse, Analog

Exception, Digital Exception, Digital (MCD) Exception, or the generic Point Data.

Note: *If the input-point element is the generic Point Data element (labeled Point Data), you must first remove this element, as described in Step 2, and then replace it with one or more input-point elements, as described in Step 5*

Double-click the input-point message element for which you want to define data. For example, double-click the input-point element of the response message (From RTU) of the scan exchange definition that you opened in Step 1. The Message Element Properties dialog box appears.



4. **Enter values for the message element properties.** The properties that appear in the Message Element Properties dialog box are element-type specific; however, input-point elements support most of the same properties. The following properties appear for input-point elements:

   - **Value.** Enter the point value that you want ASE2000 to use for this message element in the first response. All the points you define for this element will have this value in the first response that ASE2000 generates. For each successive response, ASE2000 updates the point value by the Increment (analog and pulse points) or Toggle Mask (digital points) property.
   - **Repeat Count.** For analog and pulse points, enter the number of points in this message element. For digital points, enter the number of blocks in this element (see the Point Info tab of the Point Configuration Properties dialog box for the number of bits per block).

     All the points that you define for this message element will have the same value in each response that ASE2000 generates, starting with the value that you enter into the Value field. If you want points to have different values in the same response, you must define a different message element for each value (see Step 5).
   - **Increment.** Applies to analog and pulse points only. Enter the increment that you want ASE2000 to use to modify the point value in subsequent

responses. For each successive response, ASE2000 increases the point value by this increment.

For analog points, when ASE2000 reaches the high limit (see the Analog Point Info tab of the Point Configuration Properties dialog box for the high and low limit values), ASE2000 decreases the point value by the increment in each successive response. This continues until it reaches the low limit; then the process repeats (increasing to the high limit, decreasing to the low limit, and so on).

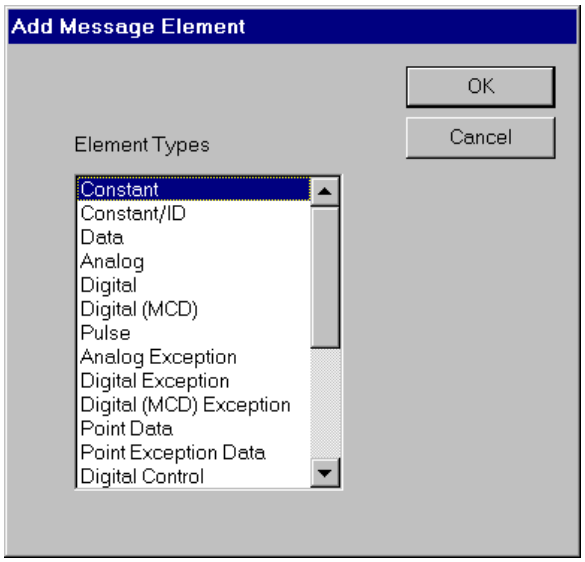
For pulse points, when ASE2000 reaches the wrap value (see the Pulse Point Info tab of the Point Configuration Properties dialog box for the wrap value), it wraps around, starting with 0 (there is no ramp down).

For more information on the Point Configuration Properties dialog box, see "Viewing Point Configuration" in this chapter.

- **Toggle Mask.** Applies to digital points only. Enter a hex value that defines which point values to toggle in subsequent responses (see the Point Info tab of the Point Configuration Properties dialog box for the number of bits per block). The initial value of the points is defined by the value you enter in the Value field. For each subsequent response, ASE2000 toggles the values of the points indicated by the Toggle Mask.
- **Display Format.** Enter a display format for the point data in this element (see the Point Configuration Properties dialog box for the default display format).

Click OK. The updated message element appears in the Exchange Elements list.

5. **Add a message element.** If you want points to have different values in the same response (see Step 4), you must define a different message element for each point or set of points that have the same value. If you are defining data for the generic Point Data element (see Step 2), you must define a different element for each point type that you want to include in the response.
   a. **Click Add Element.** The Add Message Element dialog box appears with a list of element types. Note that the element types on this list are the same across protocols.



b. **Select an element type and click OK.** The Message Element Properties dialog box appears.

c. **Enter values for the properties.** Follow the instructions in Step 4. When you click OK, the new message element appears in the Exchange Elements list.

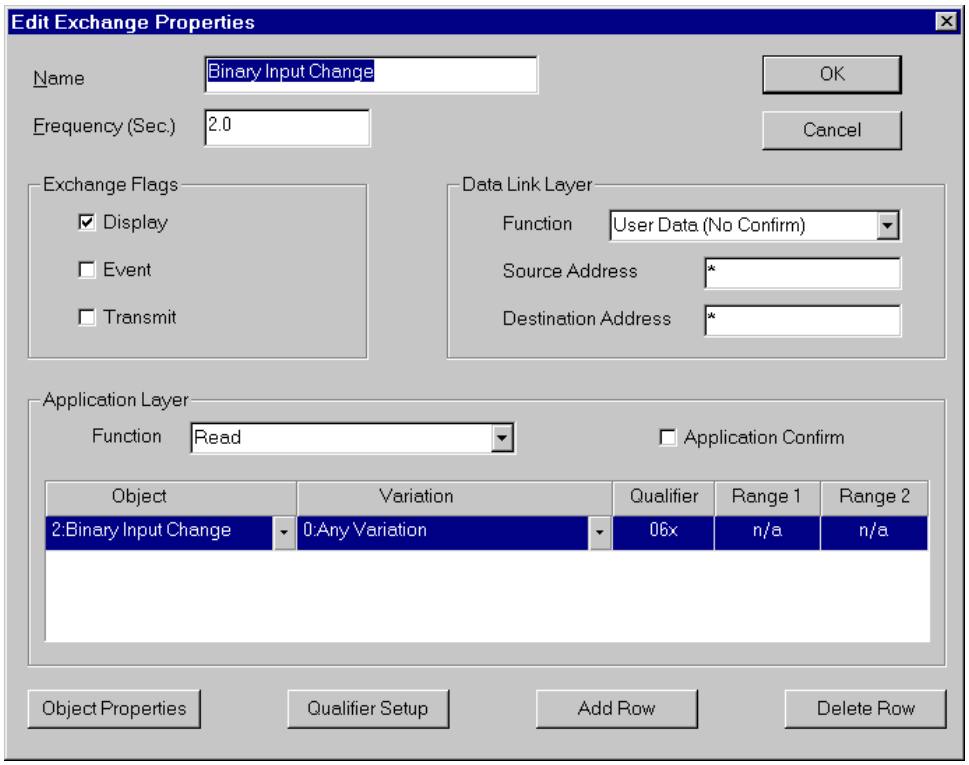
Continue to add message elements until the response data is complete.

Editing Object Properties (DNP 3.0 Only)

Use the following procedure for specifying the data in a DNP 3.0 response.

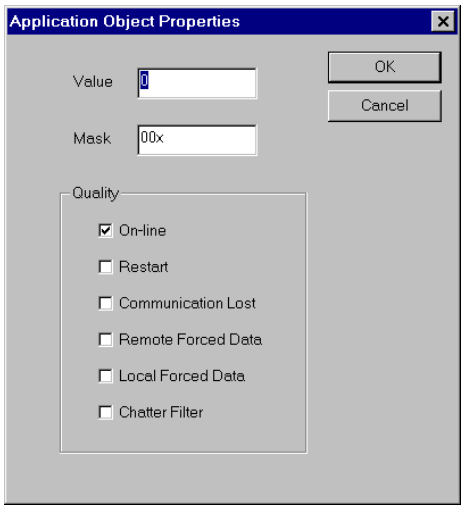
To specify the data in a DNP 3.0 response:

1. In the Exchange List view, double-click the exchange template for which you want to define response data, or select the template and choose Edit>Edit Exchange Properties, or right-button click the template and choose Edit Exchange Properties. The Edit Exchange Properties dialog box appears with a list of exchange properties. For example, double-click the Binary Input Change exchange template.



2. Enter values for Variation, Qualifier, Range 1, and Range 2, following the procedures described in Step 2 of "Generating Requests" in Chapter 2.

3. To enter point values and quality codes, click the Object Properties button. The Application Object Properties dialog box appears.



4. Enter values for the object properties. Except for the quality codes, these properties are the same as the message element properties described in Step 4 of "Editing an Exchange Definition" in this chapter. Enter object properties and checkmark the applicable quality codes.
5. If you want points to have different values in the same response, you must define a different object for each point or set of points that have the same value. This is similar to adding message elements to an exchange definition, as described in Step 5 of "Editing an Exchange Definition" in this chapter:
   a. Click the Add Row button. A new row appears in the object list.
   b. Assign values to Object, Variation, and so on, as described in Step 2 of this procedure.
   c. Assign values to object properties as described in Steps 3 and 4 of this procedure.

Specifying the Secondary Stations on a Party Line

If there is more than one secondary station on the line, modify the Exchange List as described in the following procedures to specify which secondary stations you want ASE2000 to simulate.

To specify only one secondary station on a party line:

1. Enter an asterisk (*) into the secondary-station ID field (the Destination Address field for DNP 3.0) of each of the exchange templates in the Exchange List view. (For instructions on how to edit an exchange template, see Step 2 of "Generating Requests" in Chapter 2.)

Note: *By default, the secondary-station ID field of each exchange template contains an asterisk (*); therefore, if you have not changed these settings, you do not have to execute this step.*

2. Set the secondary-station ID (the Destination Address for DNP 3.0) default to the ID of the secondary station that you want to simulate. (For instructions on how to assign exchange property default values, see "Setting Exchange Property Default Values" in Chapter 2.)

Whenever ASE2000 encounters an asterisk (*) in the secondary-station ID field of an exchange template, it uses the default value for that field. When simulating a secondary station, ASE2000 will only generate responses for requests that contain the secondary-station ID that you specified as the default.

To specify all secondary stations on the party line:

Note: *This procedure is necessary only if you changed the secondary-station ID default value or the default secondary-station IDs in the Exchange List; otherwise, ASE2000 automatically generates responses for all the secondary stations on the line when you enable simulation.*

1. Enter an asterisk (*) in the secondary-station ID field (the Destination Address field for DNP 3.0) of each of the exchange templates in the Exchange List view. An asterisk in this field tells ASE2000 to use the secondary-station ID default value for this field. (For instructions on how to edit an exchange template, see Step 2 of "Generating Requests" in Chapter 2.)

Note: *By default, the secondary-station ID field of each exchange template contains an asterisk (*); therefore, if you have not changed these settings, you do not have to execute this step.*

2. Enter an asterisk (*) as the secondary-station ID (the Destination Address for DNP 3.0) default value. An asterisk in this field works like a wild card—it tells ASE2000 that all secondary-station IDs match an asterisk in the secondary-station ID field of an exchange template. (For instructions on how to assign exchange property default values, see "Setting Exchange Property Defaults" in Chapter 2.)

Note: *By default, the value of the secondary-station ID default is *; therefore, if you have not changed this default value, you do not have to execute this step.*

To specify selected secondary stations on a party line:

For each secondary station that you want to simulate:

1. Make a set of copies of the default list of exchange templates. Use the originals, that is, the default Exchange List, as one of the sets. (See "Modifying the Exchange List" in Chapter 2 for instructions on how to copy an exchange template.)

2. Assign the secondary-station ID to the secondary-station ID field (the Destination Address field for DNP 3.0) of each template in the set. (See Step 2

of "Generating Requests" in Chapter 2 for instructions on how to edit an exchange template.)

When you are done, the Exchange List should contain only templates containing the IDs of the secondary stations that you want to simulate.

Generating Responses

Use the following procedure to generate responses.

To generate responses:

1. If you have a party line and want to limit simulation to one or a set of selected stations, specify the station or stations you want to simulate using the guidelines provided in "Specifying the Secondary Stations on A Party Line" in this chapter.

   Note: *In its default state (specifically, if you have not modified the default secondary-station IDs in the Exchange List or the secondary-station ID default value), when you enable simulation, ASE2000 automatically generates a response for every request it detects on the line. In other words, it simulates all secondary stations on the line.*

2. For the DNP 3.0 protocol, you also have the option of specifying the primary stations to which ASE2000 sends responses. Enter the target primary station in the Source Address field of the Edit Exchange Properties dialog box. An asterisk (*) in the Source Address field tells ASE2000 to send responses to any station that issues a request.

3. If you want to specify the data that ASE2000 includes in the responses that it generates, follow the appropriate procedure in "Specifying the Data in a Response" in this chapter.

4. Enable secondary-station simulation by choosing File>Simulate RTU or by clicking the Simulate RTU icon on the toolbar. ASE2000 generates responses as it detects requests on the comm line.

You can monitor the requests and responses using the Line Monitor views. To stop simulating, choose File>Stop or click the Stop icon on the toolbar.

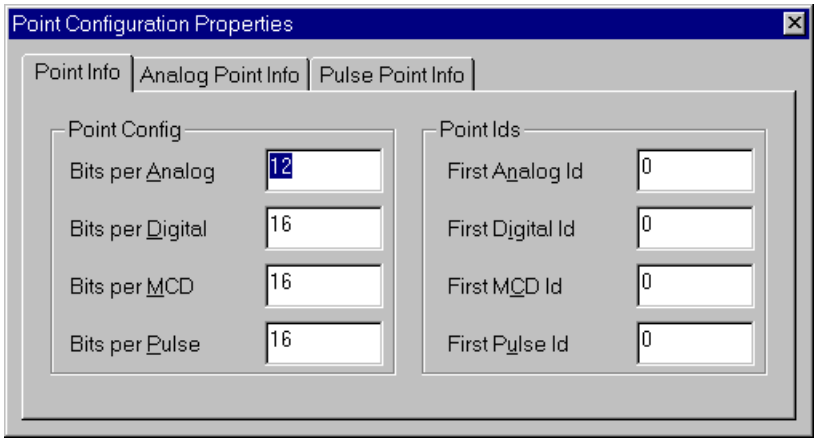
VIEWING POINT CONFIGURATION

ASE2000 uses point configuration information for parsing, displaying, and generating request and response messages. The Point Configuration dialog box displays the values of ASE2000 point configuration properties. The dialog box is primarily for information. However, you can use the dialog box to change ASE2000 point configuration property values to support non-standard secondary-station hardware configurations. Before changing the value of any point configuration property, call ASE Technical Support.

To view point configuration properties:

Choose Properties>Point Configuration. The Point Configuration Properties dialog box appears with the following tabs:

- **Point Info.** Shows the number of bits that comprise each type of point value. Shows the start point IDs that ASE2000 uses if it cannot determine the point number from the message.
- **Analog Point Info.** Shows the raw data format and other properties that ASE2000 expects and uses for analog data, including
  - **Low Limit, High Limit.** ASE2000 ramps between the Low Limit and High Limit values when generating analog response data (see "Specifying Data in a Response" in this chapter).
  - **Raw Units Info.** ASE2000 uses the Raw Units Info to determine the maximum input current or voltage to use with the Volts/ma display format. For example, if your analog input module goes from +5 volts to –5 volts, enter Volts in the Units field and 5 in the Highest Value field.
  - **Deadband.** ASE2000 uses Deadband in analog event processing: If a point is in an alarm state, it must return within normal range by at least the deadband value, before ASE2000 clears the alarm. For example, if the point value is above the high alarm limit of 100 and the deadband is 5, the point value must be less than 95, before ASE2000 will clear the alarm.
- **Pulse Point Info.** Shows the raw data format that ASE2000 expects and uses for pulse data. ASE2000 ramps up to the Wrap value when generating pulse response data (see "Specifying Data in a Response" in this chapter for more information).



EXTENDING A PROTOCOL

If you have extended a protocol, you can make adjustments to ASE2000 exchange properties and definitions so that it can support the extended protocol. ASE2000 supports two procedures for extending a protocol: One for all protocols except DNP 3.0; and one for DNP 3.0.

For all protocols except DNP 3.0, ASE2000 supports the New Message option. The New Message option lets you change the structure of an exchange definition.

To add a message to an exchange definition:

1. Open the exchange definition as described in Step 1 of "Editing an Exchange Definition" in this chapter.
2. Click New Message. The Add Message Element dialog box appears.
3. Select a message element type and click OK. The Message Element Properties dialog box appears.
4. Enter values for the message element properties as described in Step 4 of "Editing an Exchange Definition." When you click OK, a new message containing the message element that you specified appears at the bottom of the Exchange Elements list. If the message immediately preceding it is a request (to RTU), the new message is a response (from RTU); if the message immediately preceding it is a response, the new message is a request.

For DNP 3.0, you can enter new Data Link Layer and Application Layer functions, add and delete data objects, and assign new values to object properties, such as Object type, Variation, and Qualifier, as described in "Generating Requests" in Chapter 2 and in "Editing Object Properties (DNP 3.0 Only)" in this chapter.

APPENDIX A: PROTOCOL-SPECIFIC INFORMATION

This appendix contains additional information about how ASE2000 supports certain protocols, including special set-up and configuration procedures that apply only to these protocols.

Although this appendix addresses other topics, it primarily focuses on modifying scan exchange definitions to support target secondary-station configurations. See "Editing an Exchange Definition" in Chapter 3 for an introduction to exchange definitions, including a description of their basic structure and the procedure for opening and modifying them. You should also be familiar with the Exchange List view and editing exchange templates, as described in "Working with the Exchange List View" in Chapter 2.

BOA

The following procedure applies to the BOA protocol.

Forcing Errors

To force message errors:
Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **CRC.** Generate CRC error.
- **Ack bit 0.** Always send the Ack bit in the requested state, instead of toggling when required.
- **Ack bit 1.** Always send the Ack bit in the requested state, instead of toggling when required.

Checkmark the errors you want to force.

CONITEL

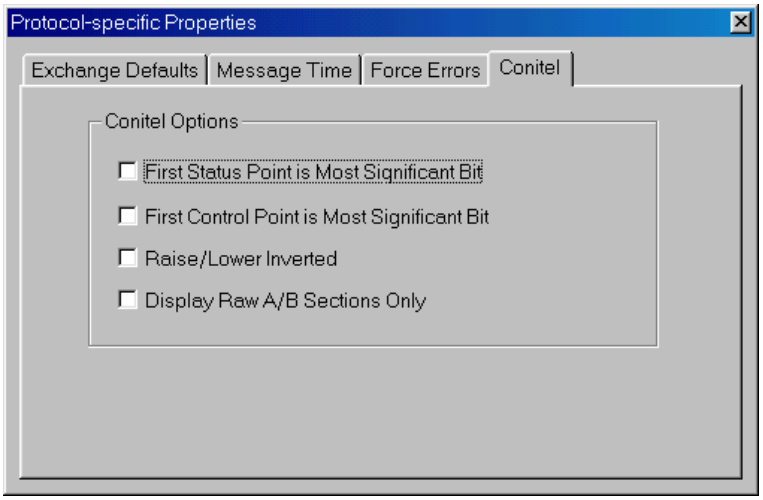
Information in this section applies to Conitel protocols, including 300, 2000, 2020, 2025, 2100B, 2100H, 2100M, and 3000.

Configuring for Conitel

The following procedure applies to all Conitel protocols.

To assign values to Conitel configuration properties:

1. Choose Properties>Protocol-specific, and then select the Conitel tab. The Conitel configuration properties appear.



2. Enter values for the following check-boxes:

   - **First status point is most significant bit.** The station reports input status points in 12-bit sections. When checkmarked, ASE2000 assumes the lowest indexed status point is the most significant bit. (Typically, the lowest indexed status point is the least significant bit, that is, the right-most bit.)
   - **First control point is most significant bit.** Each control group can control up to 12 digital output points. When checkmarked, ASE2000 assumes the lowest numbered control point is the most significant bit. (Typically, the lowest numbered control point is the least significant bit, that is, the right-most bit.)
   - **Raise/lower inverted.** Raise/lower points are four-bit values, where the most significant bit indicates the operation, raise or lower. When checkmarked, ASE2000 assumes that 0 indicates raise and 1 indicates lower. (Typically, 0 indicates lower and 1 indicates raise.)
   - **Display raw A/B sections only.** Each Conitel word contains five fields: A-section-raw-data, A-section-bit, B-section-raw-data, B-section-bit, and

BCH. Normally, ASE2000 displays values for all five sections. If checkmarked, ASE2000 displays only the raw-data sections.

Note: *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

Specifying Scan Data Formats

The Conitel protocol typically supports a single data request message called Scan. A Scan request reads digital, analog, and pulse accumulator input points. Because ASE2000 cannot know in advance what type of data the RTU will return in response to a Scan request, by default ASE2000 identifies all data as Pt Val, with data values displayed in hex. You can refine this format by modifying the Scan exchange definition to define the type of data in each Scan response message. You accomplish this in three steps:

1. **Create a Scan exchange template for each RTU/group.** A primary station typically issues multiple Scan requests designated by RTU ID (address) and group number (if applicable). You must create a separate Scan exchange template for each unique RTU/group combination that you plan to monitor or simulate:
   a. Select the Scan exchange template in the Exchange List view and choose Edit>Copy. ASE2000 copies the template to the clipboard.
   b. For each additional template that you need, select Edit>Paste. ASE2000 copies the template on the clipboard to the Exchange List.
2. **Enter an RTU ID and group number for each Scan exchange template.** For each Scan exchange template that you created in Step 1, doubleclick the template and enter a unique RTU ID/group number combination.
3. **Modify the exchange definition of each Scan template to include point configuration information.** For this step, you must know the order (in 12-bit sections) in which the RTU returns the data in the response to a Scan request. The following example assumes that the target RTU returns two sections of digital data (24 1-bit points) followed by eight sections of analog data (8 points):
   a. **Open the exchange definition.** Right-button click the Scan exchange template in the Exchange List view and select Edit Exchange Definition. The Edit Exchange Definition dialog box appears with a list of Exchange Elements.
   b. **Remove the generic Point Data element.** Select the element labeled Point Data (under "From RTU") and click Remove.
   c. **Add a new element.** Select the element immediately above the one you removed in Step b, and then select Add Element. The Message Element dialog box appears.
   d. **Define a digital element.** Select Digital from the list of message element types; then click OK. The Message Element Properties dialog box appears.

Enter the number of 12-bit digital sections into the Repeat Count field; in this example, 2. Click OK. The new digital element appears at the bottom of the Exchange Elements list.

e. Define an analog element. With the newly defined digital element selected, click Add Element. Select Analog from the list of message element types and click OK. Enter the number of 12-bit analog sections into the Repeat Count field; in this example, 8. Click OK. The new analog element appears below the digital element in the Exchange Elements list.

Note: *The order of the elements must match the order in which the RTU returns the data in the response message.*

f. Click OK. Whenever ASE2000 gets a Scan response from the RTU and group specified in this exchange template, it will parse, label, and display the point data as you defined it here.

Define point configurations for each of the Scan exchange templates that you created in Step 1 using this procedure, but substituting the appropriate element type and repeat count. Once you finish modifying exchange definitions, it is a good idea to save them (File>Save) for re-use.

Forcing Errors

The following procedure applies to all versions of Conitel.

To force message errors:

Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **BCH.** Generate BCH in first word.
- **Set A bit.** Set A bit in first section where it should be 0.
- **Clear A bit.** Clear A bit in 1st section where is should be 1.
- **Set B bit.** Set B bit in first section where it should be 0

Checkmark the errors you want to force.

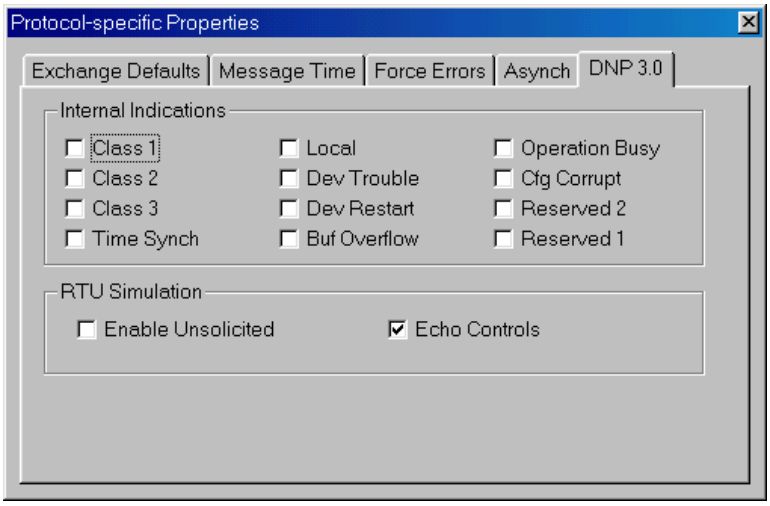
DNP 3.0

This section describes procedures for the DNP 3.0 protocol. You should be familiar with DNP 3.0 structure and terminology before proceeding.

Configuring for DNP 3.0

To assign values to configuration properties:

1. Choose Properties>Protocol-Specific, and then select the DNP 3.0 tab. Configuration properties for the protocol appear.



2. Enter values for the following check-boxes:

   - **12 internal indication bits.** Set any of the 12 internal indication bits. All application-level messages that the RTU sends contain these bits.
   - **Enable unsolicited.** When checkmarked, enables unsolicited message transmission**.**
   - **Echo controls.** If checkmarked, ASE2000 echoes relay and setpoint values. If not checkmarked, ASE2000 formats responses according to the specifications you entered using the Point Configuration Properties dialog box.

Note: *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

About Class Data Scans

When simulating a secondary station, ASE2000 creates Class Data Scan responses from composites of information contained in one or more exchange templates. To build a Class Data Scan response, ASE2000 scans exchange templates for a data object that looks like a valid response to the class data request received. Static objects, such as analog and digital inputs, are valid responses to Class 0 requests. Event or change objects are valid responses to Class 1, 2, or 3 requests. ASE2000 forms its response from all valid, enabled exchange templates.

You enable an exchange template by setting the Transmit property using the Edit Exchange Properties dialog box.

Creating Additional Exchange Types

The default Exchange List (the exchange types listed in the Exchange List view) supports most DNP 3.0 exchange types. Use the following procedure to define additional exchange types.

To define a new exchange type:

1. With the Exchange List view active, choose Edit>Create Exchange Template. The Create Exchange Template dialog box appears with a list of existing exchange types.
2. Click an exchange type similar to the one you want to create. The following guidelines may help with this selection process.

To create a new exchange with the following characteristics:	Start with exchange type:
Data Link message from master, ack expected from RTU/IED	Reset Link
Data Link message from RTU/IED	Ack
Application layer message from master, response expected from RTU/IED	Binary Input
Unsolicited RTU/IED data response	
Application layer message from master, no response from RTU/IED	Freeze All

   Click OK. A new exchange template of the specified type appears in the Exchange List view.
3. Select the exchange template you just created; then choose Edit>Edit Exchange Properties. The Edit Exchange Properties dialog box appears.
4. Enter a new exchange name, data link layer function code, and application layer information. Application layer information is not required for data link layer-only functions such as Reset Link. You can specify undefined and invalid functions codes for both data link and application layers by entering the desired value. Click the pull-down menu for a list of standard codes.

Forcing Errors

To force message errors:

Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- FC**B:0.** Always transmit the FCB bit in the requested state, as opposed to toggling it when required.
- **FCB:1.** Always transmit the FCB bit in the requested state, as opposed to toggling it when required.

- **Header CRC.** Create CRC error in data link header.
- **Data CRC.** Create CRC error in first application data section.
- **NAK messages.** Send NAK where an ACK would normally be used.
- **Transport FIR.** Send incorrect value for transport FIR bit.
- **Transport FIN.** Send incorrect value for transport FIN bit.
- **Application FIR.** Send incorrect value for application FIR bit.
- **Application FIN.** Send incorrect value for application FIN bit.
- **Transport seq (random).** Send an incorrect transport sequence number at 10% frequency.
- **Application seq/Add 1.** Adds 1 to expected application sequence number.
- **Application seq/Do not increment.** Uses same application sequence number as most recently transmitted message.
- **No data link acks.** Do not send ack when requested.
- **No application confirms.** Do not send application confirms when requested.
- **DL start error.** Do not start DNP message with [05 64].
- **Randomly select (from those checked).** 10% of the transmitted messages will contain an error, randomly chosen from other checked entries in this list. 90% of the message will be transmitted with no error.

Checkmark the errors that you want to force.

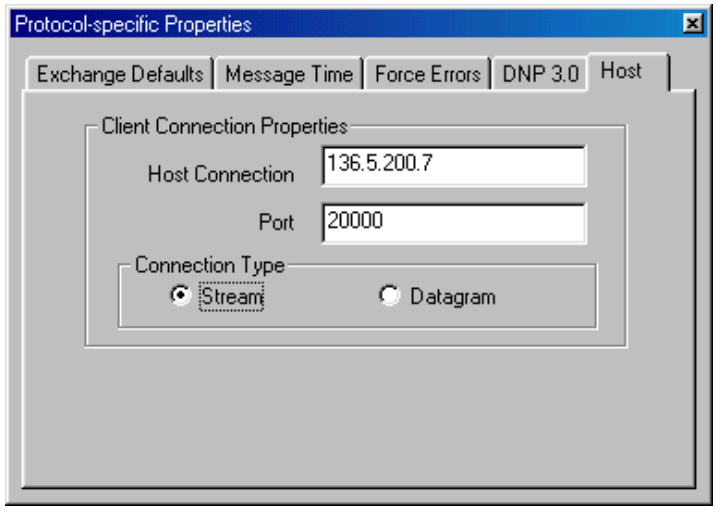
DNP 3.0 LAN/WAN

The ASE2000 implementation of DNP 3.0 LAN/WAN protocol supports Master and RTU simulation modes only. Line monitoring is not supported.

Configuring for the Device

To assign values to device properties:

1. Choose Properties>Protocol-specific, and then select the Host tab. The device properties appear.



2. Enter values for device properties:

   - **Host connection.** Specify the network address of the device with which ASE2000 communicates. This can either be an IP address or a node name that maps to an IP address using "Get Host By Name" mapping.
   - **Port.** Specify a port address. The default DNP 3.0 port address is 20000.
   - **Connection type.** Specify the TCP communication type, stream (IP) or datagram (UDP).

Configuring for DNP 3.0 LAN/WAN

To configure the protocol, follow the procedure in "Configuring DNP 3.0" in Section "DNP 3.0."

Forcing Errors

See "DNP 3.0" above.

GETAC 7020/4-BCH

This section describes the Getac 7020/4-BCH protocol. Note that this is not the same protocol as Getac 7020-LP.

Choosing the Correct Version of Getac 7020/4-BCH

There are three versions of Getac 7020/4-BCH protocol. Each version is identical, except for the structure of the analog output command. The analog output command contains one 16-bit data field. Basic Getac protocol defines this 16-bit field as a five-bit point address and an 11-bit output value. Some utilities use different definitions. The following table shows each version of the Getac protocol and the corresponding analog output command structure.

ASE2000 Protocol	Size in Bits of	
	Address	Value
Getac 7020/4-BCH	5	11
Getac (AOUT:4)	4	12
Getac (AOUT:6)	6	10

About Betac, BDOT, and BAOT

Betac is an extension of the Getac protocol. ASE2000 supports two Betac commands: BDOT and BAOT. These commands are used to transmit a sequence of analog and digital output values in a single message. Output values are contained in a series of 32-bit data words following the initial BDOT or BAOT command word. The BDOT command has one 12-bit or 16-bit output value per word. The BAOT has two 12-bit values per word.

In Monitor and RTU simulation modes, ASE2000 parses and displays BDOT and BAOT commands containing any number of 32-bit data words. In Master simulation mode, a special setup procedure is required.

To simulate BDOT or BAOT commands in Master simulation mode:

1. **Open the exchange definition.** Select the BDOT or BAOT exchange definition in the Exchange List View, and then choose Edit>Edit Exchange Definition. The Edit Exchange Definition dialog box appears.
2. **Enter the correct value for Num_Wrd.** Select the first exchange element under “To RTU,” named “Constant:…” and select Properties. The Message Element dialog box appears. Enter the correct hex value for the highlighted properties, and click OK.

3. **Define analog control value(s).** Select the exchange element under "To RTU," named "Analog Control: unknown quantity of points." Then select Properties. The Message Element Properties dialog box appears. Enter values for the following properties:

   - Value. Enter the value that you want ASE2000 to transmit.
   - Count. Enter the number of points. ASE2000 transmits the same value for the specified number of points.

   To specify a different value for each point, assign Count a value of 1, return to the Edit Exchange Definition dialog box, and select Add Element to define another Analog Control field immediately following the initial field; select the new field, and then select Properties, and assign values to Value and Count. Repeat this procedure until you define all the analog control point values that you want ASE2000 to transmit.

   See "Working with the Exchange List View" in Chapter 2 for more information on how to edit an exchange template.

HARRIS 5000/6000

This section describes special procedures for the Harris 5000/6000 protocol.

Formatting Data Dump and Status Dump

A Data Dump request reads all analog and pulse accumulator ports. A Status Dump request reads status (digital) ports. To ensure that ASE2000 correctly formats the Harris 5000/6000 Data Dump and Status Dump exchange types, you must modify the corresponding exchange definitions to match the I/O port configuration of the RTU.

You need to know the following before modifying the exchange definitions for the Data Dump and Status Dump exchange templates:

- Number of ports from which data will be requested
- For each port, the type and number of points to request

Use the following procedure to modify the Data Dump and Status Dump exchange definitions. If there are multiple RTUs on the line, create copies of each exchange template; then enter the target RTU ID and perform the procedure for each copy (see "Working with the Exchange List View" in Chapter 2 for information on how to copy and edit an exchange template).

To modify the Data Dump or Status Dump exchange definition to correctly format data:

1. **Open the exchange definition.** Right-button click the Data Dump or Status Dump exchange template in the Exchange List view and select Edit Exchange Definition. The Edit Exchange Definition dialog box appears.
2. **Remove the point count place holder.** Under the list labeled "To RTU," select the line labeled "Data: 0 words," and click Remove.
3. **Define the number of points to request from each port.** For each port at the RTU do the following:
   - **a.** Select the last element under "To RTU."
   - **b.** Click Add Element. The Add Message Element dialog box appears.
   - **c.** Select Constant from the list of element types and click OK. The Message Element Properties dialog box appears.
   - **d.** Enter the number of points to request from the port into the Value field and click OK.

   When you are done, In the "To RTU" list there should be a Constant message element for each port at the RTU.
4. **Define the type and amount of data at each port.** For each Constant message element (port) you entered in the "To RTU" list, there are two elements in the "From RTU" list: For the Data Dump definition, these

elements are Data and Point Data; for the Status Dump definition, these elements are Data and Digital. You must modify these elements to define the type of points and number of points of that type at each port. For each set of elements (port) in the "From RTU" list, do the following:

Data Dump:

a. **Remove the Point Data element.** Select the Point Data element and click Remove.

b. **Add a message element.** Click Add Element; then select Analog or Pulse from the list of element types (as appropriate) and click OK. The Message Element Properties dialog box appears.

c. **Enter the number of points.** Enter the number of points of the selected type into the Repeat Count field.

Status Dump:

Enter the Repeat Count. Double-click the Digital message element. In the Repeat Count field, enter the number of points divided by 6 and rounded to the next whole number.

5. **Delete remaining data elements in the "From RTU" list.** This step is necessary only in RTU simulation mode. Delete all the message elements after the final port entry you made in the "From RTU" list, by selecting each element and clicking Remove.

IEC 870-5-101

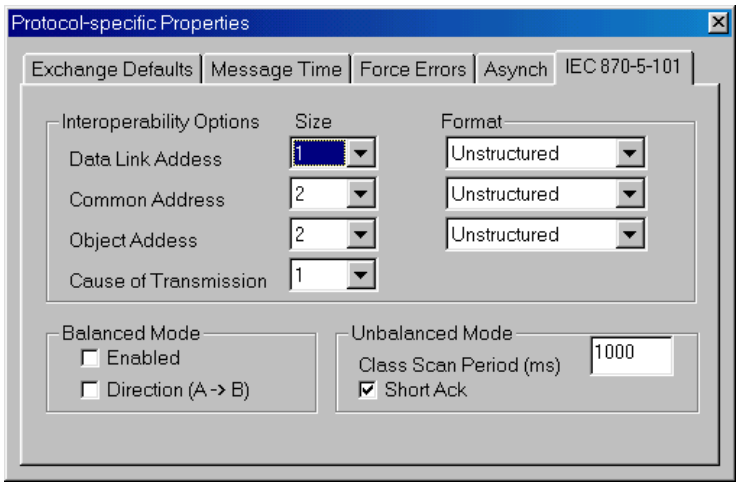
This section applies to the 101 companion to the IEC 870-5 communication standards.

Configuring for IEC 870-5-101

The IEC 870-5-101 Properties tab (Properties>Protocol-specific) supports several configuration properties. Use these to define address and cause of transmission sizes (number of octets) and to assign balanced and unbalanced mode properties.

To assign values to configuration properties:

1. Choose Properties>Protocol-Specific, and then select the IEC 870-5-101 tab. Configuration properties for the protocol appear.



2. Enter values for the listed properties:
   - **Data Link address size.** 0, 1, or 2 octets.
   - **Common address size.** 1 or 2 octets.
   - **Object address size.** 1, 2, or 3 octets.
   - **Format.** Options vary depending on address type:
     - **Unformatted.** ASE2000 displays the address as a 24-bit unsigned number.
     - **8.8.** ASE2000 displays the address as an 8-bit value followed by another 8-bit value.
     - **8.16.** ASE2000 displays the address as an 8-bit value followed by a 16-bit value. Enter data in n.n format (for example, 10.300).
     - **16.8.** ASE2000 displays the address as a 16-bit value followed by an 8-bit value. Enter data in n.n format (for example, 300.10).

- **8.8.8.** ASE2000 displays the address as three 8-bit values. Enter data in n.n.n format (for example, 10.20.30).

Note: *One-octet addresses are unsigned numbers between 0 and 255. Two-octet addresses are normally treated as unsigned numbers between 0 to 65535. This treatment is called unstructured addressing. Two octet addresses can also be structured; in this case, ASE2000 treats them as two separate eight-bit numbers each with values between 0 to 255. ASE2000 uses the term 8.8 to designate a 16-bit address structured as two eight-bit units. Three octet addresses cannot be unstructured. As a structured address, they can contain three one-octet (eight-bit) values, one two-octet (16-bit) and one one-octet (eight-bit) value, or one one-octet and one two-octet value. The ASE2000 names for these three structured address types are 8.8.8, 8.16, and 16.8.*

- **Cause of transmission size.** 1 or 2 octets. The second octet is the originator address.
- **Balanced mode - enabled.** Checkmark the Balanced Enabled box, to enable balanced mode.
- **Balanced mode - direction (A->B).** In balanced mode, the protocol defines a direction bit to the control octet. This bit is normally 0 in the messages that ASE2000 transmits and 1 in messages it receives. You can switch the direction bit values to 1 outgoing and 0 incoming by checkmarking Direction (A->B). In Line Monitoring mode and in unbalanced operation, ASE2000 ignores this property.
- **Unbalanced mode - class scan period.** In unbalanced, master simulation mode, ASE2000 automatically periodically transmits Class 1 and Class 2 requests. By default, ASE2000 sends one Class 1 or Class 2 request every second. Class Scan Period (ms) defines the frequency of this transmission. A value of 0 disables class scan transmission. A positive value defines the class scan transmission frequency in milliseconds.
- **Unbalanced mode - short ack.** IEC defines two types of acknowledgement messages: One conforms to the fixed-length message structure; the other is only one byte. Checkmark Short Ack to enable one-byte acknowledgement messages. Remove the checkmark to enable the fixed-length message structure. This property only affects messages that ASE2000 transmits. On input, ASE2000 accepts either.

Note: *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

Simulating an RTU

The IEC 870-5-101 protocol places more intelligence at the RTU than most American protocols. With this protocol, the master station periodically issues a general poll for point data, and the RTU/IED determines what data to include in

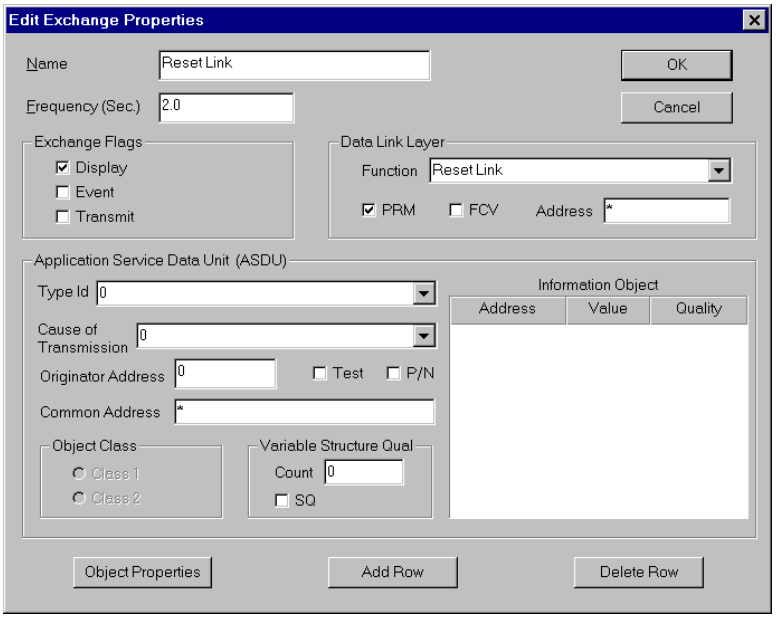
each response. This determination is based on what the RTU/IED decides is most important to report at any given time. Data is segmented into higher priority (Class 1) events and lower priority (Class 2) information. By repeating Class 1 and Class 2 polls, the master eventually receives data for all points in the RTU/IED, although higher priority data may be sent several times before lower priority data is sent once.

The master can temporarily modify the reporting sequence by sending an Interrogation or Counter Interrogation request. In response to these types of requests, the RTU returns data for all points in the interrogation set before reverting to the normal poll/response process.

To simulate an RTU, you must enter configuration information for every exchange type (ASDU) that you want included in the normal Class 1/Class 2 poll cycle or sent in response to an Interrogation or Counter Interrogation request.

To simulate an RTU, for each exchange type you want to simulate, do the following:

1. Select the exchange type in the Exchange List View and choose Edit>Edit Exchange Properties. The Edit Exchange Properties dialog box appears.



2. Assign values to the following ASDU (general) properties:

   - **Transmit.** Enables the exchange type for data reporting.
   - **Frequency (sec).** Defines how often ASE2000 attempts to report the data. ASE2000 includes all enabled exchanges in Interrogation or Counter

Interrogation response sequences. If the frequency is not zero, ASE2000 includes the exchange in responses to periodic Class 1/Class 2 requests.

- **Cause of transmission, Cause in periodic responses.** ASE2000 calculates the cause in Interrogation responses.
- **Address.** Normally set to the default value (*).
- **Common address.**
- **Test.** Controls the state of these indication bits.
- **P/N.**
- **SQ.** Specifies sequential reporting of information object addresses.
- **Object class.** Defines object as Class 1 or Class 2

Assign values to the following information object (point) properties:

- **Type ID.** Information Object type.
- **Count.** Defines how many points to report to the station. If the Information Object Grid has only one entry, ASE2000 sends that entry repeatedly until all points are transmitted. ASE2000 increments the address for each successive point.
- **Information Object address.**
- **Value.**
- **Quality.** Quality code meanings vary depending on object type. Select Object Properties to bring up a dialog box to specify quality code and other properties for the current object.
- **Add Row.** Adds an entry to the Information Object Grid and updates Count to reflect.
- **Delete Row.** Deletes the selected entry from the grid and updates Count to reflect.

Note: *With the Information Object properties, you can instruct ASE2000 to send the same value to a series of sequential points or different values to different points, by creating multiple entries in the Information Object Grid.*

Defining Additional Exchange Types

The default Exchange List (the exchange types listed in the Exchange List view) supports most IEC exchange types. Use the following procedure to define additional exchange types.

To define a new exchange type:

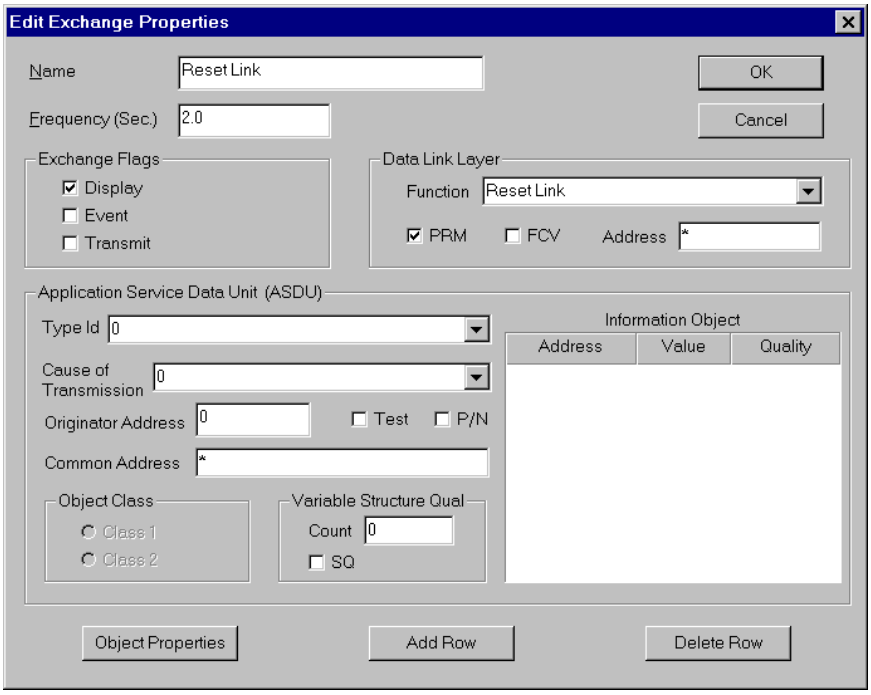
1. With the Exchange List view active, choose Edit>Create Exchange Template. The Create Exchange Template dialog box appears with a list of existing exchange types.

2. Click an exchange type similar to the one you want to create. The following guidelines may help with this selection process.

To create an exchange template with these characteristics:	Start with this exchange type:
Data Link message from master, ack expected from RTU/IED	Reset Link
Data Link message from RTU/IED	Ack
Application layer message from master, response expected from RTU/IED	General Interrogation
Application layer message from master, no response from RTU/IED	Global Counter Interrogation
RTU/IED ASDU data block	Single Point (101) Measurands I (103)

Click OK. A new exchange template of the specified type appears in the Exchange List view.

3. Select the exchange template you just created; then choose Edit>Edit Exchange Properties. The Edit Exchange Properties dialog box appears.



4. Enter a new exchange name, data link layer function code, ASDU information. ASDU information is not required for data link layer-only functions such as Reset Link. You can specify undefined and invalid functions codes for both data link and application layers by entering the desired value. Click the pull-down menu for a list of standard codes.

Forcing Errors

To force message errors:
Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **Parity.** Generates parity error in first octet transmitted
- **Checksum.** Generates checksum error
- **FCB:0.** Always transmit 0 for FCB bit
- **FCB:1**. Always transmit 1 for FCB bit
- **NAK Messages.** Send NAK instead of an ACK, where appropriate
- **No Data Link Acks.** Never acknowledge a message

Checkmark the errors that you want to force.

IEC 870-5-103

ASE2000 supports forcing errors and simulating an RTU for IEC 870-5-103, as described in “Forcing Errors” and “Simulating an RTU” in Section “IEC 870-5-101.” Note that, unlike IEC 870-5-101, IEC 870-5-103 does not support Counter Interrogation, and IEC 870-5-103 messages do not contain Test and P/N status bits.

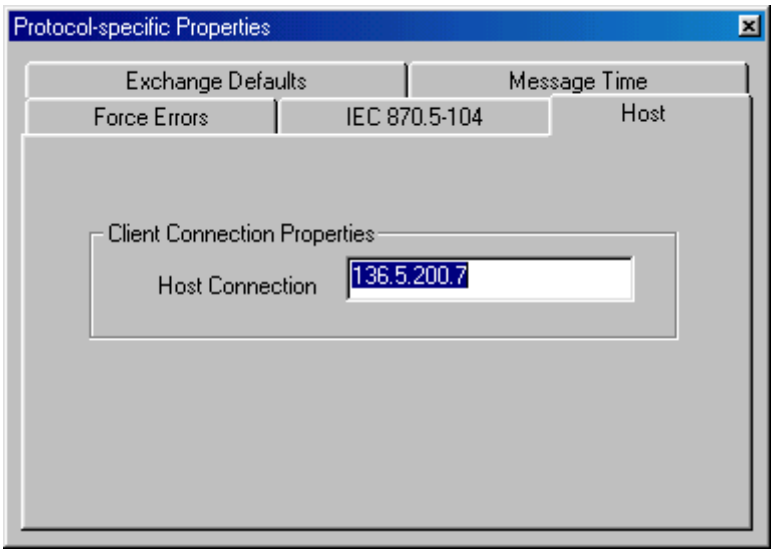
IEC 870-5-104

IEC 870-5-104 is the LAN/WAN version of the IEC 870-5-101 protocol. ASE2000 supports master and RTU simulation modes for IEC 870-5-104. (Note that ASE2000 supports simulating an RTU in the same way for both IEC 870-5-101 and IEC 870-5-104, as described in "Simulating an RTU" in Section "IEC 870-5-101.") ASE2000 does not support line monitoring mode for any LAN/WAN protocol.

Specifying the Network Address of the Device

To specify the network address of the target device:

1. Choose Properties>Protocol-Specific, and then select the Host tab. The Host Connection property appears.

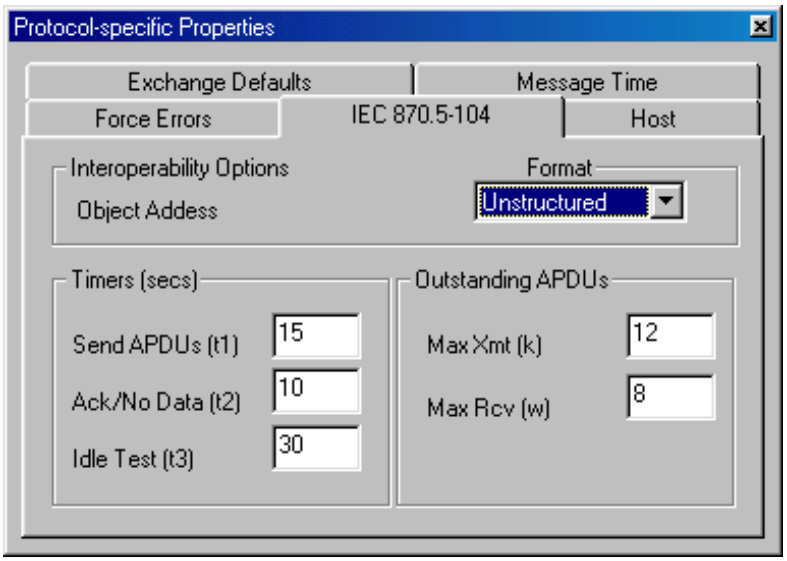


2. Enter the network address for the device with which ASE2000 is to communicate. This can be either an IP address or a node name that can be resolved to an IP address using "Get Host By Name" mapping. In RTU simulation mode, ASE2000 waits for a connection request from the specified device. In master simulation mode, ASE2000 issues a connection request to the specified device. The master-mode-initiated connection times-out if the device does not accept it.

Configuring for IEC 870-5-104

To assign values to configuration and timing properties:

1. Choose Properties>Protocol-Specific, and then select the IEC 870-5-104 tab. Configuration and timing properties appear.



2. Enter values for the listed properties:

- **Object address format.** The IEC 870-5-104 object address is 3 octets in length. This property defines the object address format and affects how ASE2000 displays the address. Choose from the following options:
  - **Unstructured.** ASE2000 displays the address as a 24-bit unsigned number.
  - **8.16.** ASE2000 displays the address as an 8-bit value followed by a 16-bit value. Enter data in n.n format (for example, 10.300).
  - **16.8.** ASE2000 displays the address as a 16-bit value followed by an 8-bit value. Enter data in n.n format (for example, 300.10).
  - **8.8.8.** ASE2000 displays the address as three 8-bit values. Enter data in n.n.n format (for example, 10.20.30).
- **Timers.** IEC 870-5-104 devices transmit information asynchronously. The protocol requires that the receiving device acknowledges messages. Devices do not have to acknowledge messages immediately, and they may acknowledge several at once. The following timeout properties define message transmission/timeout processing constraints (in seconds):
  - **Send APDUs (t1).** Maximum time that a device must wait for acknowledgement of a transmitted message.
  - **Ack/No Data (t2).** Maximum time a device may wait before acknowledging a received message.
  - **Idle Test (t3).** Maximum time a slave device waits between message transmissions. If the device has not received data in t3 seconds, the device sends a TESTFR.

- **Outstanding APDUs.** Since each data message contains a sequence number, the device can acknowledge a sequence of messages at once, by identifying the sequence number of the most recent message received.
  - **Max Xmit (k).** Maximum number of messages that can be transmitted before receiving an acknowledgement. The device stops transmitting after it has sent k messages without receiving acknowledgement.
  - **Max Rec (w).** Maximum number of messages that can be received before transmitting an acknowledgement. After receiving w messages, the device must transmit an acknowledgement.

Notes:

- *When running in RTU simulation mode, in accordance with IEC 870-5-104 standards, ASE2000 must receive a STARTDT message before starting normal communication.*
- *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

INDACTIC 33/41

ASE2000 supports both Indactic 33/41 Base and Indactic 33/41 Extended addressing. The Base addressing option uses a 4-bit RTU address format, and the Extended option uses a 12-bit RTU address format. The two formats are implemented as separate protocols.

In addition to the RTU address options, the Indactic 33/41 protocol also supports different analog (measurand) formats and message security options for analog reporting. If the customer RTUs uses different options from those supplied as defaults, use the following procedures to set the correct values.

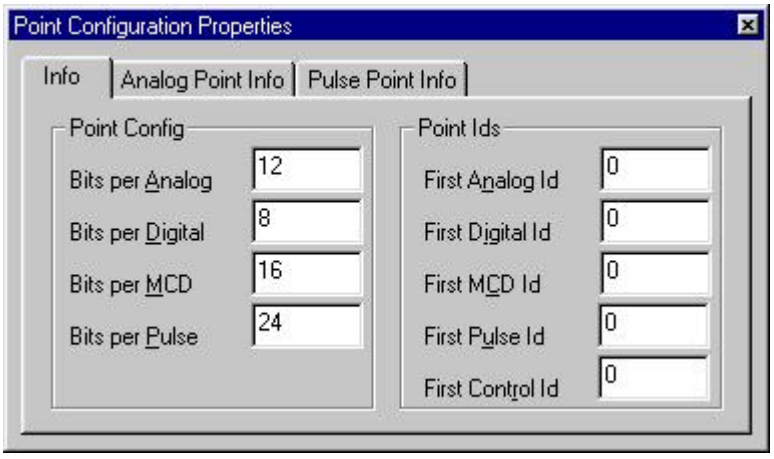
Configuring for Indactic 33/41

ASE2000 uses the following defaults:

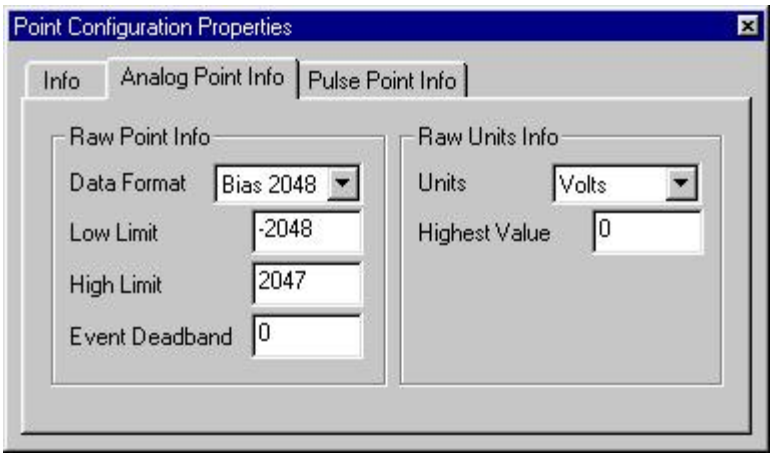
- 12-bit analogs (measurand and setpoint), bias 2048 Data Format
- CRC 12-bit analog reporting

To change the analog size:

- Select Properties > Point Configuration and the Info tab.
- Set the Bits per Analog to the appropriate value, 8 or 12.



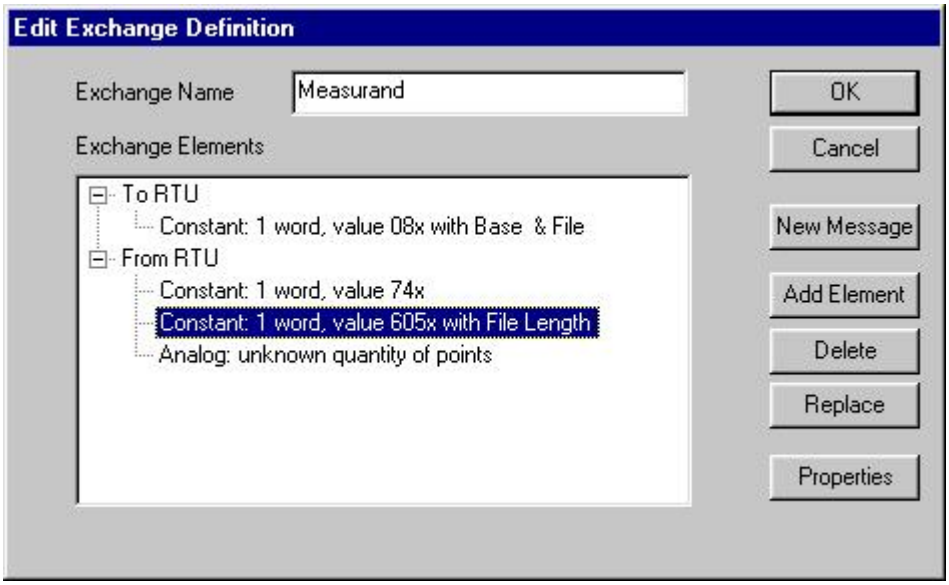
- Select the Analog Point Info tab and select the correct Data Format value
- Enter the Low Limit and High Limit values that correspond to the Bits per Analog and Data Format values.



The following change is only required if the Test Set is to be used in RTU Simulation Mode AND the reporting mode is 12-bit Analog without CRC. In all other modes, the Test Set will adapt to the reporting format automatically.

Use the following procedure to change the security format for Analog reporting:

- Go to the Exchange List view and select the Measurand exchange.
- Select Edit > Edit Exchange Definition



- For analog 12-bit reporting with the CRC security per word, use the definition shown above
- For analog 12 bit reporting without CRC security per word, remove the exchange entry “Constant: 1 word, value 605x with File Length”.

Changes to the Point Configuration Properties are automatically saved as permanent changes to the protocol definition and will apply to all subsequent uses of the protocol. Changes at the Edit Exchange Definition level will only be preserved if a Save or Save As is performed to save the changes to a MON file.

RP-570

This section describes configuration details for ABB's RP-570 protocol. At this time, RP-571 extensions are not supported.

About FTAB and TDC Transmission

FTAB and TDC messages both allow transmission of arbitrary length data sequences. Before transmission, the data sequence for each FTAB or TDC message must be entered into a text file using a text editor external to the ASE2000. This procedure is not required for line monitoring.

Each text file contains a sequence of entries separated by at least one blank. Each entry is a digit string defining the value of one message byte. The value is hexadecimal if the last character of the string is the letter 'x'. It is decimal otherwise. The number of entries defines the length of the FTAB or TDC sequence. For example, a file with contents:

```
10 20 15x 17x
```

defines a 4-byte sequence of 10-decimal, 20-decimal, 15-hex, and 17-hex.

Each file must be linked to an FTAB exchange as follows:

- Locate or create an FTAB exchange on the Exchange List view
- Select *Edit>Edit Exchange Definition*
- Highlight the last entry in the Edit Exchange Definition menu (*File*)
- Select *Properties*
- Enter the text file name in quotes, for example, "test.txt". If the file is not in the default ASE2000 folder, you must enter a full path name. Unless overridden at installation, the default ASE2000 folder is C:\Program Files\ASE\ASE2000 Comm Test Set.

Simulating an RTU

In normal RP-570 polling, the master issues a series of RA, RB, and RX requests. The ASE2000, in RTU simulation mode, determines the response to each request based on poll table status at the time the request is received. Each response can either be a point data block, an information block, or a "poll cycle complete" message.

The ASE2000 exchange list contains entries for each possible RTU poll response. The user can enable selected exchanges by setting the *Transmit* flag from the Edit Exchange Properties menu. The *Frequency* field defines how often each enabled exchange is to be considered for transmission. An exchange is never sent more

often than the frequency specifies. A “Poll Cycle Complete” message is transmitted if a poll request is received when no exchanges are enabled or have reached their transmission time.

SES-92

The following procedure applies to the SES-92 protocol.

Forcing Errors

To force message errors:
Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **CRC.** Generate CRC error.
- **Ack bit 0.** Always send the Ack bit in the requested state, instead of toggling when required.
- **Ack bit 1.** Always send the Ack bit in the requested state, instead of toggling when required.

Checkmark the errors you want to force.

SYSTEM 9

The following procedures applies to the System 9 protocol.

Configuring BCH

Typically devices send an inverted BCH value, which is the ASE2000 default. Use the following procedure to configure for non-inverted BCH.

To configure BCH:

Choose Properties>Protocol-Specific, and then select the System 9 tab. The Invert BCH checkbox appears. Remove the checkmark from this box.

Note: *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

Forcing Errors

To force message errors:

Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **BCH.** Generate BCH in first word.
- **Space bit.** Use 1 for space bit vales in first host word (normal value is 0).

Checkmark the errors you want to force.

TEJAS SERIES III AND V, VALMET SERIES III AND V

Tejas Controls originally designed the Tejas Series III and Tejas Series V protocols. Valmet Automation purchased Tejas Controls and continued to support the Tejas Series III and Tejas Series V protocols, but changed the names to Valmet Series III and Valmet Series V. The Tejas Series III and Valmet Series III protocols are identical, as are Tejas Series V and Valmet Series V.

Simulating a Pulse Output Request

When using ASE2000 to simulate a primary station, if you want to send a pulse output request, you must assign a value to the Value property of the pulse output exchange template (opcode 34 or 35). This value is a 16-bit hex number with the following format:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Group		Timer 1						RL1	RL2	Timer 2					

Interpret these fields as follows:

- **Group.** Code identifying two points as specified in the following table.

Group	First Point Number	Second Point Number
0	0	1
1	2	3
2	4	5
3	6	7

- **Timer 1.** Raise/lower duration for the first point.
- **Timer 2.** Raise/lower duration for the second point.
- **RL1.** Action for first point (0 for lower; 1 for raise).
- **RL2.** Action for second point (0 for lower; 1 for raise).

The Group identifies a pair of points. The RTU applies the RL1 action to the first point for the Timer 1 duration and the RL2 action to the second point for the Timer 2 duration.

To assign a value to the Value property:

1. Open the target pulse output exchange template. Double-click the template in the Exchange List view. The Edit Exchange Properties dialog box appears.
2. In the area of the dialog box labeled Protocol-specific Properties, enter a 16-bit hex number into the Value field, following the format guidelines outlined above. To specify a 16-bit hex value, enter four 4 alpha-numeric characters followed by an x, such as 12F8x.

Setting Message Security for Valmet Series III and V

Valmet Series III and V support two types of message security, LRC and CRC-16.

To set message security:

1. Choose Properties>Protocol-specific, and then select the Valmet Series (III, V) tab. The Message Security options, LRC and CRC-16, appear. Checkmark the desired option.
2. Select the Asynch tab, and assign the appropriate value to Parity:
   - For LRC, select **Odd**
   - For CRC-16, select **None**

TELEGYR 6500

This section describes Telegyr 6500 protocol. This is an older protocol and should not be confused with the more widely used Telegyr 8979 protocol.

About Control Point Select

The Control Point Select command has an optional "Analog Feedback Address" field in the fourth byte of the message's content portion. The ASE2000 Control Select exchange is coded without this optional field. If your RTUs use this field, you can include it by editing the Control Select exchange, as follows:

1. Highlight the Control Select Exchange
2. Select "Edit>Edit Exchange Definition"
3. Under Exchange Elements, advance to last entry in the "To RTU" section
4. Select "Add Element"
5. Select "Constant"
6. Enter the desired Analog Feedback Address in the Value field of the Constant entry
7. Select "OK" to end the Constant element definition
8. Select "OK" to end the Control Select Exchange editing session

About Setpoint

The Setpoint command can transmit values for multiple setpoints in each request. The ASE2000 default configuration is to transmit one value. The following procedure describes how to configure the ASE2000 to transmit more than one value. This procedure does not need to be followed when operating in Monitor or RTU Simulation mode.

1. Highlight the Setpoint Exchange
2. Select "Edit>Edit Exchange Definition"
3. Highlight the line beginning with the word Repeat
4. Select "Properties"
5. Under Repeat Count, enter the number of setpoints to transmit
6. Select "OK" to end the Constant element definition
7. Select "OK" to end the Control Select Exchange editing session
8. Press Enter to request the Edit Exchange Properties menu
9. In the Protocol-specific Properties area, locate the Count field. Enter a value 1 less than the number entered in step 5. This "1-less" value is a Telegyr 6500 protocol requirement.
10. Select OK

Forcing Errors

To force message errors:

Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **CRC.** Generate CRC error.

- **Ack bit 0.** Always send the Ack bit in the requested state, instead of toggling when required.
- **Ack bit 1.** Always send the Ack bit in the requested state, instead of toggling when required.

Checkmark the errors you want to force.

TELEGYR 8979

The following procedure applies to the Telegyr 8979 protocol.

Forcing Errors

To force message errors:
Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **CRC.** Generate CRC error.
- **Ack bit 0.** Always send the Ack bit in the requested state, instead of toggling when required.
- **Ack bit 1.** Always send the Ack bit in the requested state, instead of toggling when required.

Checkmark the errors you want to force.

TRW 9550

The following procedures applies to the TRW 9550 protocol.

Configuring BCH

Typically devices send an inverted BCH value, which is the ASE2000 default. Use the following procedure to configure for non-inverted BCH.

To configure BCH:

Choose Properties>Protocol-Specific, and then select the TRW 9550 tab. The Invert BCH checkbox appears. Remove the checkmark from this box.

Note: *The values you enter here become permanent: ASE2000 saves them in a <protocol>.OPT file and reloads them each time you select the protocol.*

Forcing Errors

To force message errors:

Choose Properties>Protocol-specific, and then select the Force Errors tab. Error options appear:

- **BCH.** Generate BCH in first word.
- **Space bit.** Use 1 for space bit vales in first host word (normal value is 0).

Checkmark the errors you want to force.

WISP+

The section applies to the Westinghouse UK (now Group Schneider) WISP+ protocol.

About Back-To-Back Messages

A master obtains data from a WISP+ protocol RTU by sending a request for data followed by a series of one or more poll requests. Polls are repetitively sent at least until the RTU responds with all data requested. The RTU does not respond to the initial data request, only to the polls. Because of this, the initial sequence sent by the master contains two back-to-back messages, the data request and the initial poll request.

The ASE2000 can be configured to operate in one of two low-level communication modes, the default mode and *Native Async* mode. *Native Async* mode can be selected from the *Communication Properties>Line* tab. The default mode provides some features not available in *Native Async* mode including better control over pre-mark and post-mark timings, and the ability to select some options from the *Protocol Specific Properties>Force Errors* tab. All *Force Error* options are available in default mode, and most in *Native Async* mode. Except for these differences, default and *Native Sync* modes operate identically.

The default mode has one disadvantage in that the receiver must be reset after each incoming message. For WISP+, this forces a reset between the Data Request and initial Poll messages. Depending on the computer speed and communication data rate, the ASE2000 may incorrectly detect errors with these message sequences. To stop these errors from occurring, *Native Async* mode should be selected.

Simulating an RTU

In RTU simulation mode, data messages are transmitted in response to specific requests for data, and in response to normal poll requests. The number of points contained in each response must be configured in two places in each corresponding exchange. The first place, on the *Edit Definition* menu, is the point count field in the analog, digital, or pulse entry. The second place is the exchange's *Mask* property. Data responses contain a *Mask* with one bit set for every point reported. If the number of bits set in the *Mask* does not agree with the actual number of configured points, then the simulated response message will be formatted incorrectly.