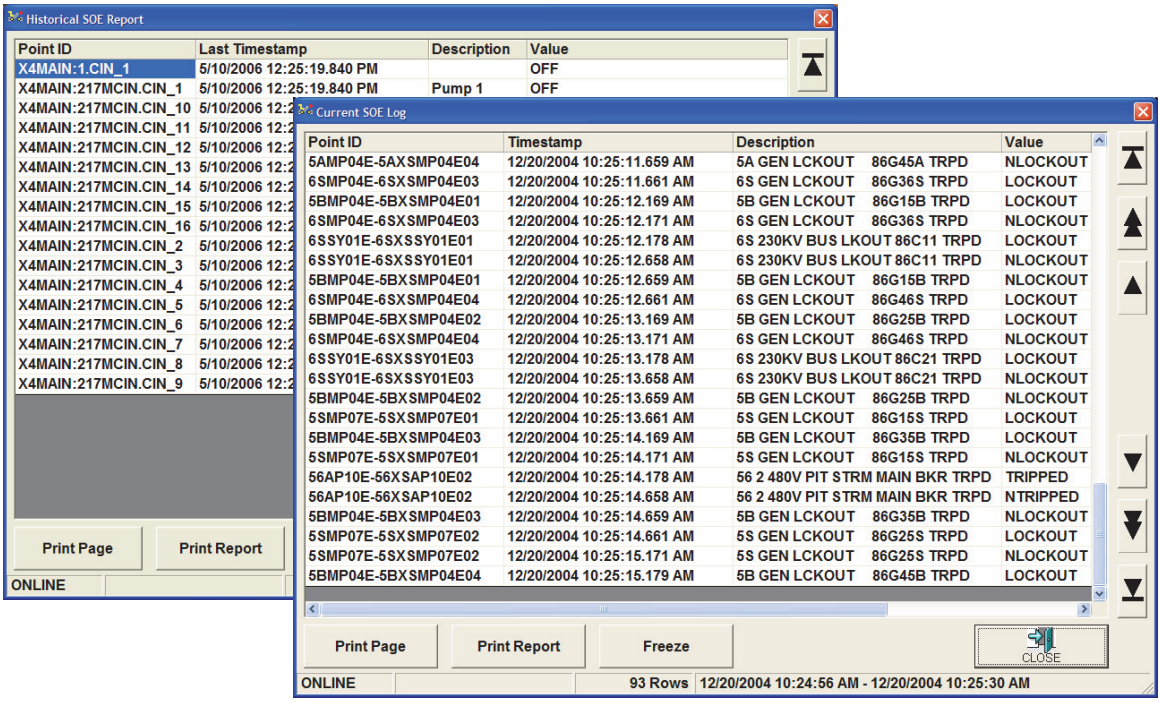
Foxboro Evo™ Process Automation System

Product Specifications

Foxboro by Schneider Electric

PSS 31S-2SOE

Sequence of Events



The Sequence of Events (SOE) software package acquires, stores, displays, and reports state changes (events) from specific digital input points in a control system.

OVERVIEW

The Sequence of Events (SOE) software package provides the ability to accurately collect, display and report both current and historical events, defined as discrete state changes. The SOE software package is designed to assist in the analysis of plant behavior after a fault.

The SOE software package uses server/client architecture for acquisition, storage, and display of data from digital points in your control system with a resolution of one millisecond (ms). SOE software, taking advantage of the optional GPS based time synchronization capability, supports data acquisition at intervals of up to one ms across the entire system.

Data that SOE software collects is sent to an AIM*Historian database for long-term storage to permanent media.

SOE data is based on events, defined as the change in state of a digital input signal. When a digital input goes from false to true, an “event” occurs and the SOE software displays a message showing the date and time of the event. Similarly, when a digital input

goes from true to false, an event occurs and is reported. A "sequence of events" is a complete time-sorted set of data that documents the occurrences and sequence of events or disturbances in a plant.

Data from the I/O channels of the following FBMs can be collected and analyzed with SOE software:

- FBM207, Channel Isolated Voltage Monitor/Contact Sense Input Module
- FBM217, Group Isolated Discrete Input Module
- FBM219, Group Isolated Discrete Input Module
- FBM247, Current/Voltage Analog/Digital/Pulse I/O Configurable Module (4-20, 0-5 V dc, 0-10 V dc, and SOE inputs for TDR).

FEATURES

SOE provides the following features:

- Highly accurate collection of digital signals at a resolution of up to 1 ms
- High-resolution data acquisition across multiple control processors with the optional GPS time synchronization feature
- Prevention of data loss during high frequency occurrences of events with the use of an intermediate, configurable buffer
- Seamless integration with AIM*Historian software to provide long-term storage of SOE data
- Generation of reports and logs containing current or historical digital information
- Configurable report and log templates
- Dynamically updated on-screen displays with controls that allow you to easily navigate to and view or print specific data
- Access to reports and logs from any SOE operator client workstation
- Easy-to-use GUI for quickly identifying and importing SOE points for which you want to record SOE data and events
- Capability of configuring meaningful and identifiable entries to be used in reports and logs.

SOE CONFIGURATION AND OPERATOR CLIENTS

SOE software uses server/client architecture, and provides two different types of interaction: operation or configuration.

Before collecting data, the process engineer uses the configuration client to define the behavior of the SOE software by setting general operating parameters and selecting the real-time data points that will be monitored by SOE software. Each selected point is identified by a unique tag, the FBM name, and the FBM channel number associated with the point. Data from these real-time points (RTPs) will be collected from your running process and stored in an AIM*Historian database.

In addition, the configuration client allows you to customize each RTP's description, and ON and OFF state text. This facilitates identification and analysis of events and disturbances in the plant by making reports and logs more meaningful and understandable.

A process operator monitoring the plant uses the operator client to display and print the configured SOE reports and logs. The operator client can be used with a mouse or a touchscreen.

SOFTWARE OPERATION

The SOE server acquires data from FBM channels via an FCP280, FCP270, or FCM100Et on the control domain using a high speed data acquisition interface. The data is stored in a memory-resident circular buffer and sent to an AIM*Historian database for long-term storage. SOE sends current data (from the buffer) or historical data to SOE clients, and the clients show reports and logs with configurable and understandable messages.

Data Collection

Data collection is performed by the same high speed data acquisition interface to the control domain used by Transient Data Recorder and Analyzer (TDR/TDA) software (PSS 31S-2TDRA). The TDR/TDA product is licensed separately from the SOE product; but for digital points designated for both transient data and sequence of events reporting, the two packages may run in the same workstation and share the same high speed data acquisition interface.

Data Storage and Retrieval

The SOE package sends data to the AIM*Historian product for permanent storage. Between the time that events are collected by SOE and archived by AIM*Historian, they are temporarily stored in an intermediate buffer. SOE relies upon this buffering mechanism to process an extensive amount of data in a short time period without losing information. The circular buffer is configurable from 1,000 to 1,000,000 events.

You can use standard AIM*Historian functions to query its archives for specific data.

Refer to *AIM*Historian* (PSS 21S-6AIMHST) for additional information on AIM*Historian software.

THE SOE CONFIGURATION CLIENT

The configuration client provides the user interface with which you can configure the real-time points (RTPs) that are to be collected as SOE data from FBM I/O data channels. You can customize the printed reports and logs in which these RTPs appear by editing the supplied templates.

Additionally, the configuration client allows you to edit the following general SOE operating parameters:

- The time delay between event detection and the time at which the collected data is sorted by time stamp and stored in the circular buffer. This time delay ensures that if there is a time delay between different data sources (FBMs), the data is stored in the correct time sorted order in the circular buffer.
- The size of the SOE circular buffer.
- The default debounce period, or the number of milliseconds a signal must be stable before its change in state is processed. The debounce filter eliminates a signal's relay chatter.
- The name of the AIM*Historian instance used to archive data.
- The names of the printers used to print SOE reports and logs.
- The time preference (UTC or local time) in which the timestamps are displayed.
- The maximum number of rows in SOE data tables that are displayed on the screen for the reports and logs.
- The location of configurable report, log, and configuration templates.

Also, from the General Parameters window (Figure 1), you can access SOE server statistics (Figure 2), such as buffer use and the number of events processed.

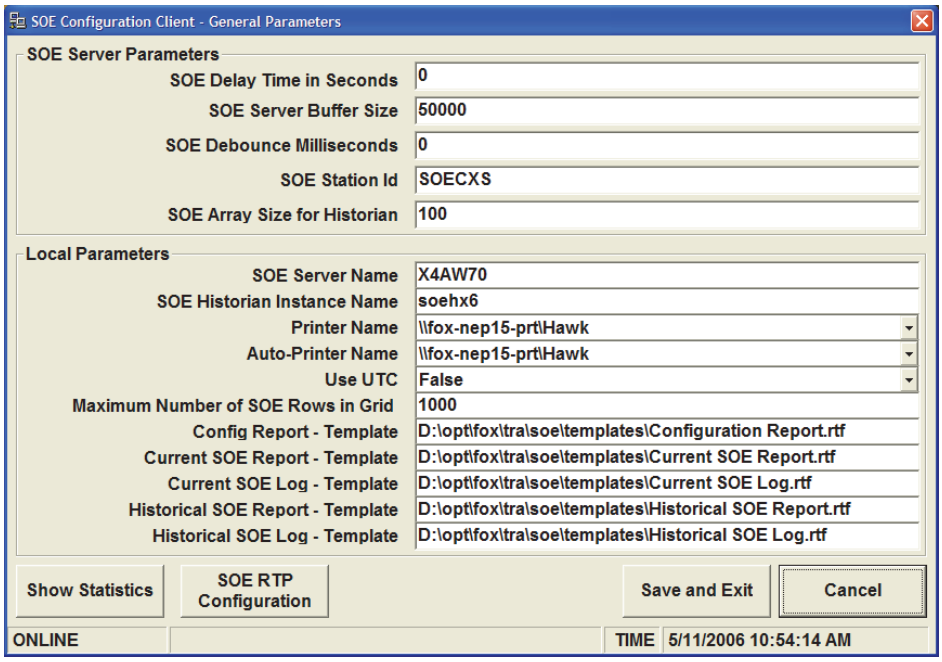


Figure 1. Configuring SOE General Parameters

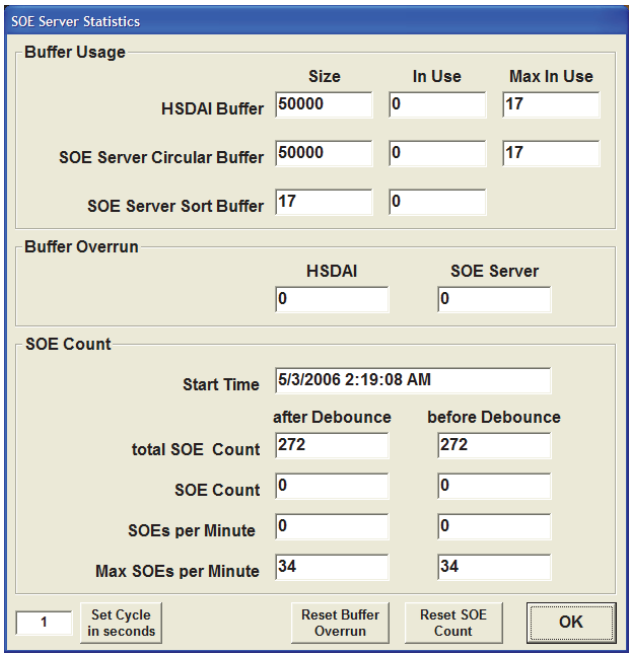


Figure 2. SOE Server Statistics

Selecting SOE Real-Time Points

After setting up general SOE parameters, you can quickly and easily select the digital tags in your control system for which you want to record SOE data and events.

SOE software queries the control system for available digital points that can be collected with SOE software, and retrieves only valid SOE RTPs, that is, those points that are supported and enabled for sequence of events collection.

The supported points are then displayed in a tree format so you can select them for inclusion in the set of RTPs for which data will be collected, as shown in Figure 3. To do this, expand the compound in which the points exist, then select the point you wish to include (block.parameter format).

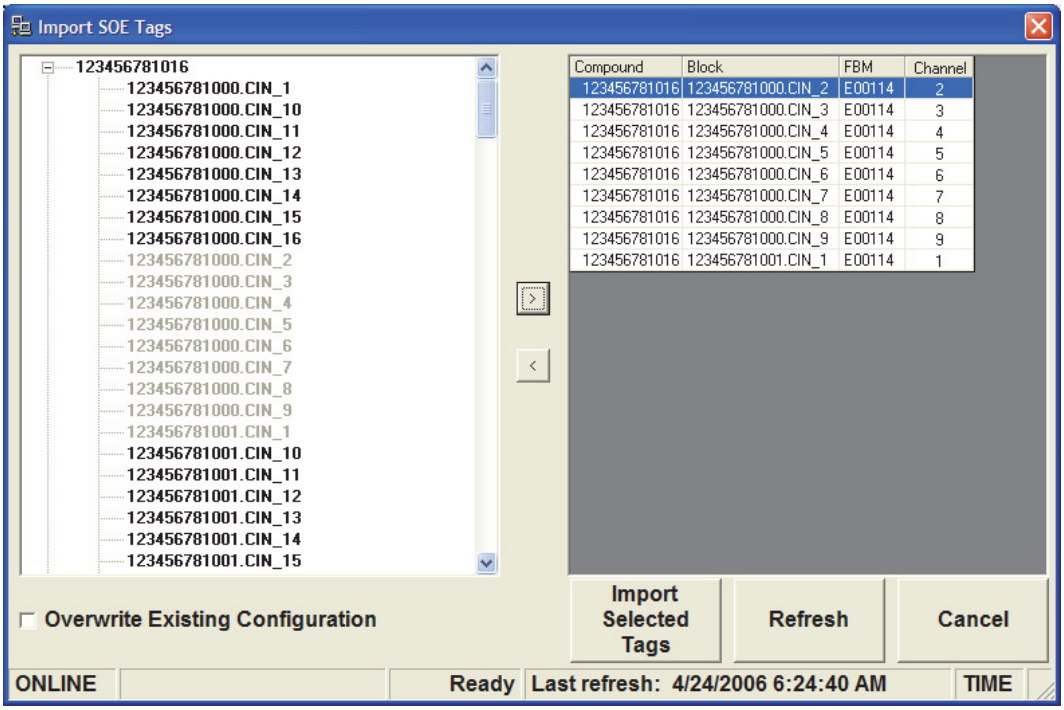


Figure 3. Importing SOE Tags

Configuring Real-Time Points

After selecting a data point for which you want to collect data, the RTP name is set to a tag name (C:B.P) assigned by SOE, no description of the point is provided, and the state text of the point defaults to ON and OFF. You can customize this generic text and insert an RTP description so that specific, meaningful messages pertaining to the RTPs and their state values are displayed in SOE reports and logs.

Using the SOE RTP Configuration window, shown in Figure 4, you can:

- Modify the “Description” field to contain a meaningful text string representing the RTP in reports and logs.
- Customize the “VALUE ON” and “VALUE OFF” fields to contain the text that appears in the “Value” column in SOE reports and logs when the

state of the associated RTP is On (True) or Off (False) respectively. For example, if the SOE tag represents a valve's position, you can set the value "ON" to "Open" and the value "OFF" to "Closed".

- Adjust the debounce value to the time required for a signal to be stable before its state change is processed.
- Enable or disable the collection of data for an individual configured RTP.
- Import from the set of SOE RTPs.
- Run the configuration report, which prints the settings you establish in the SOE configuration client on the printer specified in the General Parameters window.
- Save or cancel configuration changes.
- Exit the SOE configuration client.

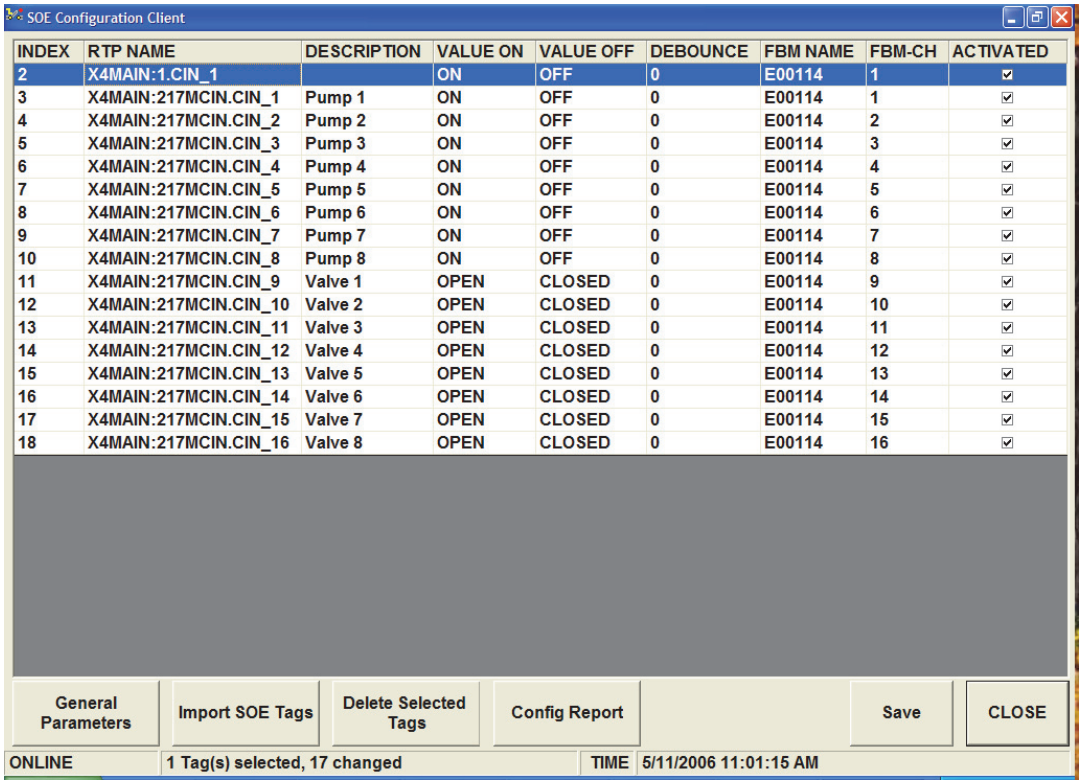


Figure 4. Configuring SOE Real-Time Points

THE SOE OPERATOR CLIENT

The operator client is used to display and print SOE reports and logs. Two different modes are supported: the first mode displays current events with automatic updates (current SOE log) on the screen. The second mode displays historical data.

SOE Operator Client Main Window

The operator client main window (Figure 5) is used to perform all operator functions in the SOE software. From the operator client main window, you can:

- Display any of the available SOE reports or logs described in the following sections
- Activate or deactivate automatic printing of the current SOE log
- Exit the SOE operator client.

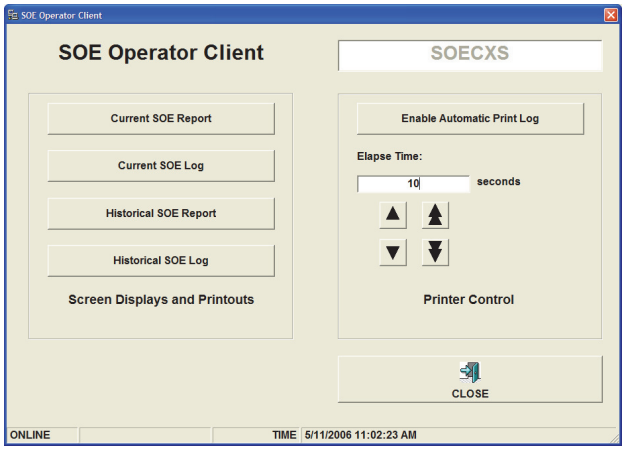


Figure 5. SOE Operator Client

REPORTS AND LOGS

An important feature of SOE software is the creation of reports and logs, which organize and present information about SOE points and events so that you can easily analyze digital data. In addition, reports and logs can be generated on demand using archived data to allow plant personnel to analyze data when needed.

After a plant upset, for example, you can examine a generated report or log to determine what caused the disturbance and how plant management can be improved in response to the disturbance.

You can access current SOE events and have them displayed and updated automatically on your monitor. You can access historical SOE data stored in the AIM*Historian instance, which can also be viewed on a monitor or printed from any SOE client workstation.

SOE software allows you to customize reports using the provided report templates. The template files are in rich text format, so you can use a word processor such as Microsoft® Word to tailor the reports according to your preferences and to the specifications of your plant.

SOE provides you with the capability to demand a report or log at any time, or to configure the SOE current log to display or print automatically to the output device of your choice.

An SOE ***report*** documents the states of designated digital points sorted by point ID at a specific point in time (current or historical). An SOE ***log*** documents a complete set of events sorted by time stamp over a specified time span (current or historical). The following reports can be displayed and printed in landscape format:

- SOE report using the current time
- SOE report using a historical time
- SOE log using the current time
- SOE log using a historical time.

Screen Displays of SOE Reports and Logs

Identical data is reported in printed output and on screen displays of SOE reports and logs. However, the screen displays contain controls that make it easy to navigate to and view or print specific data.

Using the Update and Freeze buttons on the current SOE log, you can enable or disable automatic on-screen updates to current RTP values. These buttons are only available when displaying an SOE log using the current time; historical data cannot be dynamically updated.

Navigation buttons that appear on the right-hand side of screen displays allow you to:

- Navigate to the top or bottom of the report/log
- Go up or down one page
- Go up or down one item.

From a screen display, you can opt to print the currently displayed page or the entire SOE report or log to the configured printer.

Sequence of Events Reports

An SOE report retrieves all RTPs configured as SOE points and sorts them by Point ID (RTP name). For each RTP, the report lists the Point ID, the time at which the digital RTP last changed its state (to the millisecond), a description of the RTP, and the state to which the RTP changed at the listed time. An SOE report is generated on demand.

Current SOE Report

Figure 6 shows an example of an SOE report displayed on a screen using the current time.

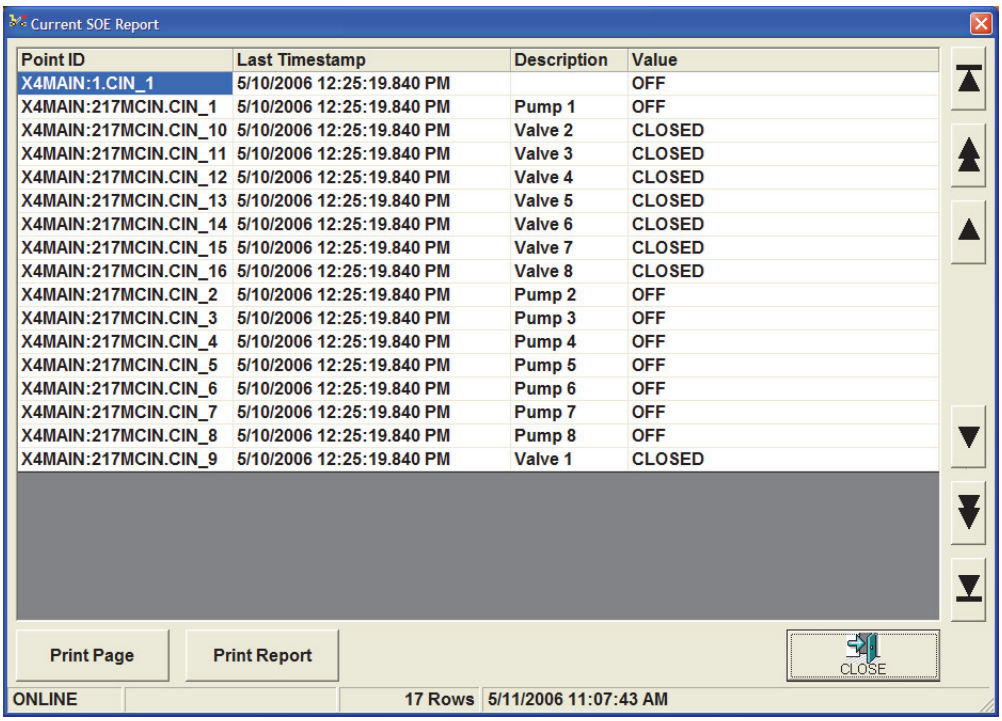


Figure 6. Current SOE Report

Historical SOE Report

For a historical SOE report, a dialog box (Figure 7) allows you to select the point in time at which you want to display the states of the configured SOE RTPs.

Figure 8 shows an example of an SOE report displayed on a screen using a specified historical time.

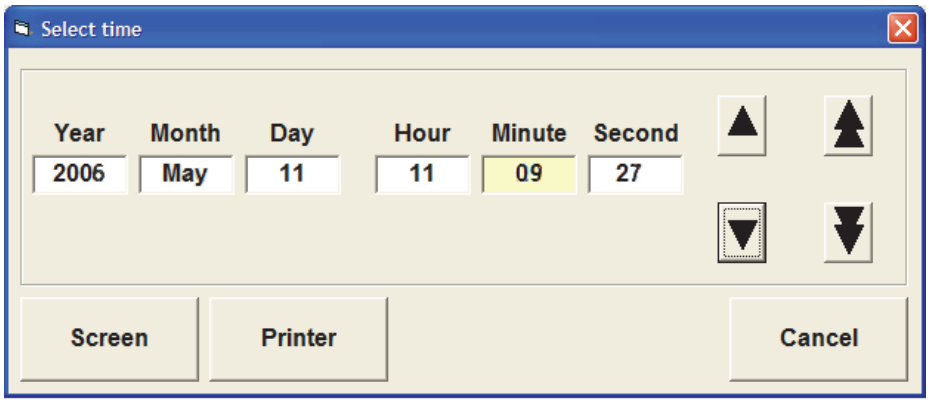


Figure 7. Select Report Start Time

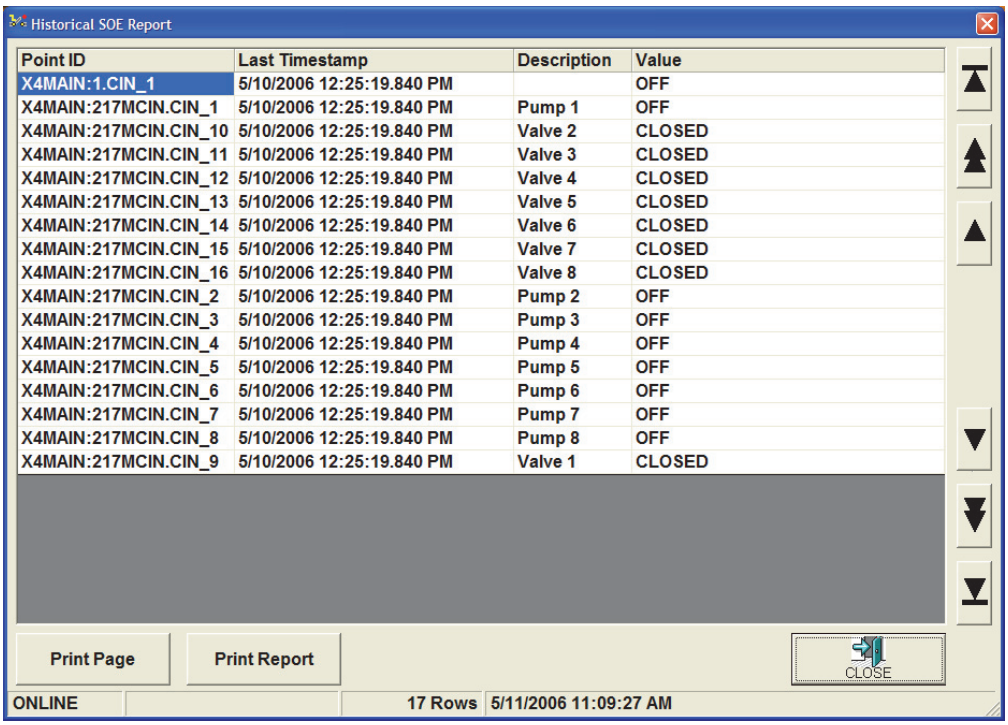


Figure 8. Historical SOE Report

Sequence of Events Logs

The SOE log contains an entry line for every event that occurs, that is, one entry for every time an RTP changes state. The events listed in the SOE log are sorted by time. For each event entry, the SOE log records the Point ID (RTP name), the time at which the digital RTP changed its state, the RTP's description, and the state to which it changed.

You can choose to view a current SOE log, or you can specify a start point and an end point for the historical SOE log.

Current SOE Log

A current SOE log displayed on a screen shows data that is automatically updated: a new line is added to the bottom of the displayed list every time an RTP changes state. The automatic updates to the log can be disabled or enabled by clicking the Freeze or Update button.

Figure 9 shows an example of a current SOE log displayed on a screen.

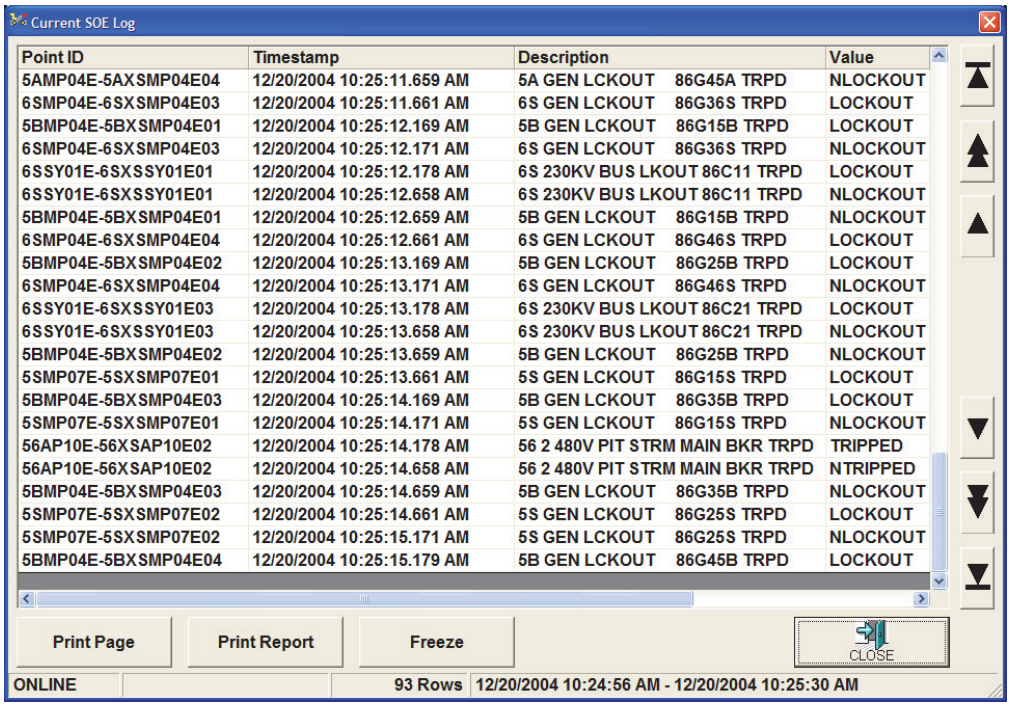


Figure 9. Current SOE Log

Historical SOE Log

For a historical SOE log, a dialog box (see Figure 10) allows you to select the start time and end time for which you want to create a log of events. The historical log displays the SOE RTPs that changed state during the specified time period.

Figure 11 shows an example of an SOE log displayed on a screen using a specified historical time span.

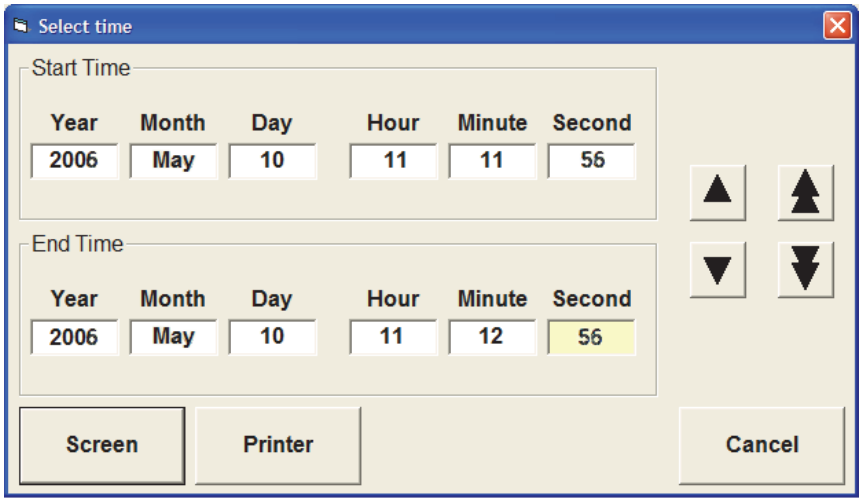


Figure 10. Select Log Start and End Time

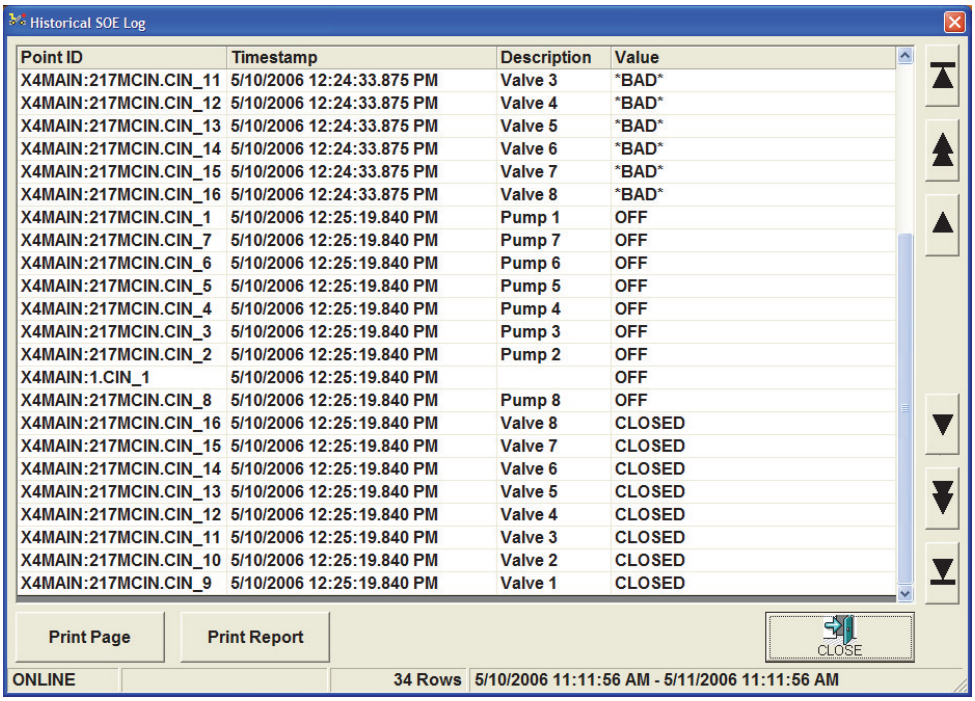


Figure 11. Historical SOE Log

Printing Reports and Logs

Current reports and logs as well as historical reports and logs work with page-oriented printers only.

You can also print the most recent page of the current SOE log, even if the page is not completely full. Figure 12 shows an example of a printed SOE log using the current time.

Auto Log Printing

The auto log printing function runs in the background and is enabled and disabled from the SOE Operator Client.

Depending on the printer, the log will print as follows:

- With a line printer configured, a line is printed immediately every time a point value change occurs.
- With a page-oriented printer configured, every time a page of data is collected or the elapsed time has expired, the page automatically prints in landscape format.This page-oriented print mechanism is controlled by a configurable elapse timer.

A detailed log file is also created regarding the printing task: start and exit of the auto print log, use of a line printer, errors, lines not printed due to errors.

SEQUENCE OF EVENTS

Current SOE Log

REPORT TIME: 12/20/2004 12:55:13 STATION ID: H91AW7-SOE

DATE	TIME	RTPNAME	DESCRIPTION	VALUE
12/20/2004	12:54:59.392 PM	6AP07E-06XSAP07E02	06-1 480V ST MCC TRIPPED	TRIPPED
12/20/2004	12:54:59.392 PM	06AP08E-06XSAP08E04	06-2 480V ST MCC TRIPPED	NTRIPPED
12/20/2004	12:54:59.892 PM	5AMP04E-5AXSMP04E02	5A GEN LCKOUT 86G25A TRPD	LOCKOUT
12/20/2004	12:54:59.892 PM	5AMP04E-5AXSMP04E03	5A GEN LCKOUT 86G35A TRPD	NLOCKOUT
12/20/2004	12:55:00.392 PM	6AMP04E-6AXSMP04E01	6A GEN LCKOUT 86G15B TRPD	LOCKOUT
12/20/2004	12:55:00.392 PM	6AMP04E-6AXSMP04E02	6A GEN LCKOUT 86G25B TRPD	NLOCKOUT
12/20/2004	12:55:00.892 PM	6SMP04E-6SXSMP04E02	6S GEN LCKOUT 86G26S TRPD	NLOCKOUT
12/20/2004	12:55:00.892 PM	6SSY01E-6SXSSY01E03	6S 230KV BUS LKOUT 86C21 TRPD	NLOCKOUT

Figure 12. Printed SOE Log Using the Current Time

SYSTEM REQUIREMENTS

A Foxboro Evo™ or I/A Series® Windows based workstation or Windows Server 2003 with I/A Series V8.x software or Foxboro Evo Control Core Services software v9.x or later installed and AIM*Historian software (V3.2.4 or later) installed on the SOE server.

Foxboro®

by Schneider Electric

Invensys Systems, Inc
10900 Equity Drive
Houston, TX 77041
United States of America
http://www.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: https://support.ips.invensys.com

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