

**OMC System Software**






**High-performanceHMI**

**SOE Use Guide**

**IM50S13-E**

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Symbol Definition	
	<b>WARNING:</b> Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	<b>RISK OF ELECTRICAL SHOCK:</b> Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	<b>ESD HAZARD:</b> Indicates information that Danger of an electro-static discharge to which device may be sensitive. Observe precautions for handling electrostatic sensitive devices
	<b>ATTENTION:</b> Identifies information that requires special consideration.
	<b>TIP:</b> Identifies advice or hints for the user.

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# SOE Use Guide

## Section 1 About

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This manual aims to guide users to use the SOE software in the OMC system, and introduces in detail the methods of using SOE software to collect SOE events in different scenarios.

### 1.1 References

The following manuals are referenced in the subsequent introduction.

System	References
OMC system	<i>System Builder User Manual</i>
	<i>Config Explorer User Manual</i>
	<i>Hardware Module Builder User Manual</i>
	<i>Base User Manual</i>
	<i>GW712 User Manual</i>
ECS-100&JX-300XP system	<i>FW212 User Manual</i>
	<i>FW214 User Manual</i>
	<i>XP211 User Manual</i>
TCS-900 system	<i>SafeContrix User Manual</i>
	<i>Project Configuration Guide</i>
	<i>SCM9040 User Manual</i>
	<i>SCM9041 User Manual</i>

### 1.2 Terminology

Terminology	Illustration
Event	ON and OFF transitions of the monitored devices on filed are recorded as event.
SOE	Sequence of event, it means a set of events with timestamps.
SOE module	Modules with SOE property
Fast mode	It is also called the hard mode. This mode works in SOE modules and the frequency to generate timestamps can up to 0.5ms apart.
Normal mode	It is also called the soft mode. This mode works in the controller and the frequency to generate timestamps is one control cycle apart, aiming to DI, DO and custom digital points in the corresponding SOE browser.

## Section 2 Introduction

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SOE software includes SOE server and SOE browser. It is an important part of the High-performanceHMI system software package. It is mainly used to collect and record on-site ON and OFF events, such as operations of circuit breaker and switch trip. The SOE server can record information such as the time, status, type, and location of the events. Based on the above information, users can take corresponding measures based on the on-site situation to achieve the purpose of solving on-site process control problems.

### 2.1 Main Features

In the High-performanceHMI system software, SOE event management is carried out through SOE server and SOE browser, and its main functions are as follows.

- SOE server collects and records data.
- SOE browser to browse and query SOE data.

The SOE server can record up to 800,000 pieces of data by default. After more than 1 million pieces of data, the oldest records will be automatically deleted, and only the latest 800,000 records will be retained.

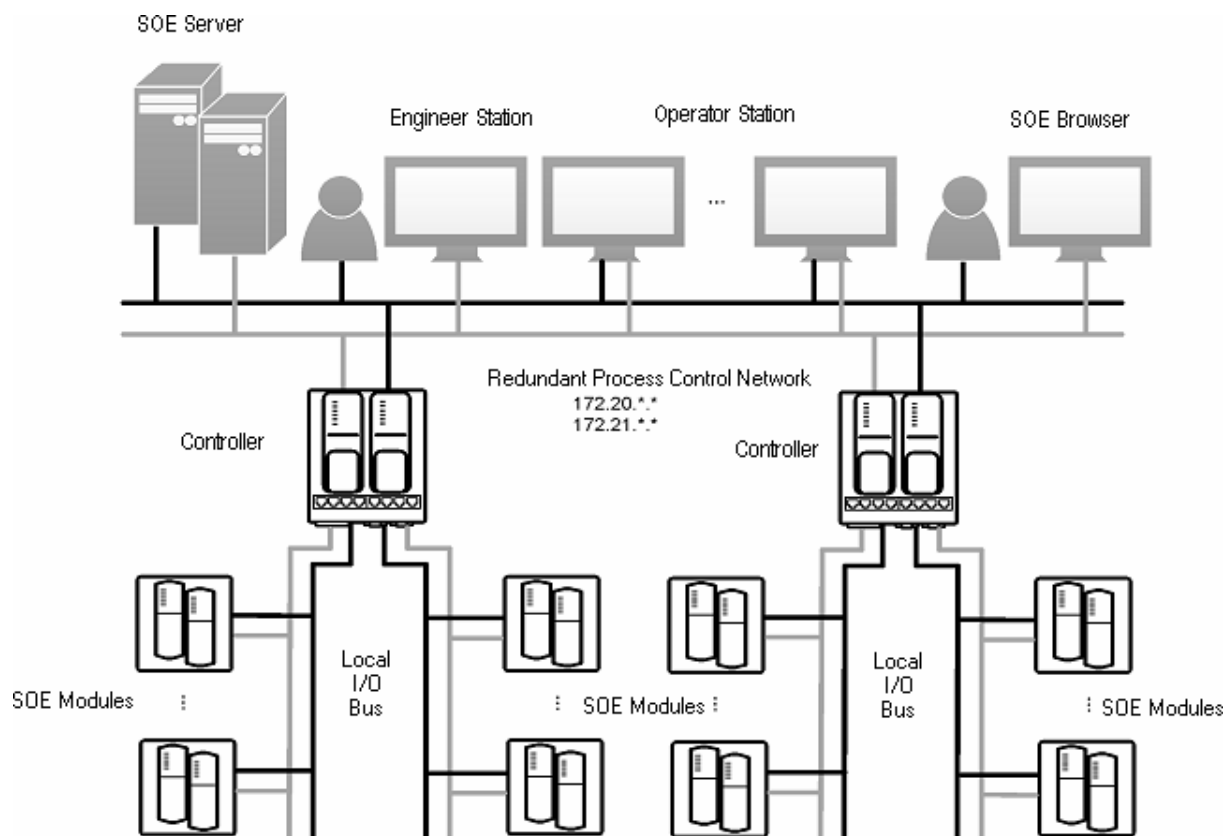
### 2.2 Typical Scenario

In the High-performanceHMI project, SOE data can be collected in the following scenarios through SOE software:

- Directly collect SOE data generated by the OMC system.
- Directly collect SOE data generated by the TCS-900 system.

## Section 3 Collect SOE Data of OMC

When the SOE system software collects the SOE data of the OMC system, the SOE system structure is shown in the figure below.



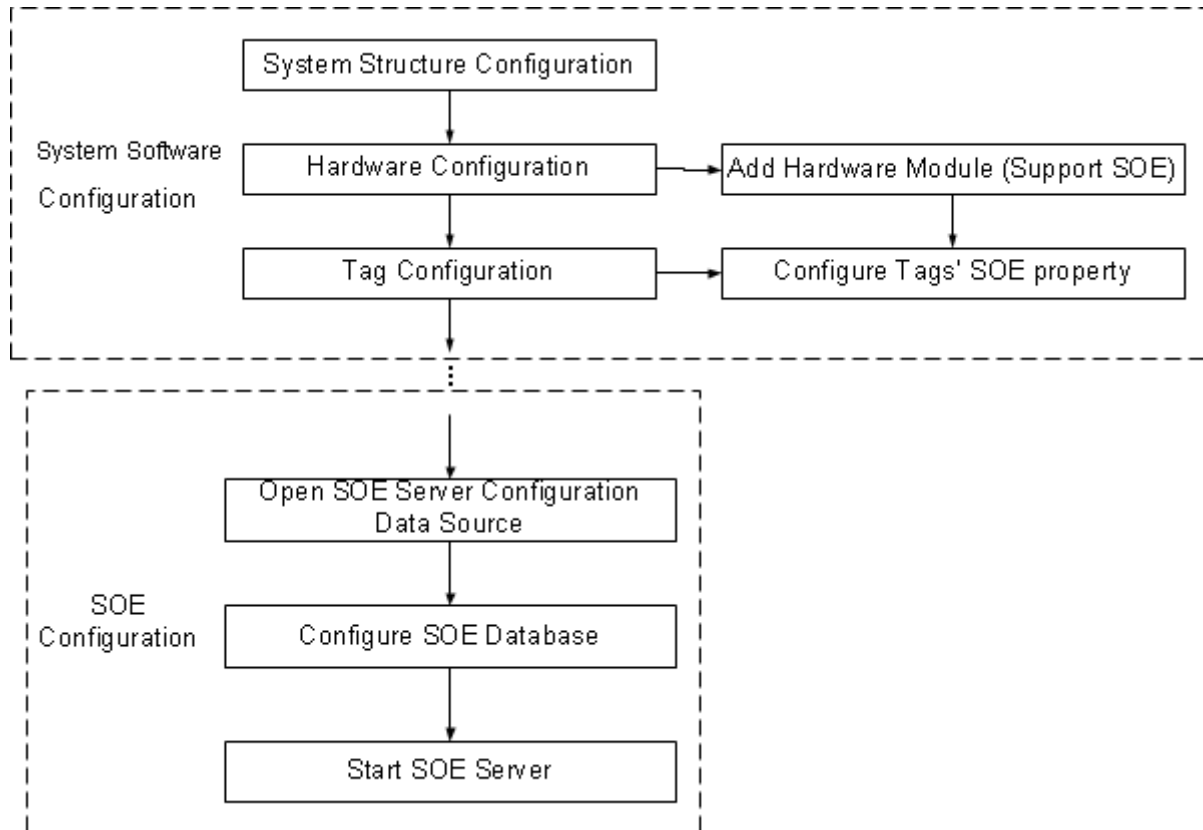
**Figure 3-1 SOE in system structure**

The whole system consists of four parts, SOE server, SOE browser, controller, and SOE module.

- SOE server: complete system SOE data collection and recording, and provide SOE historical data query service.
- SOE browser: complete viewing and querying of SOE data.
- Controller: The controller collects the SOE records in the SOE module in real time, and sends the event records to the SOE server through master-slave communication.
- SOE module: The SOE module scans the status of the DI or DO channel at high speed. When the channel status changes, the original SOE record is formed and sent to the main controller in real time.

### 3.1 Configure Process

In order to realize the SOE recording function of the OMC system, it is necessary to configure it according to the following process.



**Figure 3-2 SOE application process**



## 3.2 Configure SOE Tag in High-performanceHMI Software

In the High-performanceHMI configuration, you need to complete the configuration of the system structure configuration, hardware module configuration, and tag configuration. When configuring the High-performanceHMI software, you need to complete the following SOE related configuration.

### 3.2.1 Configure SOE Modules

The OMC system supports two SOE modes, namely fast mode and normal mode with DI/DO.

- Fast mode refers to the DI module (DI713-S/DI714-S/DI718-S) that provides SOE function by default in OMC. Tags in these modules all support SOE data collection.
- Normal mode with DI/DO refers to DI modules (DI711-S, DI712-S, DI715-S, DI716-S and DI717-S) and DO modules (DO711-S, DO712-S, DO715-S, DO716-S) which provide DI/DO tags, these tags do not support SOE data collection by default, yet do support SOE data collection once its SOE configuration is done.

### 3.2.2 Configure SOE Tag's Property

The OMC system tag editor supports the configuration of three types of SOE tag, namely DI tag, DO tag and custom digital tag. Among them, the SOE property of the fast mode is "Yes" by default and cannot be modified.

- DI/DO tags in normal SOE mode require "Yes" in the "SOE Tag" item of tag property. As shown in Figure 3-3 and Figure 3-4.

<b>Basic Properties</b>	
Number	0
Name	DI00020000
Type	Digital Input
Description	Standby
<b>Input Channel Settings</b>	
Tag Type	Normal DI Tag
Node No.	000
Rack No.	000
Module No.	001
Channel No.	000
Module Type	DI711-S Digital Input Module(16 Channels,24V)
Tag Running Cycle	Basic Scan Cycle
<b>Signal Conversion Process</b>	
<b>Alarm Settings</b>	
<b>Tag Fault Processing</b>	
<b>Supervision Settings</b>	
<b>SOE Settings</b>	
SOE Tag	No
SOE Description	Yes
SOE Device Group	No

Figure 3-3 Define normal DI SOE tags

<b>Basic Properties</b>	
Number	0
Name	DO001220000
Type	Digital Output
Description	Standby
<b>Output Channel Settings</b>	
Tag Type	Normal DO Tag
Node No.	006
Rack No.	000
Module No.	001
Channel No.	000
Module Type	DO711-S Digital Output Module(16 Channels)
Tag Running Cycle	Basic Scan Cycle
<b>Signal Conversion Process</b>	
<b>Alarm Settings</b>	
<b>Supervision Settings</b>	
<b>SOE Settings</b>	
SOE Tag	Yes
SOE Description	Yes
SOE Device Group	No

**Figure 3-4 Define Normal DO SOE tags**

- Custom digital values are custom tags provided by the control station. These tags do not have SOE properties by default, but SOE properties can be defined. You only need to select “Yes” in the tag property “SOE Tag” item as shown below.

<b>Basic Properties</b>	
Number	0
Name	SOE_ND001220000
Type	Custom Digital
Description	SOE Tag
<b>Initial Value</b>	
Initial Value	OFF
<b>Supervision Settings</b>	
Tag Group	Tag Group 0
Tag Level	Level 0
ON Description	ON
OFF Description	OFF
Color Config	Global Default Settings
Panel	*
<b>SOE Settings</b>	
SOE Tag	No
SOE Description	Yes
SOE Device Group	No

**Figure 3-5 Define custom SOE tags**

Enter the corresponding SOE event description and the corresponding device groups to which the tag belongs in the “SOE description” and “SOE Device Group” to complete the SOE property

configuration of the tag.



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**Tip:**

- When configuring SOE tags for the control stations with FCU811-S, use the *VFConBuilder* software. For detailed configuration, please refer to the *VFConBuilder Software User Manual*.  
When configuring SOE tags for the control stations with other controllers, use the *VFIOBuilder* software and *VFTAGBuilder* software. For detailed configuration, please refer to the *Hardware Module Builder User Manual* and *Tag Builder User Manual*.
  - After the hardware configuration and tag configuration are completed, the configuration download and configuration publish are required. For the specific operation method, please refer to *Config Explorer User Manual*.
- 

### 3.3 Configure Clock Synchronization

In order to ensure the time accuracy of collecting SOE events, clock synchronization operations are required.

- For OMC system software clock synchronization operation, please refer to *System Builder User Manual* and *Real-time Monitoring Software User Manual* to configure the clock synchronization server;
- For hardware clock synchronization operations, please refer to the relevant sections on clock synchronization in the *Base User Manual*.

### 3.4 Preparation

Before starting the SOE server, you need to ensure that the following tasks have been completed on the computer where the SOE server runs:

- Software dongle should obtain authorization to access to SOE.
- Install High-performanceHMI system software (High-performanceHMI installation package includes SOE server and SOE browser).
- Ensure that the IP address of the computer where the SOE server runs should be configured as 172.20/21.\*.\* to make sure that it is connected to the OMC controller network.
- In order to ensure that the SOE server can collect SOE data normally, the SOE server must start with the VFLaunch. The specific operation steps are as follows:
  1. Select "OMC > System Global Settings" in the start menu.
  2. On the "Monitoring" tab, check "Start SOE Server".

### 3.5 Start SOE Server

The SOE server is used to collect SOE tag data when the field status changes.

The following uses the Windows 10 operating system as an example to illustrate how to start the SOE server. After starting the SOE server, you can configure properties such as the data source in the SOE server.

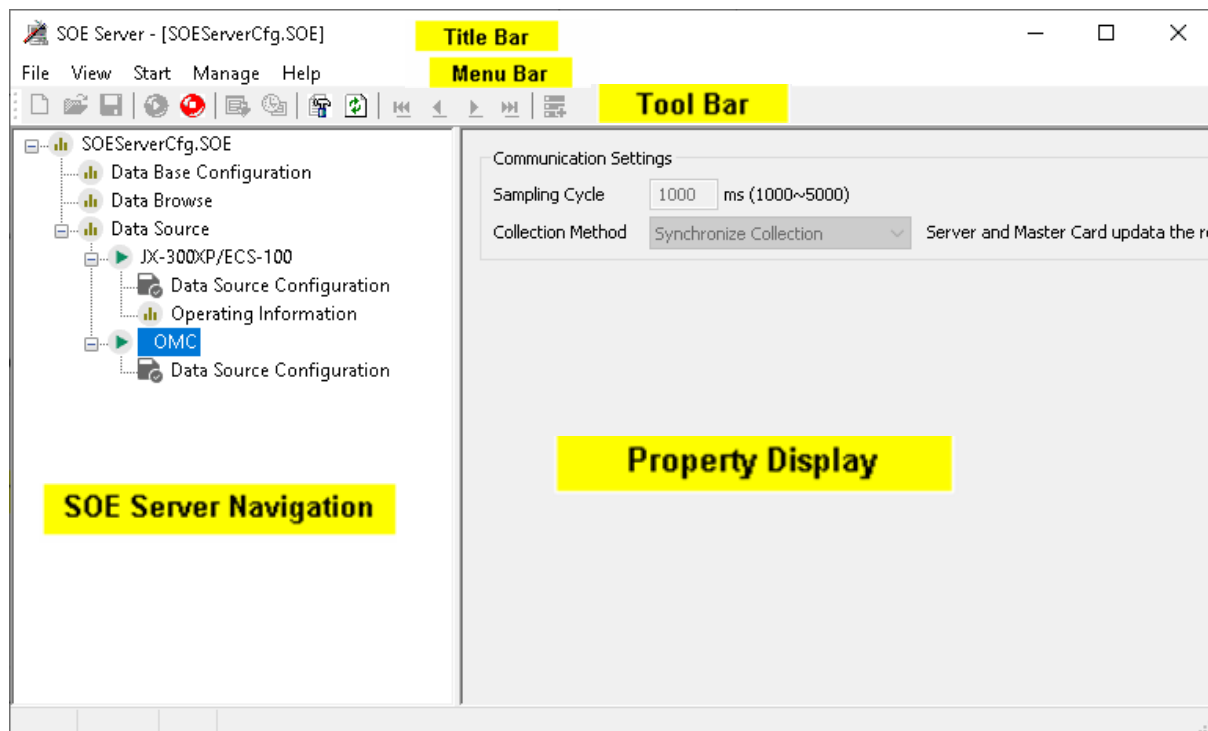


Figure 3-6 SOE Server interface



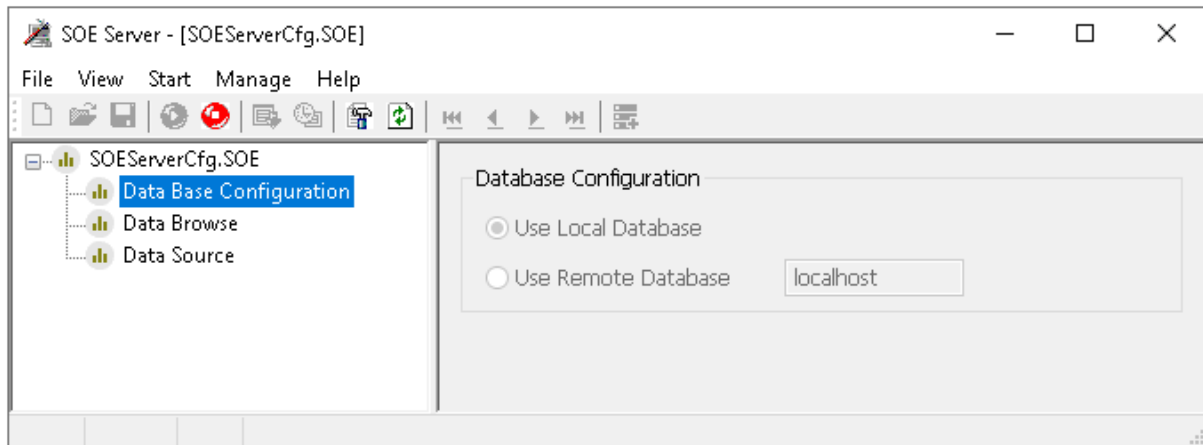
**Tip:**

Please refer to Appendix for the interface and command introduction of the SOE server.

### 3.6 Configure SOE Database

Through the configuration of the SOE database, you can specify the location where the SOE data is stored and the source of the SOE data when the SOE server provides the historical data query function.

In the configuration interface of the SOE server, select “Database Configuration” in the navigation tree on the left, and the database configuration interface will be displayed in the right area, as shown in the figure below.



**Figure 3-7 SOE database configuration interface**

To select the database, you can choose “Use local database” or “Use remote database”.

Use local database: refers to using the local computer as the database;

Use remote database: refers to selecting a non-local computer as the database. If a remote database is selected, enter the IP address or computer name of the computer as the remote database in the following box. For example, if the IP address of the selected computer is 172.30.0.159 and the computer name is HS01, you only need to fill in 172.30.0.159 or write HS01 directly.



**Tip:**

- It is generally recommended to use a local database. In special cases, for example, SOE events of multiple operating domains need to be recorded in a database, and a remote database needs to be used.
- The computer selected as the remote database must have SOE software installed.
- If you want to modify the configuration of SOE server, you should stop the SOE server firstly, then start the SOE server after changed the configuration.

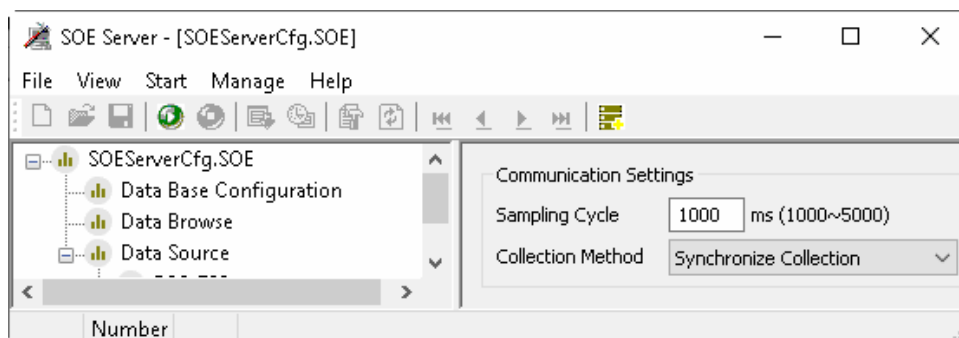
If you want to exit the server (exit the SOE server software), you can select [Start/Exit] in the menu.

### 3.7 Configure Data Source

When the SOE server is required to manage SOE tags in the OMC system, the data source of OMC needs to be added. By default, the SOE data source of the OMC system has been added to the SOE server.

The specific steps are as follows:

- 1) Select “Data Source> OMC” in the SOE server navigation, and the following interface is displayed in the property display area on the right.




**Figure 3-8 OMC SOE data source setting interface**



2) Configure the SOE data source of OMC according to the following table.

Configuration	Meaning	Configuration Instruction
Sampling Cycle	Sampling cycle is the minimum period of reading SOE event records from the main controller.	Default sampling cycle is 1000ms (recommended). Generally, user can choose between 1000ms~5000ms.
Acquisition Scheme	SOE server supports three acquisition scheme among synchronous sample, trace records and sample all	Synchronous sample: It refers to that server will synchronously update events for all SOE main station (Controller) within the configuration after service is started, namely it doesn't collect the SOE records produced before the server startup. This solution can guarantee the effectiveness of the events and is applicable for the server and SOE hardware device which prepare to run in long period. Usually, synchronous sample is recommended.
		Trace Records: It refers to that server adjusts event sampling start point dynamically based on status of the last run. This scheme can guarantee server can trace back the possible SOE events generated during the stop period when start up again after stopping running a certain time. Time can be traced back is determined by density of SOE events generated during server shutdown. This scheme is suitable for short term maintenance of SOE server and it keeps the integrity of record.
		Sample All: It refers that no optimized scheme is adopted. Server will sample all SOE event records in all SOE main station (Controller) after starting up. This sample scheme usually takes long time to sample events after the server is started up each time, and it samples large amount of expire useless SOE event records. If there are no special reasons, it is not recommended.

### 3.8 Start SOE Service


After the database and data source configuration is completed, you can start the SOE service in the following ways:

- Click the Start Service button  in the toolbar to start the SOE server.
- Select the “Start> Start Service” command in the menu bar.

When the parameter configuration is changed, you can click  and  to restart the SOE server to reapply the new server configuration scheme.

### 3.9 Browse SOE Data

After the server is started successfully, click “Data Browse” in Figure 3-6 to view the SOE event record. By browsing the SOE data, you can view the time of the event, and the tag name, tag address and other information of the event, which is convenient for users to fastly locate the tag of which event occurs.

When the on-site SOE tag status changes, you can click the refresh button  in the toolbar on the data browsing interface of the SOE server, and the latest 100 records will be displayed on the record display interface, as shown in the figure below. If the number of event records exceeds the number of items that can be displayed on a page, the page turning button becomes operable, and you can use the page turning button to page backward (forward) to view all SOE event records in the current database.

Serial ...	Event Time	Tag Name	Tag Address	Even...	Type	Test Point	Device Group
1	2021-10-27 20:40:40 200.000	DO001220000	0.122.6.0.1.0		DO Soft Point	OFF	
2	2021-10-27 20:40:37 699.000	DO001220000	0.122.6.0.1.0		DO Soft Point	ON	
3	2021-10-27 20:39:45 199.000	SOE_ND001220000	0.122.0		Custom	OFF	
4	2021-10-27 20:39:43 200.000	SOE_ND001220000	0.122.0		Custom	ON	

**Figure 3-9 SOE records**

As shown in the figure above, the data browsing interface consists of the following parts of information.

**Table 3-1 Introduction of data browser interface**

Area	Description
Serial number	The sequence number of the SOE tag event, which is sorted by time by default..
Event time	The time when the status of the SOE tag changes.
Tag name	The SOE tag name whose status has changed can be configured by the user.
Tag address	State changes SOE – tag address, generated automatically by the system. For the meaning of each address, refer to Table 3-2.
Event description	Used to indicate the event description corresponding to the tag, the user can configure it by oneself.
Type	In the OMC system , the type of SOE tag includes fast test point ( DI713-S/DI714-S/DI718-S ), custom (custom switch value), DI (other DI ) and DO soft point ( DO Module).
Test point	It is used to describe the current value of the SOE tag.
Device group	It is used to indicate the device group of the SOE tag that has changed status, and the user can configure it by oneself.
System	It is used to describe the system where the SOE tag of the state change is located, including OMC , ECS-100 and TCS-900.

**Table 3-2 Introduction of the meaning of SOE tag address**


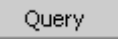
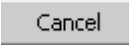
System	Types	The meaning of the tag address (from left to right)
--------	-------	---

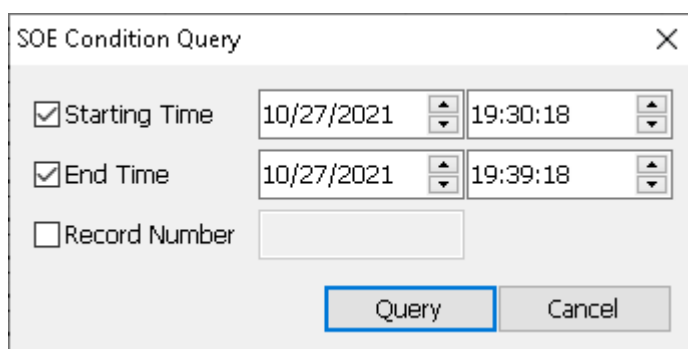
System	Types	The meaning of the tag address (from left to right)
OMC system	Fast test point	A total of six digits: controller domain address, controller station address, node serial number, rack serial number, module serial number, channel serial number
	DI	
	DO normal test point	
	customize	A total of three digits: controller domain address, controller station address, serial number of the custom switch in the tag table

### 3.9.1 Data Query

Data query can query SOE event records with filter conditions.

- Conditional query

Click the condition query button  on the toolbar, and the condition setting interface for SOE conditional query as shown in Figure 3-10. The conditions that can be set are start time, end time, and number of records to choose from. Only select "Start Time" to query all records from the beginning of the time; select "End Time" to query all records before that time; select only "Number of records", then according to the current The record sorting order, and the number of records required to be displayed are searched for the records with the highest sorting. If the selected conditions are 2 or 3 of them, the intersection of these conditions is searched. Click the button  after conditions are set. Click the button  to cancel the query.




The dialog box titled "SOE Condition Query" contains three rows of settings:

- ☒ Starting Time: 10/27/2021 19:30:18
- ☒ End Time: 10/27/2021 19:39:18
- ☐ Record Number: (empty text box)

At the bottom right are two buttons: "Query" and "Cancel".



Figure 3-10 SOE condition query

### 3.9.2 Refresh



Click Refresh , display the last SOE.

- If the record is less than 100, display all the SOE records.
- If the record is more than 100, display all the last 100 SOE records.

### 3.9.3 Turn Page

When the displayed SOE event record exceeds 1 page, the page turning button becomes operable. Click the button  to turn to the first page; click the button  to turn one page



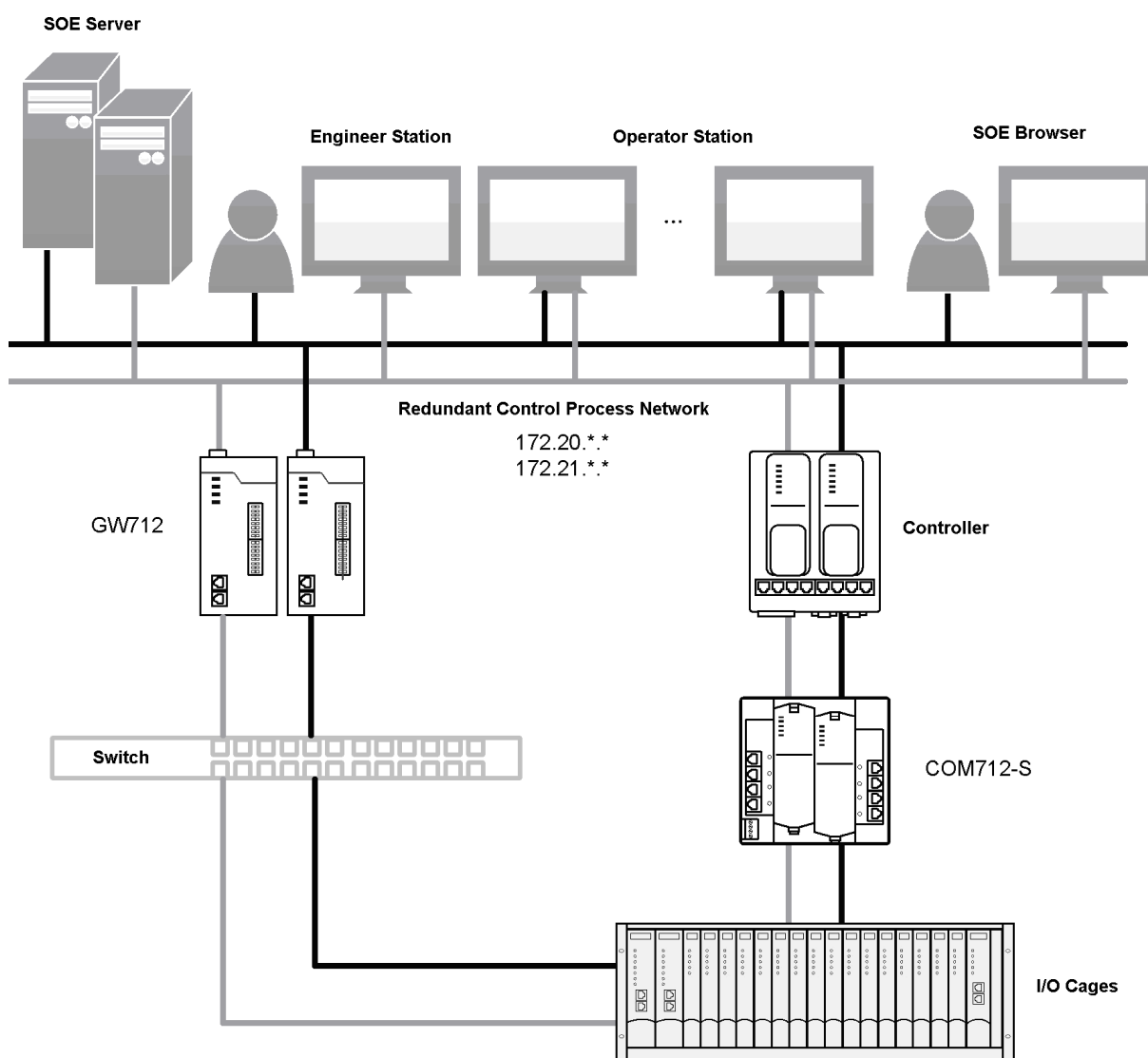
backward; click the button  to turn one page forward; click the button  to turn to the last page.

## Section 4 Collect SOE Data of JX-300XP/ECS-100

This section introduces how the SOE server of the OMC system collects system events of the JX-300XP/ECS-100 after the JX-300XP/ECS-100 system is connected to the OMC system.

### 4.1 Scenario

The SOE modules of the JX-300XP/ECS-100 system can be connected to the OMC system through COM712-S, as shown in the figure below. Through this method, OMC system can collect SOE data of JX-300XP/ECS-100 system.



**Figure 4-1 Controller system with SOE through COM712**

As shown in the figure above, the controller structure with SOE is mainly composed of the following parts:

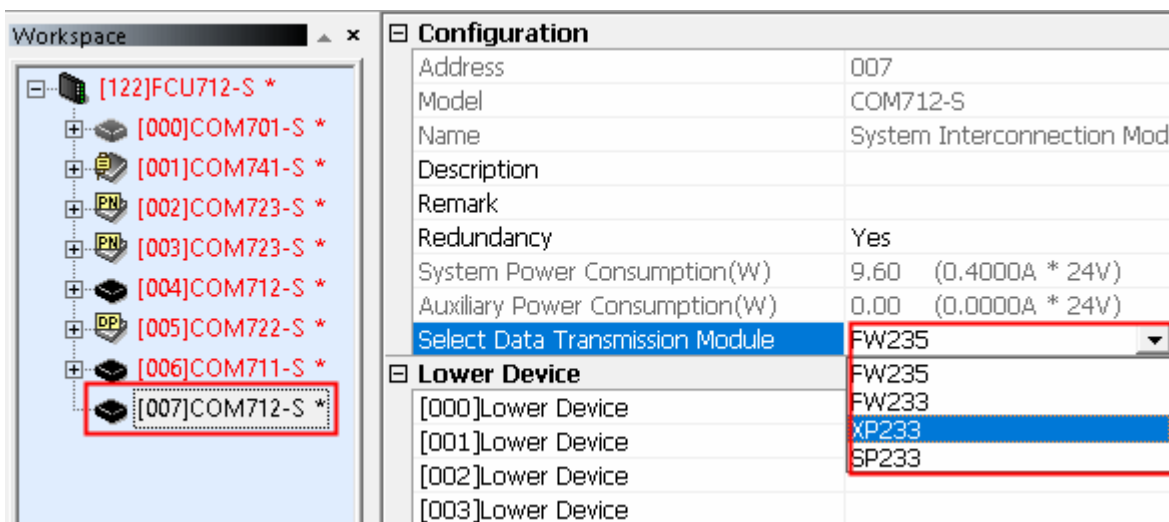
- COM712 module: the core component that connects the OMC controller and the JX-300XP/ECS-100 system I/O cage.
- SOE master module (in the I/O cage): When implementing the SOE function, it has the same function as the main controller in the OMC system. It is used to collect SOE records in the SOE module in real time and record events through master-slave communication. Upload them to the SOE server.
- SOE slave module (in the I/O cage): as an SOE module, it has the same function as the SOE module in the OMC system. It is used to scan the status of DI channels at high speed. When the channel status changes, the original SOE is formed Record it and send it to the SOE main module in real time.
- GW712 module: Send the SOE data of the JX-300XP/ECS-100 system to the control network of the OMC system.
- SOE server and SOE browser have the same functions as in 2.1. Therefore, it isn't repeated here.

## 4.2 Configuration

### Connection by COM712

For the structure configuration of the OMC system, please refer to the *System Builder User Manual*.

Open the hardware configuration software in the VFExplorer software, select COM712-S for the newly added node under the controller, and then select the data forwarding module of the corresponding system, as shown in the figure below.



After selecting the data forwarding module of the JX-300XP/ECS-100 system, you can continue to select each SOE module under the corresponding data forwarding module. For the subsequent configuration process, please refer to the *Hardware Module Configuration Builder User Manual*.

## 4.3 Configure Clock Synchronization

### Connection by COM712

For software clock synchronization, refer to *System Builder User Manual*: Configure clock synchronization server. The hardware clock synchronization is realized by GW712. For details, refer to the section 2.4.1 in *GW712 User Manual*: configure SCnetII clock synchronization server.

## 4.4 Preparation

Before starting the SOE server, you need to ensure that the following tasks have been completed on the computer where the SOE server runs:

- Install High-performanceHMI system software (High-performanceHMI installation package includes SOE server and SOE browser).
- when accessing through COM712, confirm that the IP address of the computer running the SOE server should be configured as 172.20/ twenty one.\*.\*.
- In order to ensure that the SOE server can collect SOE data normally, the SOE server must be started with the High-performanceHMI monitoring software (VFLaunch).
- The software dongle should obtain authorization to access to SOE.

## 4.5 Start SOE Server

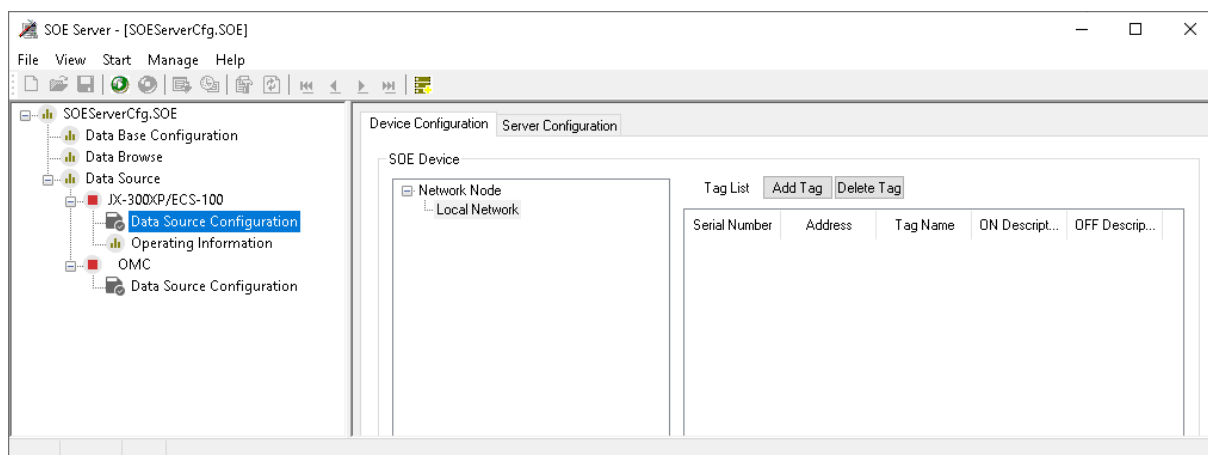
Before starting the SOE server, you need to ensure that the following operations have been configured.

## 4.6 Configure Data Source

Except that the configuration of the data source is different from that of the OMC system, the configuration and operation of starting the SOE server and other items are the same as those described in Section 2, and will not be repeated here. The following will focus on the configuration of the JX-300XP/ECS-100 system data source.

When the SOE server is needed to manage tags in JX-300XP/ECS-100, it is necessary to add SOE data source of JX-300XP/ECS-100 firstly. The specific steps are as follows:

- 1) Select “Manage > Add Data Source” in the menu bar, and the “SOE Driving Selection” dialog box will pop up.
- 2) Select “JX-300XP/ECS-100” in the “SOE Driving Selection” combo box , and click “OK”.
- 3) The “Data Source > JX-300XP/ECS-100 “ node will be added in the navigation tree as shown in the figure below.



**Figure 4-2 “SOE server” interface (add JX-300XP/ECS-100)**

- 4) According to the following table, carry out the “device configuration” of JX-300XP/ECS-100.

Configuration Item		Meaning	Configuration Instructions
The internet node	Local network / gateway	Level 1 subordinate node of the network node.	Click “Network Node” and select “Add” in its right-click menu to add a new gateway.
	Master Module	Level 2 subordinate node of the network node.	Click “Local Network / Gateway” and select “Add” in its right-click menu to add a new main module. After double-clicking, you can modify the main module address and main module description. The address is the dialing address of the module.
	Slave module	Level 3 subordinate node of the network node.	Click “Master Module” and select “Add” in its right-click menu to add a new slave module. After double-clicking, you can modify the slave module address and slave module description. The address is the dialing address of the module.
Tag List	Add tag	Used to add SOE tag .	Select “Slave Module” and click this control to add a SOE tag .
	Delete tag	Used to delete the SOE tag .	Select the tag to be deleted in the tag list and click the control to delete the specified SOE tag .



**Tip:**

**For the address of the network node and its corresponding tag, please configure it according to the hardware configuration of FW369 and XP369.**

- 5) In Figure 4-2, double click one tag in the list, and a “Tag Settings” dialog box pops up. You can configure tag address, name and ON/OFF transition's detailed description.
- 6) Click the “Server Configuration” tab to configure the properties of the SOE server of the JX-300XP/ECS-100 system. JX-300XP/ECS-100 of SOE server configuration and OMC of SOE server configuration is substantially the same, refer to Configure Data Source.
- 7) Start the SOE server, click “Data Source > JX-300XP/ECS-100> Running Information” in

the configuration tree, the SOE device status of the JX-300XP/ECS-100 system under the current configuration will be displayed, as shown in the figure below.

Figure 4-3 JX-300XP/ECS-100 SOE device status



**Tip:**

In order to ensure the record of SOE data of ECS-100/JX-300XP system, after configuring the JX-300XP/ECS-100 data source, it is recommended to perform the download operation to realize the configuration download of the SOE main module.

## 4.7 Browse SOE Data

When the SOE tag in the JX-300XP/ECS-100 system changes, click the refresh button in the SOE server to get the latest SOE data, as shown in the figure below.

Serial ...	Event Time	Tag Name	Tag Address	Even...	Type	Test Point	Device Group	System
1	2021-10-27 20:40:40 200.000	DO001220000	0.122.6.0.1.0		DO Soft Point	OFF		ECS-100
2	2021-10-27 20:40:37 699.000	DO001220000	0.122.6.0.1.0		DO Soft Point	ON		ECS-100
3	2021-10-27 20:39:45 199.000	SOE_ND001220000	0.122.0		Custom	OFF		ECS-100
4	2021-10-27 20:39:43 200.000	SOE_ND001220000	0.122.0		Custom	ON		ECS-100
5	2021-10-27 20:39:41 699.000	SOE_ND001220000	0.122.0		Custom	OFF		ECS-100

Figure 4-4 Data browser interface

The function of SOE event browsing is basically the same as that in 3.9 Browse SOE Data, so I won't repeat it here.

In addition, as shown in the figure above, the type of SOE tag in the JX-300XP/ECS-100 system

only has a fast test mode, and its tag address has three digits, representing the SOE master module DIP address, SOE slave module DIP address, and Tags.



---

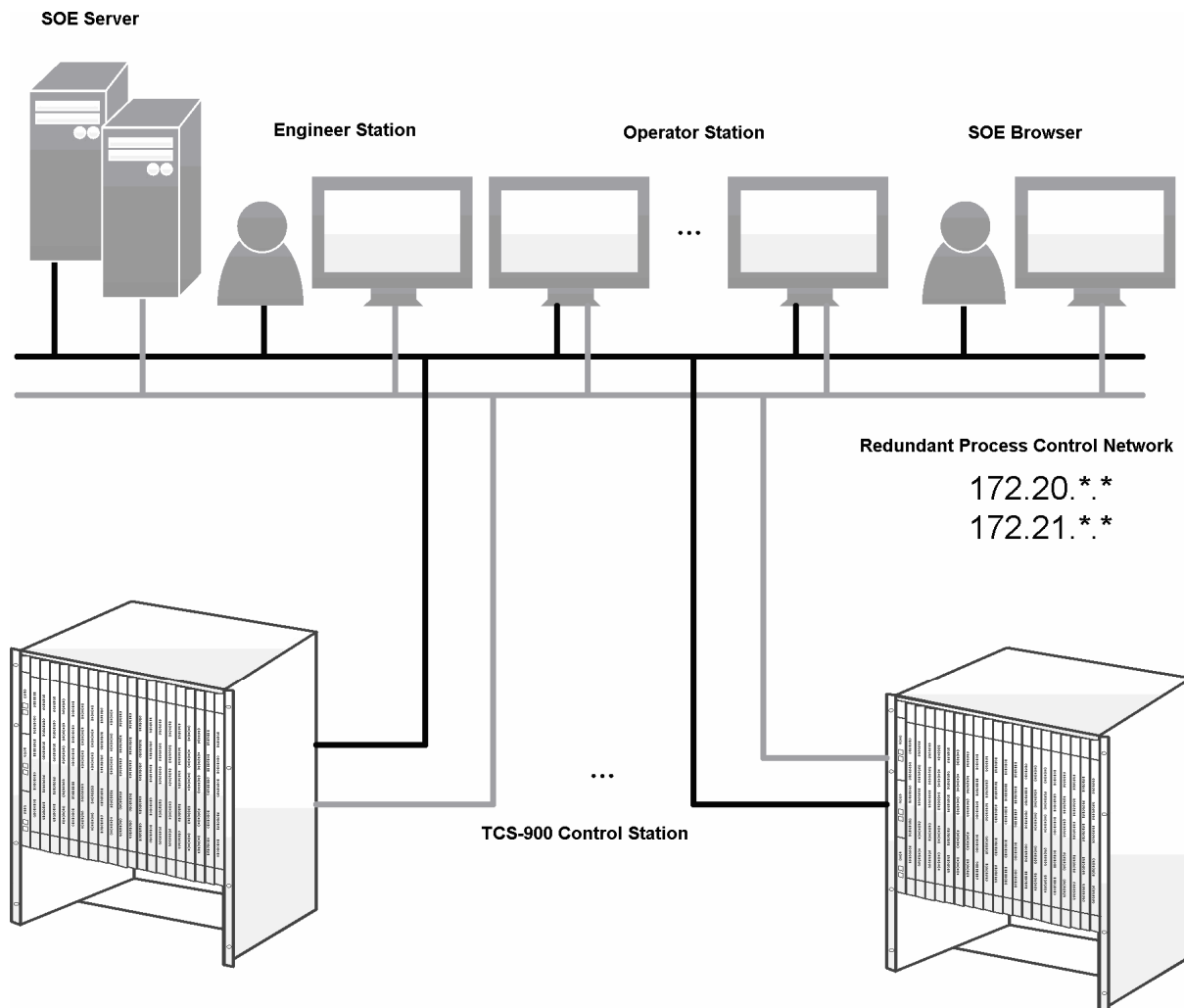
**Tip:**

As Figure 4-4 shown in the formula, JX-300XP/the ECS-100 system SOE tag of the “group device” item can not be configured.

---

## Section 5 Collect SOE Data of TCS-900

When the SOE server of High-performanceHMI collects the SOE data of the TCS-900 system, the SOE system structure is shown in the figure below.



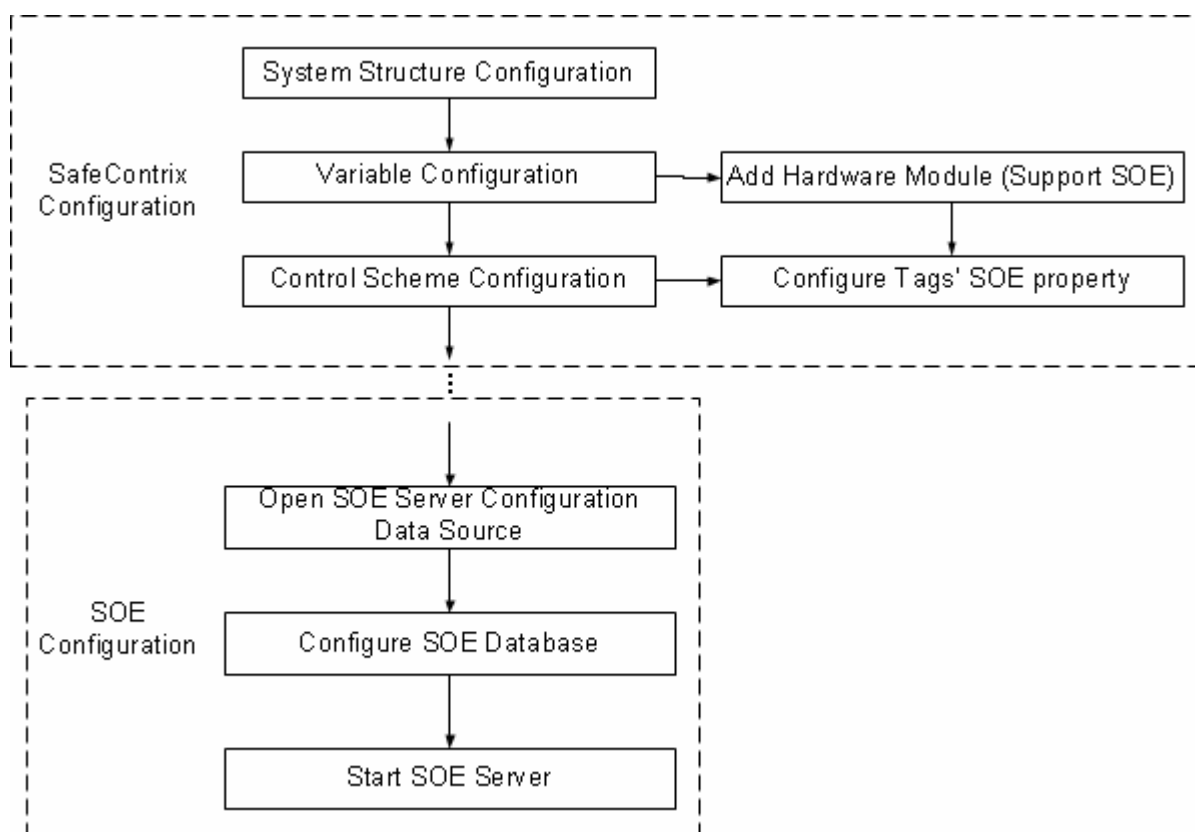
**Figure 5-1 Controller system with SOE**

The whole system includes SOE server, SOE browser, TCS-900 control station (controller, communication module, SOE module). It should be noted that the SOE server and browser in this scenario are the software of the OMC system; the controller and SOE module are the modules of the TCS-900 system.

### 5.1 Configuration Process

In order to realize the SOE recording function of the system, it is necessary to configure according to the following process.





**Figure 5-2 SOE application process**

## 5.2 Configure SOE Tags in SafeContrix

In SafeContrix of TCS-900 system, hardware configuration and variable configuration need to be completed. For detailed configuration process and download, please refer to *SafeContrix Software User Manual*.

### 5.2.1 Configure SOE Module

The SOE records of the TCS-900 system are divided into hard SOE records and soft SOE records.

- Hard SOE recorded by DI acquisition module is obtained.
- Soft SOE records generated in the controller, the controller comprising DO variable, BOOL type synchronous variable, BOOL type and memory variables BOOL state variable generated by the manipulated variable.

### 5.2.2 Configuration Tags' SOE Property

#### Configure IO tags' SOE property

Use SafeContrix software to configure the SOE property of the IO module channel tag. The following takes the DI tag as an example.

- 1) In the SafeContrix configuration tree, select the node "Hardware Configuration > MCN9010 or MCN9020> SDI9010" and select "Channel Detailed Settings" in the

right-click menu, and the “DI Channel Settings” dialog box pops up.

- 2) Configure “SOE Parameters” in the “DI Channel Settings” dialog box.
  - “SOE Type”, select whether to enable the SOE function of the tag.
  - In “SOE Description” text box to the tag of SOE description, character length should be (0 to 256) between.
  - The SOE group to which the tag belongs in the “SOE Device Group” text box. The character length should be between (0~64 ).
- 3) After configuring other properties of the DI channel tag, the system automatically saves the modification.



---


**Tip:**

The SOE property configuration method of the DO module's channel tag is basically the same as the DI module's SOE property configuration method, which will not be repeated here.

---

### Configure BOOL Variables' SOE property

In the SafeContrix software, BOOL type variables, BOOL type memory variables, BOOL extended type and BOOL type synchronous variables also support SOE. The following takes “memory variable” as an example to introduce the SOE property configuration method of BOOL type variable.

- 1) In the SafeContrix configuration tree, select the node “Variable Management > Memory Variables or Operating Variables”, and the variable list will be displayed in the information area.
- 2) Select “BOOL variable” tab, the BOOL variables pop up.
- 3) Configure the SOE property of BOOL type variables.
  - In the “SOE” column, choose whether to enable the SOE function. “ON” means that SOE recording is enabled, and “OFF” means that SOE recording is disabled.
  - In “SOE Description” column of the input tag of the SOE described, the character length is up to 256.
  - The SOE group to which the tag belongs in the “SOE Group” column, the character length is up to 256.
- 4) After configuring other properties of BOOL variables, click the  button in the toolbar.



---

**Tip:**

Please refer to the *SafeContrix User Manual* for the channel number of the IO device and other property configuration methods of variables.

---

### 5.2.3 Configure Clock Synchronization

When the SOE server of the OMC system collects SOE data of the TCS-900 system, the clock

synchronization server should be configured as the clock synchronization server in the High-performanceHMI system. For detailed operations, refer to Configure Clock Synchronization.

### 5.3 Preparation

Before starting the SOE server, you need to ensure that the following tasks have been completed in the device running the SOE server:

- Install SafeContrix software, SOE server software and SOE browser along with the High-performanceHMI system software installation and installation.
- That the IP address of the device running the SOE server should be configured as 172.20/21.\*.\* to ensure that it is connected to the network of the TCS-900 controller.
- High-performanceHMI system software should be authorized by the operator station, and the software dongle should be authorized by the SOE.


### 5.4 Start SOE Service Software

Before starting the SOE server, you need to ensure that the following operations have been configured.

### 5.5 Configure Data Source

Except that the configuration of the data source is different from that of the OMC system, the configuration and operation of starting the SOE server and other items are the same as those described in Section 2, and will not be repeated here. The following will focus on the configuration of the TCS-900 system data source.

When SOE server is required to manage SOE tags of TCS-900, it is necessary to add SOE data source into the SOE server. The specific steps are as follows:

- 1) Select "Manage > Add Data Source" in the menu bar, and the "SOE Driver Selection" dialog box pops up.
- 2) Select "TCS-900 System" in the "Drive Selection" combo box, and click "OK".
- 3) The "Data Source > JX-300XP/ECS-100 " node will be added in the navigation tree.
- 4) Click next to "Configuration Path" , and select the path where SafeContrix configuration is located in the pop-up "Browse Folder" dialog box .

By default, the SafeContrix configuration file is the folder "D:\TCSData\ Project Name".

- 5) After selecting the SafeContrix configuration file, click "Add". The SafeContrix configuration will be added to the " SafeContrix Configuration List".

After the SafeContrix project is successfully added, you can view the SOE event records in the project in the SOE server software and SOE browser.

**Tip:**

- The server configuration of the TCS-900 system is the same as that of the OMC system. For details, please refer to 3.7 Configure Data Source.
- The SOE configuration and control cycle in the SafeContrix configuration change, the SOE server should be manually started to reload the SafeContrix configuration.
- In SOE selected server SafeContrix configuration should be downloaded to the same configuration and the actual controller. Otherwise, the error or unknown tag name.

For server configuration, refer to **Configure Data Source**.

## 5.6 Browse SOE Data

When the SOE tag in the TCS-900 system changes, click the refresh button in the SOE server to get the latest SOE data.

The function of SOE event browsing is basically the same as that in 3.9 Browse SOE Data and it isn't repeated here.

In addition, as shown in the figure above, the type of SOE tag in the TCS-900 system and the meaning of its tag address are shown in the following table.

**Table 5-1** SOE tag type and its address' meaning


System	Types	The meaning of the tag address (from left to right)
TCS-900 system	DI	A total of five digits: controller domain address, controller station address, rack serial number, slot serial number, channel serial number
	Customization (memory variables, operation variables, synchronization variables)	A total of four bits: controller domain address, controller station address, variable address high byte, variable address low byte
	DO soft point	

## Section 6 SOE Browser

Through the SOE browser, you can configure the browser-related database, so as to realize the view, analysis and management of the SOE records in the database.

### 6.1 Start SOE Browser

When installing the SOE software, select the operating station with the SOE browser installed to start the SOE browser. The specific operation steps are as follows (take Window10 operating system as an example):

- 1) Click the icon  in the toolbar of the VFLaunch, and select “SOE Log” in the pop-up drop-down list and the interface as shown in the figure below pops up.

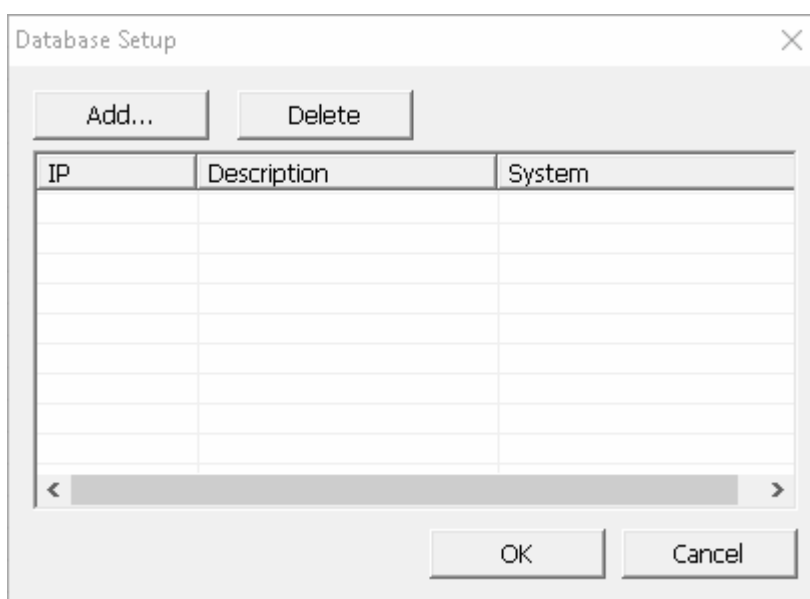


Figure 6-1 Client database settings



**Tip:**

- First start or SOE server does not start, will start SOE pop-up dialog box shown in the browser on the map.
- Not started for the first time or the SOE server has been started, the above dialog box will not be displayed, and the main interface of the SOE browser will be displayed directly.
- Completing the first configuration of the database and confirming it, the configuration results will be saved and automatically loaded when the program is started next time without the need to configure again.

- 2) Click “Add” and the “SOE Server” configuration dialog box pops up as shown in the figure below.



**Figure 6-2 Add a SOE server**

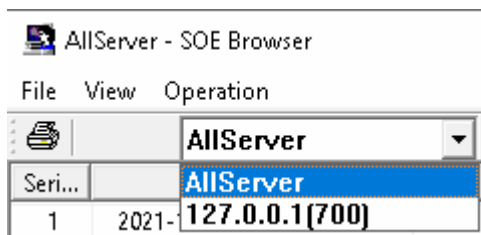
- 3) Enter the address and description of the SOE server in the “Address” and “Description” text boxes.
- 4) According to actual needs, select “System” type, “ JX-300XP\ECS-100\OMC” or “TCS-900”.
- 5) Click “OK” to complete the configuration of the SOE server and enter the main interface of the SOE browser, as shown in the figure below.

Serial Number	Event Time	Tag Name	Tag Address	Event Description	Type	Test Point	Device Group
1	2021-10-27 20:40:43 699.0	DO001220000	0.122.6.0.1.0		DO	ON	
2	2021-10-27 20:40:40 200.0	DO001220000	0.122.6.0.1.0		DO	OFF	
3	2021-10-27 20:40:37 699.0	DO001220000	0.122.6.0.1.0		DO	ON	
4	2021-10-27 20:39:45 199.0	SOE_ND001220000	0.122.0		Custom	OFF	
5	2021-10-27 20:39:43 200.0	SOE_ND001220000	0.122.0		Custom	ON	
6	2021-10-27 20:39:41 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
7	2021-10-27 20:39:26 700.0	SOE_ND001220000	0.122.0		Custom	ON	
8	2021-10-27 20:39:22 200.0	SOE_ND001220000	0.122.0		Custom	OFF	
9	2021-10-27 20:39:17 201.0	SOE_ND001220000	0.122.0		Custom	ON	
10	2021-10-27 20:39:14 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
11	2021-10-27 20:38:37 699.0	SOE_ND001220000	0.122.0		Custom	ON	
12	2021-10-27 20:38:35 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
13	2021-10-27 20:38:33 699.0	SOE_ND001220000	0.122.0		Custom	ON	
14	2021-10-27 20:38:32 199.0	SOE_ND001220000	0.122.0		Custom	OFF	
15	2021-10-27 20:38:29 199.0	SOE_ND001220000	0.122.0		Custom	ON	

**Figure 6-3 The initial window of SOE browser**





The figure above, SOE browser interface meaning of each column represents information, refer to Table 3-1.

When multiple SOE servers are configured, you can select different databases in the toolbar to switch fast, as shown in the figure below.



**Figure 6-4 Fast switch SOE servers**

## 6.2 View Data

After setting up the database, click the  button, SOE browser interface will be the last on the current server displays 10000 items of SOE event record. When the event record exceeds the number of items that can be displayed on a page, click the “ (condition query) button” to set the query conditions, and the page turning button becomes operable. At this time, you can click the page turning button  to view all the records. In addition, you can also select the page you want to jump to from the drop-down list of  the page.


Seri...	Event Time	Tag Name	Tag Address	Ev...	Type	Test Point	Device Group
1	2021-10-27 20:40:43 699.0	DO001220000	0.122.6.0.1.0		DO	ON	
2	2021-10-27 20:40:40 200.0	DO001220000	0.122.6.0.1.0		DO	OFF	
3	2021-10-27 20:40:37 699.0	DO001220000	0.122.6.0.1.0		DO	ON	
4	2021-10-27 20:39:45 199.0	SOE_ND001220000	0.122.0		Custom	OFF	
5	2021-10-27 20:39:43 200.0	SOE_ND001220000	0.122.0		Custom	ON	
6	2021-10-27 20:39:41 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
7	2021-10-27 20:39:26 700.0	SOE_ND001220000	0.122.0		Custom	ON	
8	2021-10-27 20:39:22 200.0	SOE_ND001220000	0.122.0		Custom	OFF	
9	2021-10-27 20:39:17 201.0	SOE_ND001220000	0.122.0		Custom	ON	
10	2021-10-27 20:39:14 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
11	2021-10-27 20:38:37 699.0	SOE_ND001220000	0.122.0		Custom	ON	
12	2021-10-27 20:38:35 699.0	SOE_ND001220000	0.122.0		Custom	OFF	
13	2021-10-27 20:38:33 699.0	SOE_ND001220000	0.122.0		Custom	ON	
14	2021-10-27 20:38:32 199.0	SOE_ND001220000	0.122.0		Custom	OFF	
15	2021-10-27 20:38:29 199.0	SOE_ND001220000	0.122.0		Custom	ON	

**Figure 6-5 SOE records**

As shown above, the right column shows the current state of the event number of records that can be displayed, the current page and the total number of pages (one event record can be displayed as 200 items).

### 6.2.1 Data Search

Users can view the SOE event records that meet the requirements through “conditional query” . The “conditional query” of the browser is more powerful than the “conditional query” of the server, and it can perform multi-condition combination queries.

Select [Operation / Condition Query] or click the  button and the “Query Settings” dialog box pops up, as shown below.

The **Query Setup** dialog box is used to define search conditions for SOE event records. It includes a 'Condition' section with the following options:

- ☒ Starting Time: 9/27/2021 20:29:47
- ☒ End Time: 10/27/2021 20:29:47
- ☒ Tag Name
- ☐ Matched Tag
- ☒ Tag Address
- ☐ Matched Address
- ☒ Event Description
- ☐ Matched Description
- ☒ Device Group
- ☐ Matched Device

Below these options are four columns, each with an 'Add' and 'Delete' button, for specifying values for the selected conditions. A notice at the bottom states: "Notice: If not check match query, asterisk wildcards (\*,?) are used". Buttons for 'Query' and 'Cancel' are at the bottom right.

**Figure 6-6 Query Setup**

You can query the SOE event records that meet the conditions by setting the start time.

Conditions such as "Tag Name", "Tag Address", "Event Description", and "Device Group" are not enabled by default, and are selected as query conditions. Up to 10,000 query results can be displayed.

Take query "Tag Address" as an example to introduce the detailed usage of query settings.

- "Matched Address" is checked, it is an exact match to query the address of the tag. At this time, you need to enter all the addresses of the tag you want to query.
- "Matching Address" is not checked, it is a fuzzy matching query tag address. In this case, a wildmodule ( \* or ? ) is required for query. If you want to query all the tags whose addresses start with " 6.2 ", you only need to enter " 6.2.\* ", click Add to query, and all tags whose addresses begin with " 6.2 " can be displayed in the browser ; If you need to query the address starting with " 6.2 " and the address has a total of four digits, you only need to enter " 6.2..??.? ", click Add and query, then the browser can display all addresses with " 6.2 ..??.? " "Starts with all four digits.

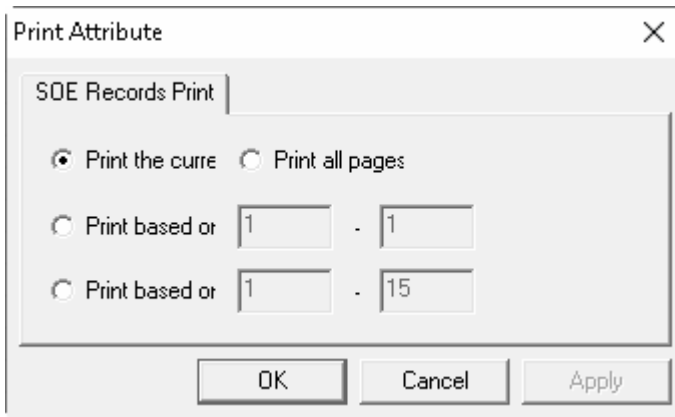
### 6.2.2 SOE Event Record Print

The client also has the function of printing SOE event records.

Select [File / Print Settings], the print settings dialog box pops up, select the printer and paper size.

After the print setting is completed, you can select [File/Print], and the print property setting dialog box as shown in the figure below pops up.





**Figure 6-7 Print property settings**

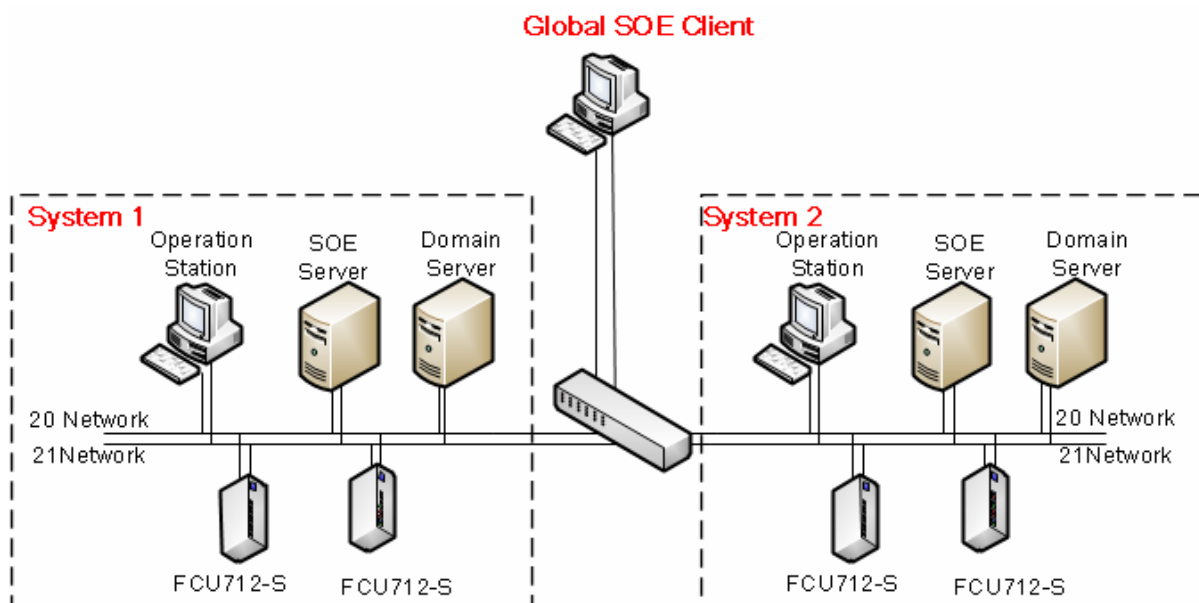
You can choose to print the current page, print all pages, print by page number or print by sequence number in the dialog box. Click “OK” after the setting is completed.

To print preview, select [File/Print Preview] to prompt Print properties dialog box as shown in Figure 6-7. After the settings are completed, click “OK” to preview. Click “Print” in the preview interface, the effect is the same as selecting [File/Print].

### 6.3 Browse SOE Record

In a multi-project connection system, as long as the versions of the SOE components are the same and the computers are connected to each other in the network, the SOE browser supports viewing the SOE records of all SOE servers in the same LAN.

As shown in the figure below, it is a typical scenario of SOE browsing SOE data of two systems. The SOE browser collects the SOE data in the SOE server in System 1 and System 2.

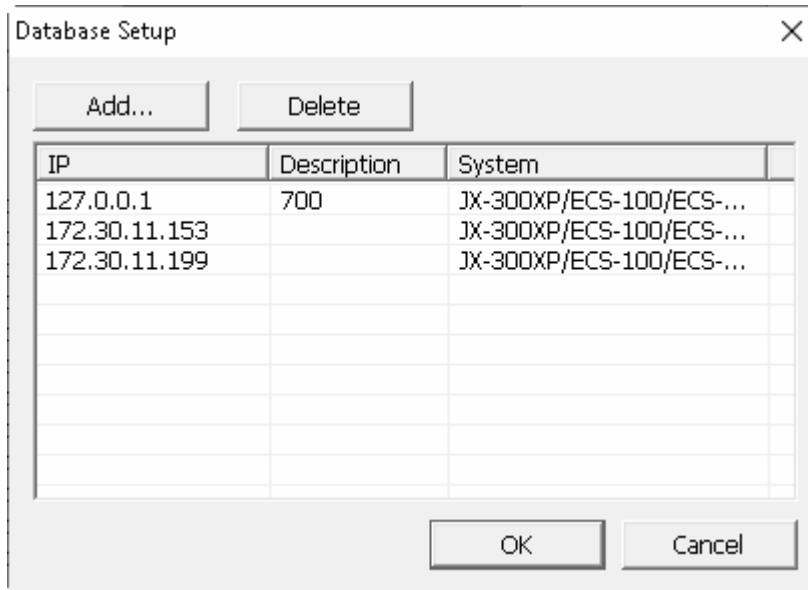


**Figure 6-8 Global SOE client-side typical network diagram**

## 6.4 Configuration Illustration

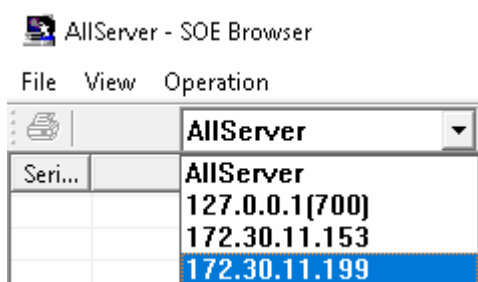
Use the following steps to configure the global SOE browser:

- 1) Start the SOE browser and configure the database in it. For detailed settings, refer to 3.6Configure SOE Database.
- 2) In the SOE select “Operator menu bar of the browser software > Settings”, “Database Settings” dialog box pops up as shown in the figure below.



**Figure 6-9 “Database settings” dialog box**

- 3) Click “Add” to add the downstream SOE servers associated with the SOE browser one by one. After the SOE server is successfully added, you can select it from the drop-down list shown on the SOE client.



**Figure 6-10 SOE server selection drop-down list**

- When you select “AllServer “ when, SOE information list from top to bottom by the time the earliest to the latest display 200 bars.
- Specified SOE server is selected, the SOE list will display the latest 200 pieces of SOE information from top to bottom according to the change of the tag in the specified SOE server.

## Section 7 Appendix

### 7.1 SOE Server's Interface and Command Introduction

This section mainly introduces the interface and commands of the SOE server software.

#### 7.1.1 Interface Introduction

**Table 7-1 Introduction of SOE server interface**

Area	Description
Title Bar	The title bar of the SOE server is used to display the name of the current SOE server, such as "SOE server 1".
Menu Bar	It contains all menu commands of SOE server. For detailed menu description, refer to Table 7-2 Menu command introduction of SOE server.
Tool Bar	Which contains the SOE commonly used commands server, detailed toolbar commands, refer to Table 7-2 Menu command introduction of SOE server.
SOE server navigation	The subordinate nodes of the SOE server are listed in the navigation.
Property display area	It is used to display the information of the selected node in the navigation.








**Tip:**







The "Configuration Download" command and the "Time Synchronization" command under the management menu are inoperable (the menu is always in gray and inoperable status).

#### 7.1.2 Command Introduction

Table 7-2 describes the menu command in SOE server.

**Table 7-2 Menu command introduction of SOE server**

Menu	Sub-menu/ Icon	Function
File	New 	Create a new SOE server configuration file.
	Open 	Open an already existed SOE server configuration file.
	Close	Close the current program.
	Save 	Save the current SOE server configuration file.
	Save As	Save the current SOE server configuration file to the specified directory.
	Recent Files	Show the recent SOE server configuration file.
View	Toolbar	Show/ hide the toolbar, select the command to show.
	Status Bar	Show/ hide the status bar, select the command to show.
Start	Start 	Start the SOE server.
	Stop 	Stop the SOE server.
	Reload	When the SOE server is in the type of "TCS-900 system" or "TCS-500 system", you should reload the server after changed the configuration related to the server.

Menu	Sub-menu/ Icon	Function
	Exit	Exit the SOE server.
Manage	Add data source 	Add data source to SOE server. Stop SOE server and operate.
		Download configuration information of SOE main card to SOE card. Start SOE server, then load. Configuration information of SOE slave card is loaded by SCConfig software.
		Manually sync SOE server to clock synchronization server. Start SOE server can sync clock synchronization.
		Set the search conditions for SOE records. Start SOE server and set query condition.
		Refresh the current SOE records. Start SOE server and refresh SOE records.
		Turn to the first page, previous page, next page and the last page separately.

## Section 8 Revision

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*Table 8-1 Retrofit list of the version*

Document Version	Applicable Product Model	Remarks
V1.0 (20230301)	OMC High-performanceHMI V4.70.00.00	First release
V1.1 (20230830)	OMC High-performanceHMI V5.10.00.00-M	Updated screenshots.