

WEINTEK LABS., INC.

Sequence of Events

Demo Project

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1. Overview and Operation

Overview

SOE, the abbreviation for Sequence Of Events, is a function that records the precise time of the events occur, and sorts the events by their time sequence. When an event occurs, PLC will store the data frame in [Address of first record], and writes the number of events in [No. of queued records] address. HMI will scan [No. of queued records] address in the frequency set in [Scan cycle]. If the value in [No. of queued records] address is not 0, HMI reads the data frame in [Address of first record]. The content of data frame records the precise time and type of the event, etc.

SOE

SOE Data

21	2013/02/08	14:79:00.512	General Alarm	Lube oil pump 2	User 2
20	2013/02/08	14:79:00.256	General Alarm	Generator2	User 2
19	2013/02/08	14:79:00.000	General Alarm	Generator1	User 2
18	2013/02/08	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
17	2013/02/08	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2
16	2013/02/08	14:60:00.000	Emergency Alarm	Cooling water pump 2	User 2
15	2014/02/07	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
14	2014/02/07	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2
13	2014/02/07	14:60:00.000	Emergency Alarm	Cooling water pump 2	User 2
12	2013/02/07	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
11	2013/02/07	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2

Search

Mode: 0 0 1 2 3 4 5

Type: 0

User Name: 0

Device: 0

Start date: 0 0 0

Start time: 0 0 0

ms: 0

State: all event

=the value read from register

>=the value read from register

End date: 0 0 0

End time: 0 0 0

ms: 0

Fast Sel

Language

English Traditional Chinese

User Name

2

Password

2

B

Log out

Operation

SOE Display object allows users to view SOE event logs. The designated registers query type, user name, device, date, time, and millisecond to select the events to be displayed.

The screenshot shows the SOE Display interface. A callout box points to the 'SOE Data' button with the text 'Click to view the selected events.' Another callout box points to the 'Log in' button with the text 'Log in'.

No.	Date	Time	Event Type	Device	User
21	2013/02/08	14:79:00.512	General Alarm	Lube oil pump 2	User 2
20	2013/02/08	14:79:00.256	General Alarm	Generator2	User 2
19	2013/02/08	14:79:00.000	General Alarm	Generator1	User 2
18	2013/02/08	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
17	2013/02/08	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2
16	2013/02/08	14:60:00.000	Emergency Alarm	Cooling water pump 2	User 2
15	2014/02/07	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
14	2014/02/07	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2
13	2014/02/07	14:60:00.000	Emergency Alarm	Cooling water pump 2	User 2
12	2013/02/07	14:60:00.032	Emergency Alarm	Lube oil pump 2	User 2
11	2013/02/07	14:60:00.016	Emergency Alarm	Lube oil pump 1	User 2

Search

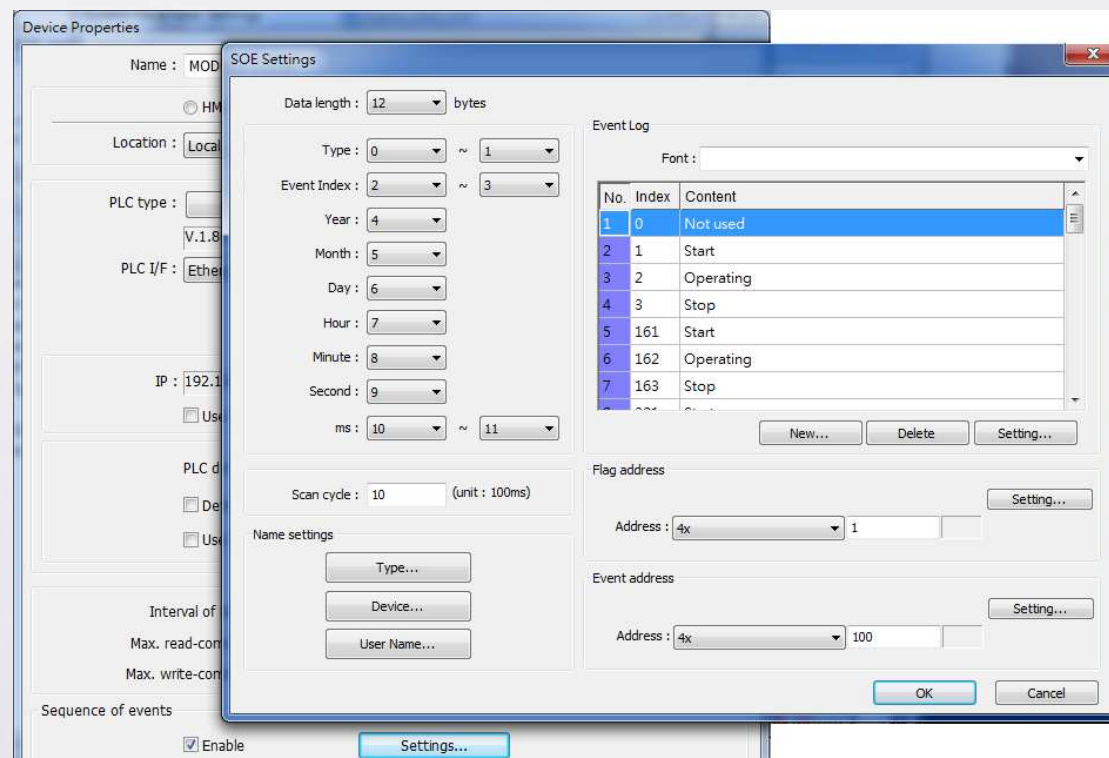
Mode: 0 1 2 3 4 5 State:
 =the value read from register
 >=the value read from register

Type: Start date: End date:
 User Name: Start time: End time:
 Device: ms: ms:

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2. Setting up the Screen

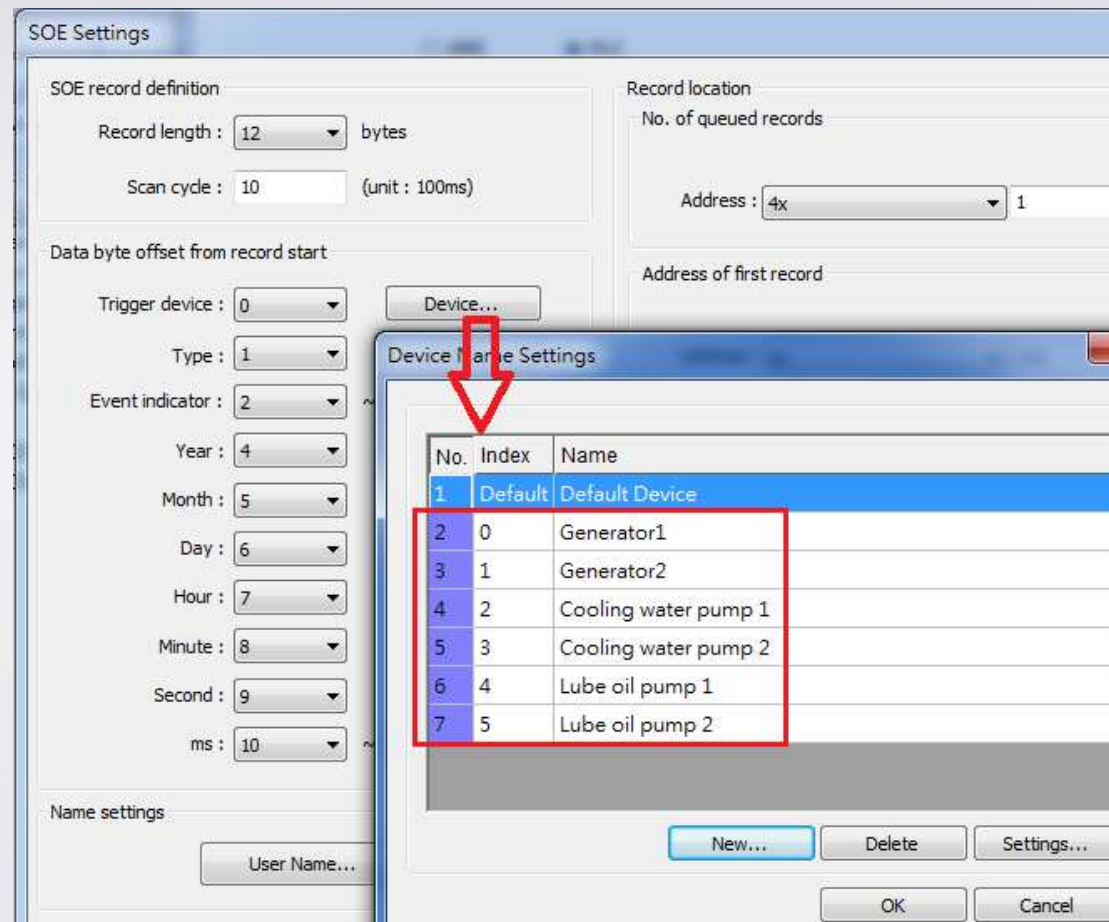
Step 1. SOE settings.



In EasyBuilder [System Parameter Settings] > [Device list] > [Settings] > [Device Properties], select [enable] check box under [Sequence of events]. Click [Settings] to finish the settings.

As shown in this demo project, there are 6 devices defined:

- 0: Generator 1
- 1: Generator 2
- 2: Cooling water pump 1
- 3: Cooling water pump 2
- 4: Lube oil pump 1
- 5: Lube oil pump 2

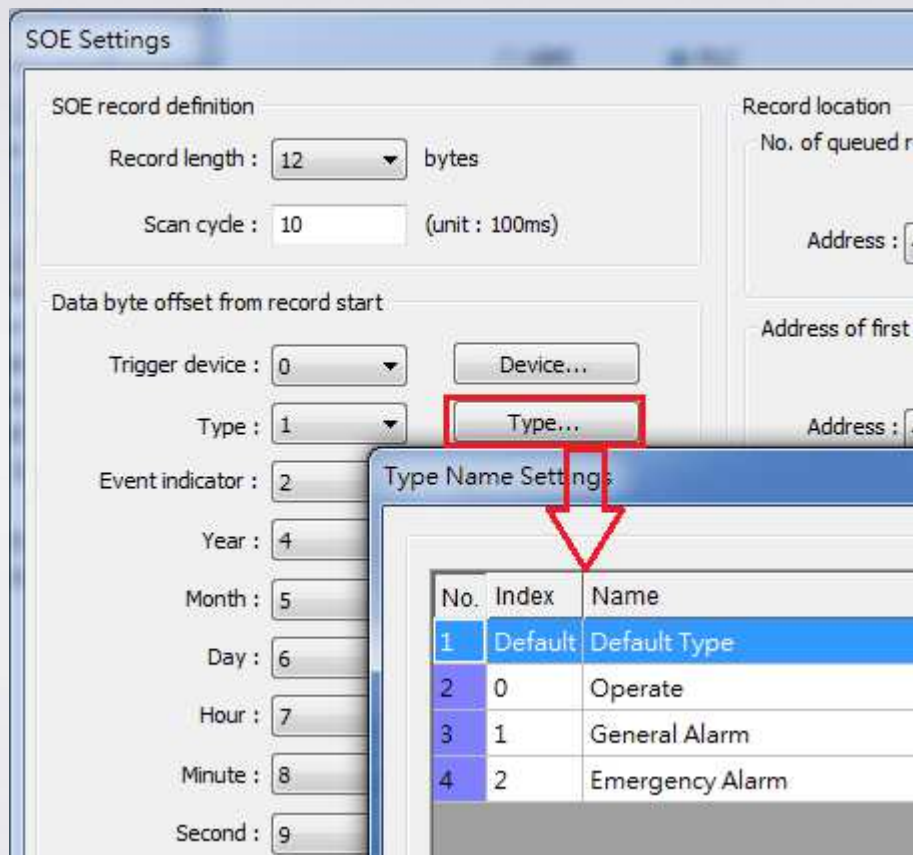


As shown in this demo project, there are 3 types defined:

0: Operator

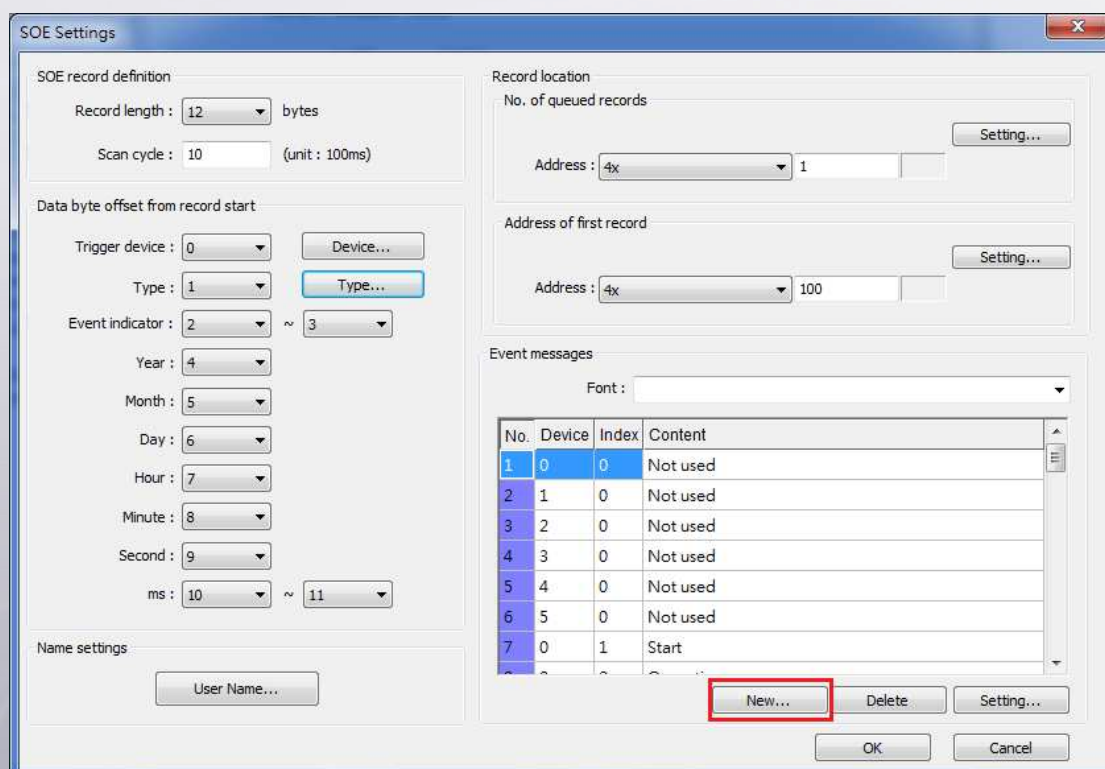
1: General Alarm

2: Emergency Alarm



There are 48 messages designed for these 5 devices and 3 types.

Click [New] button under [Event messages] to define the event messages.



The way to calculate the index number is shown in the following list:

Device	Type	The way to calculate the index number: [Type] X 1000 + [Bit offset of the event indicator]								
0	0	Type 0 x 1000 + 1 = 1 Enter 0 in [Device] field, 1 in [Index] field, and the content to be displayed. <table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>7</td><td>0</td><td>1</td><td>Start</td></tr></table>	No.	Device	Index	Content	7	0	1	Start
No.	Device	Index	Content							
7	0	1	Start							
0	1	Type 1 x 1000 + 1 = 1001 Enter 0 in [Device] field, 1001 in [Index] field, and the content to be displayed. <table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>13</td><td>0</td><td>1001</td><td>Slow RPM</td></tr></table>	No.	Device	Index	Content	13	0	1001	Slow RPM
No.	Device	Index	Content							
13	0	1001	Slow RPM							
0	2	Type 2 x 1000 + 1 = 2001 Enter 0 in [Device] field, 2001 in [Index] field, and the content to be displayed. <table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>16</td><td>0</td><td>2001</td><td>Insufficient fuel</td></tr></table>	No.	Device	Index	Content	16	0	2001	Insufficient fuel
No.	Device	Index	Content							
16	0	2001	Insufficient fuel							
1	0	Type 0 x 1000 + 1 = 1 Enter 1 in [Device] field, 1 in [Index] field, and the content to be displayed. <table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>10</td><td>1</td><td>1</td><td>Start</td></tr></table>	No.	Device	Index	Content	10	1	1	Start
No.	Device	Index	Content							
10	1	1	Start							
1	1	Type 1 x 1000 + 1 = 1001 Enter 1 in [Device] field, 1001 in [Index] field, and the content to be displayed.								

		<table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>19</td><td>1</td><td>1001</td><td>Slow RPM</td></tr></table>	No.	Device	Index	Content	19	1	1001	Slow RPM
No.	Device	Index	Content							
19	1	1001	Slow RPM							
1	2	<p>Type $2 \times 1000 + 1 = 2001$</p> <p>Enter 1 in [Device] field, 2001 in [Index] field, and the content to be displayed.</p> <table><tr><th>No.</th><th>Device</th><th>Index</th><th>Content</th></tr><tr><td>22</td><td>1</td><td>2001</td><td>Insufficient fuel</td></tr></table>	No.	Device	Index	Content	22	1	2001	Insufficient fuel
No.	Device	Index	Content							
22	1	2001	Insufficient fuel							

The following lists all the message contents.

No.	Device	Index	Content	No.	Device	Index	Content
1	0	0	Not used	25	2	1	Start
2	1	0	Not used	26	2	2	Operating
3	2	0	Not used	27	2	3	Stop
4	3	0	Not used	28	2	1001	Low water pressure
5	4	0	Not used	29	2	1002	Overheated water
6	5	0	Not used	30	2	2001	Overloaded motor
7	0	1	Start	31	3	1	Start
8	0	2	Operating	32	3	2	Operating
9	0	3	Stop	33	3	3	Stop
10	1	1	Start	34	3	1001	Low water pressure
11	1	2	Operating	35	3	1002	Overheated water
12	1	3	Stop	36	3	2001	Overloaded motor
13	0	1001	Slow RPM	37	4	1	Start
14	0	1002	Fast RPM	38	4	2	Operating
15	0	1003	Low air pressure	39	4	3	Stop
16	0	2001	Insufficient fuel	40	4	1001	Low pressure
17	0	2002	RPM too fast	41	4	1002	Overheated oil
18	0	2003	Exhaust temperature too high	42	4	2001	Overloaded motor
19	1	1001	Slow RPM	43	5	1	Start
20	1	1002	Fast RPM	44	5	2	Operating
21	1	1003	Low air pressure	45	5	3	Stop
22	1	2001	Insufficient fuel	46	5	1001	Low pressure
23	1	2002	RPM too fast	47	5	1002	Overheated oil
24	1	2003	Exhaust temperature too high	48	5	2001	Overloaded motor

Step 2. Create a SOE Display object.

Set [Query address] to LW-100.

SOE Display Object's Properties

General | **SOE Display** | Shape | Font | Profile

Description :

Query address

PLC name :

Address :

Select [Display items] and set [Display order].

SOE Display Object's Properties

General | **SOE Display** | Shape | Font | Profile

Max. event no. :

Color

☐ Transparent

Frame : Background :

Select box :

Format

Sort

☐ Time ascending ☒ Time descending

Order & Characters

Display items	Display chars
<input checked="" type="checkbox"/> Sequence no.	0
<input checked="" type="checkbox"/> Event trigger date	0
<input checked="" type="checkbox"/> Event trigger time	0
<input checked="" type="checkbox"/> Event message	0
<input checked="" type="checkbox"/> Type	0
<input checked="" type="checkbox"/> Device	0
<input checked="" type="checkbox"/> Operator	0

Display order

- Sequence no.
- Event trigger date
- Event trigger time
- Type
- Device
- Operator
- Event message

If "Display chars" is 0, it means that the system will display all of characters.

Date : Time :

Step 3. Set query items.

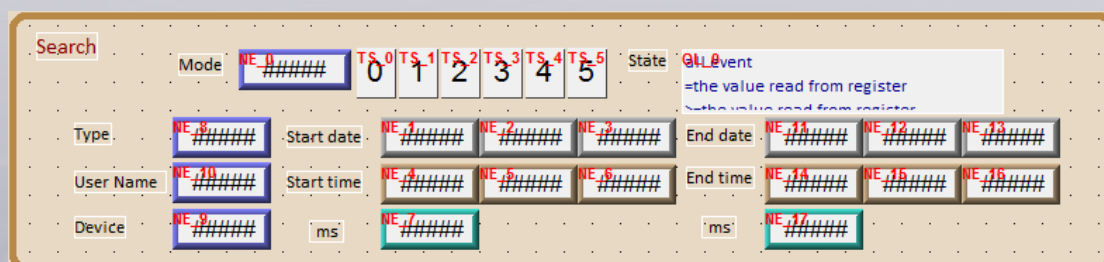
Create several Numeric Input objects and set addresses as the following.

Name	Query Address
Mode	LW-100
Type	LW-109
Device	LW-110
User name	LW-111
Start date	LW-102 to LW-104
Start time	LW-105 to LW-107
Start time ms	LW-108
End date	LW-112 to LW-114
End time	LW-115 to LW-117
End time ms	LW-118

Create an Option List object and set address as the following.

Name	Query Address
State	LW-101

Create several Toggle Switch objects to control Mode, set the address from LW-Bit10000 to LW-Bit10005.



Step 4. Set language selection, user name and password.

Create a Function Key object to switch to window no. 11.

Create an Option List object, use system register LW-9134 to switch among three languages.

Go to [System Parameter Settings] > [Security] and then set user name and password.

Create two Numeric Input objects and use system registers:

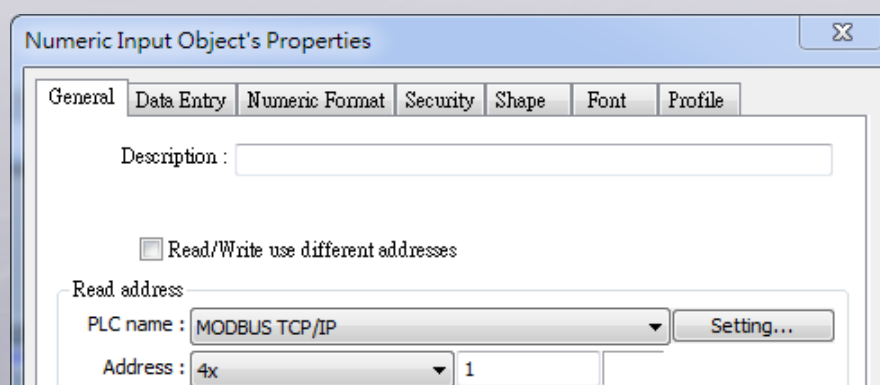
LW-9219: User Name

LW-9220: Password



Step 5. Go to window no. 11, create Numeric Input object to display the read PLC data. This demonstration uses Modbus TCP/IP; therefore the addresses are as follows.

Number of queued records address: 4x-1



Address of first record: 4x-100 to 4x-129

Step 6. The messages are displayed as the following figure.

Time	Description	User	State
14:03:03.768	General Alarm Lube oil pump 2	User 1	Low pressure
14:02:02.512	General Alarm Cooling water pump 2	User 1	Overheated water
14:02:02.512	General Alarm Cooling water pump 2	User 1	Low water pressure
14:01:01.280	Operate Generator2	User 1	Operating
14:03:03.768	General Alarm Lube oil pump 2	Not Login	Low pressure
14:02:02.512	General Alarm Cooling water pump 2	Not Login	Overheated water
14:02:02.512	General Alarm Cooling water pump 2	Not Login	Low water pressure
14:01:01.280	Operate Generator2	Not Login	Operating

Type	Index	YY/MM	DD/HH	MM/SS	ms
1	2	50D	E19	101	1280
103	3	50D	E19	202	512
105	1	50D	E19	303	768

The preceding figure shows the PLC data, when the system receives a SOE data frame, it compares the value and triggers the corresponding message.

The PLC data:

Type	Index	YY/MM	DD/HH	MM/SS	ms
1	2	50D	E19	101	1280
103	3	50D	E19	202	512
105	1	50D	E19	303	768

The first row: 4x-100 to 4x-5

The second row: 4x-106 to 4x-11

The third row: 4x-12 to 4x-17

In the first row, the way to calculate the message index number is:

Device = 1 (low byte), Type = 0 (high byte), Index = 2

When Index is 2, the [Data byte offset from record start] is 2, according to the following equation:

$[Type] \times 1000 + [\text{Bit offset of the event indicator}]$

$= 0 \times 1000 + 2 = 2$

The corresponding device is device 1: Generator 2, and the corresponding message with index number 2 is displayed.

Event messages				
Font : <input type="text"/>				
No.	Device	Index	Content	
11	1	2	Operating	

14:01:01.280 Operate Generator2 User 1 Operating

In the second row, the way to calculate the message index number is:

Device = 3 (low byte), Type = 1 (high byte), Index = 3

When Index is 3, the [Data byte offset from record start] is 1 and 2 according to the following equation:

$[Type] \times 1000 + [\text{Bit offset of the event indicator}]$

$= 1 \times 1000 + 1 = 1001$

And

$$1 \times 1000 + 2 = 1002$$

The corresponding device is device 3: Cooling water pump 2, and the corresponding messages with index number 1001 and 1002 are displayed.

Event messages

Font :

No.	Device	Index	Content
34	3	1001	Low water pressure
35	3	1002	Overheated water

14:02:02.512

General Alarm Cooling water pump 2 User 1

Overheated water

14:02:02.512

General Alarm Cooling water pump 2 User 1

Low water pressure

In the third row, the way to calculate the message index number is:

Device = 5 (low byte), Type = 1 (high byte), Index = 1

When Index is 1, the [Data byte offset from record start] is 1, according to the following equation:

$$[\text{Type}] \times 1000 + [\text{Bit offset of the event indicator}]$$

$$= 1 \times 1000 + 1 = 1001$$

The corresponding device is device 5: Lube oil pump 2, and the corresponding message with index number 1001 is displayed.

Event messages

Font :

No.	Device	Index	Content
46	5	1001	Low pressure

14:03:03.768

General Alarm Lube oil pump 2

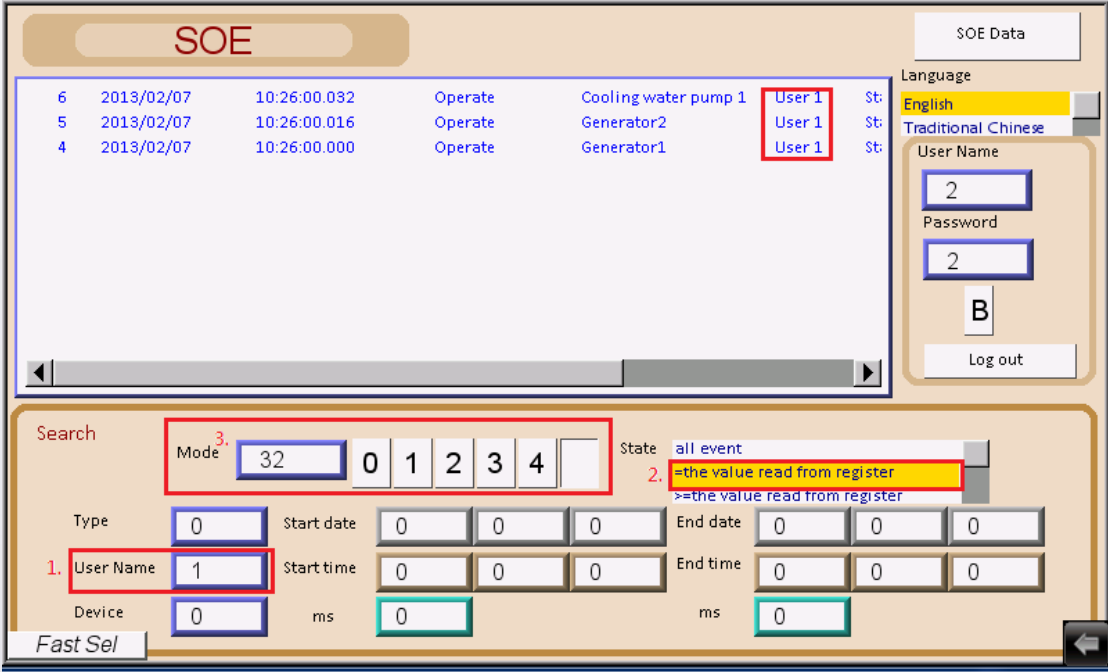
User 1

Low pressure

Step 7. The way to search data is as shown in the following figure.

Enter 1 in [User Name], select [the value read from register] in [State], and select 5 for [Mode] (The displayed value is 32). The content about User 1 is displayed.

For more detail please see EasyBuidler8000 User Manual Chapter 36 Sequence of Events.



The screenshot shows the SOE (Sequence of Events) interface. At the top, there is a title bar with 'SOE' and 'SOE Data'. Below this is a table of events. The table has columns for ID, Date, Time, Action, Device, User, and State. The events listed are:

ID	Date	Time	Action	Device	User	State
6	2013/02/07	10:26:00.032	Operate	Cooling water pump 1	User 1	St:
5	2013/02/07	10:26:00.016	Operate	Generator2	User 1	St:
4	2013/02/07	10:26:00.000	Operate	Generator1	User 1	St:

Below the table is a search section. It includes fields for Mode (32), State (all event), Type (0), User Name (1), Device (0), Start date, Start time, End date, and End time. The search results are displayed in a table below the search fields.

Search filters:

- Mode: 32
- State: all event
- Type: 0
- User Name: 1
- Device: 0
- Start date: 0 0 0
- Start time: 0 0 0
- End date: 0 0 0
- End time: 0 0 0

Search results:

ID	Date	Time	Action	Device	User	State
6	2013/02/07	10:26:00.032	Operate	Cooling water pump 1	User 1	St:
5	2013/02/07	10:26:00.016	Operate	Generator2	User 1	St:
4	2013/02/07	10:26:00.000	Operate	Generator1	User 1	St:

On the right side of the interface, there is a 'Language' dropdown menu with 'English' selected, and a 'User Name' field with '2' entered. Below this is a 'Password' field with '2' entered, a 'Log out' button, and a 'Fast Sel' button.

3. Addresses

The addresses of objects used in this demonstration are listed below.

Object	Address	Object ID	Description
Window 10			
Word	LW-100	SD_0	SOE Display object
Word	LW-100	NE_0	Mode (query address)
Word	LW-102~LW104	NE_1~NE_3	Start Date (query address)
Word	LW-105~LW107	NE_4~NE_6	Start Time (query address)
Word	LW-108	NE_7	Start Time ms (query address)
Word	LW-109	NE_8	Type (query address)
Word	LW-110	NE_9	Device (query address)
Word	LW-111	NE_10	User Name (query address)
Word	LW-112~LW-114	NE_11~NE_13	End Date (query address)
Word	LW-115~LW-117	NE14_~NE_16	End Time (query address)
Word	LW-118	NE_17	End Time ms (query address)
Word	LW-9219	NE_18	User name
Word	LW-9220	NE_19	Password
		FK_0	Switch to window 11
Word	LW-101	OL_0	State (query address)
Word	LW-9134	OL_1	Switch language
Bit	LB-9050	SB_0	Log out
Bit	LW_Bit10000	TS_0	Set Mode (query address)
Bit	LW_Bit10001	TS_1	Set Mode (query address)
Bit	LW_Bit10002	TS_2	Set Mode (query address)

Sequence of Events

Bit	LW_Bit10003	TS_3	Set Mode (query address)
Bit	LW_Bit10004	TS_4	Set Mode (query address)
Bit	LW_Bit10005	TS_5	Set Mode (query address)
Bit	LB-0	TS_6	Security-Class A
Bit	LB-1	TS_7	Security-Class B
Bit	LB-2	TS_8	Security-Class C
Bit	LB-3	TS_9	Security-Class D
Window 11			
		FK_0	Close window 11
Word	4x-1	NE_0	Displays event content
Word	4x-100	NE_1	Displays event content
Word	4x-101	NE_2	Displays event content
Word	4x-102	NE_3	Displays event content
Word	4x-103	NE_4	Displays event content
Word	4x-104	NE_5	Displays event content
Word	4x-105	NE_6	Displays event content
Word	4x-106	NE_7	Displays event content
Word	4x-107	NE_8	Displays event content
Word	4x-108	NE_9	Displays event content
Word	4x-109	NE_10	Displays event content
Word	4x-113	NE_11	Displays event content
Word	4x-114	NE_12	Displays event content
Word	4x-115	NE_13	Displays event content
Word	4x-116	NE_14	Displays event content
Word	4x-119	NE_15	Displays event content
Word	4x-120	NE_16	Displays event content

Sequence of Events



Word	4x-121	NE_17	Displays event content
Word	4x-122	NE_18	Displays event content
Word	4x-125	NE_19	Displays event content
Word	4x-126	NE_20	Displays event content
Word	4x-127	NE_21	Displays event content
Word	4x-128	NE_22	Displays event content
Word	4x-111	NE_23	Displays event content
Word	4x-117	NE_24	Displays event content
Word	4x-123	NE_25	Displays event content
Word	4x-129	NE_26	Displays event content
Word	4x-106	NE_27	Displays event content
Word	4x-112	NE_28	Displays event content
Word	4x-118	NE_29	Displays event content
Word	4x-124	NE_30	Displays event content