General Specifications

GS 33K30D10-50E

Model LPC6900, LPC6910, LPC6920, LPC6930
SEM Sequence of Events Manager (for Vnet/IP and FIO)

CENTUM VP
Vnet/IP

[Release 5]

■ GENERAL

This GS (General Specifications) describes the specifications of the Sequence of Events Manager (SEM). The SEM captures, records and displays in chronological order the sequence of events (SOE) prior to and during a plant trip. The SEM provides a means of recording activities leading to a potential plant upset or trip.

The SEM offers the following benefits:

- High-speed capturing of events with one millisecond time stamp resolution
- SOE inputs available for use as control and or monitoring signals
- Accurate system time synchronization across a Vnet/IP system without additional hardware
- Time synchronization with Simple Network Time Protocol (SNTP) server (Option)
- Trip Report for a specified time period upon occurrence of user defined triggers
- Long-term data storage and automatic trip report generation
- SOE data output to OPC clients (e.g. Exaquantum)
- SOE viewing and reporting at multiple Human Interface Stations (HIS) and/or any other PCs via Ethernet
- SOE viewing and reporting that integrate SOE messages with process alarms and other process related events

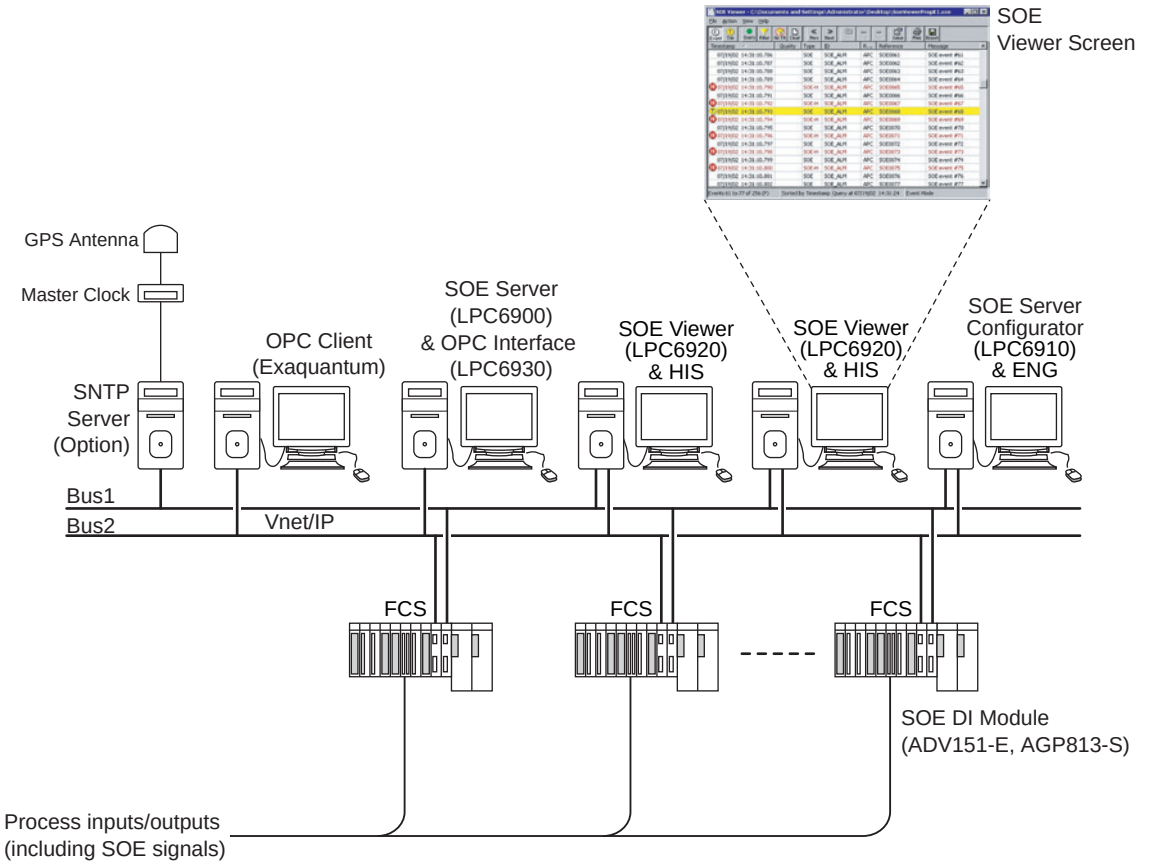

Figure: Example of SEM System Basic Configuration

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GS 33K30D10-50E

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■ SYSTEM COMPONENTS AND SOFTWARE

The SEM is designed to capture the events using SOE digital input modules (ADV151-E) and High Speed protection modules (AGP813-S). These modules apply time stamp and send the SOE data from the Field Control Station to the SOE Server via Vnet/IP. An open communication bus of Vnet/IP is used for SOE data transmission. The SOE data is sent to the SOE Server, stored in the SOE Server and displayed in chronological order on the SOE Viewer screen. As the SEM employs a Server/Client (Viewer) architecture, the SOE data stored in the SOE Server can be easily accessed from multiple HISs and/or any other PCs via Vnet/IP. The SEM consists of the following system components with the appropriate SEM software.

● Field Control Station (Model: AFV□0□)

The following FCS models can provide an interface to transfer time-stamped SOE data from SOE digital input modules to the SOE Server.

- AFV30S Field Control Unit
  (for Vnet/IP and FIO, 19” Rack Mountable Type)
- AFV30D Duplexed Field Control Unit
  (for Vnet/IP and FIO, 19” Rack Mountable Type)
- AFV40S Field Control Unit
  (for Vnet/IP and FIO, with Cabinet)
- AFV40D Duplexed Field Control Unit
  (for Vnet/IP and FIO, with Cabinet)
- AFV10S Field Control Unit
  (for Vnet/IP and FIO, 19” Rack Mountable Type)
- AFV10D Duplexed Field Control Unit
  (for Vnet/IP and FIO, 19” Rack Mountable Type)

For the specifications of these models, see the “Hardware Specifications” of GS 33K50E10-50E, GS 33K50E20-50E, GS 33K50E30-50E.

● SOE Digital Input Module (Model: ADV151-E/AGP813-S)

The ADV151-E has 32 digital input channels with an SOE capturing feature. The AGP813-S has 8 digital input channels with an SOE capturing feature. Each input on state change can be configured individually whether or not to allow a SOE time stamp. All ADV151-E/AGP813-S inputs can be used as control and monitoring signals in the control scheme. The ADV151-E/AGP813-S modules can also be used in pairs to provide redundant inputs where high reliability is required. The ADV151-E has the same basic specification as ADV151. See the corresponding section of GS 33K50F70-50E “Digital I/O Modules (for FIO)” and GS 33K50F10-50E “FIO System Overview (for Vnet/IP).

● SOE Server (Model: LPC6900)

The SOE Server is designed to acquire and store SOE data from multiple FCSs and make available this data to multiple HIS or PCs running SOE Viewer software. The SOE Server is configured in a dedicated server PC connected to an open communication bus (Bus 2) of Vnet/IP. The SOE Server can also be configured in an HIS under the some conditions specified in “■ SPECIFICATIONS OF SOE SERVER”. Microsoft SQL Server is used for database management.

● SOE Viewer (Model: LPC6920)

The SOE Viewer is designed to access and query the SOE Server. It displays the SOE data with filtering as specified by the user. The SOE Viewer generates and prints trip reports, and exports them to CSV (comma-separated value) format files. The SOE data from other data sources, such as messages stored in HISs, can also be displayed on the SOE Viewer. Each SOE point can be viewed with its associated time stamp, alarm class, equipment name, event message along with other configured in formation.

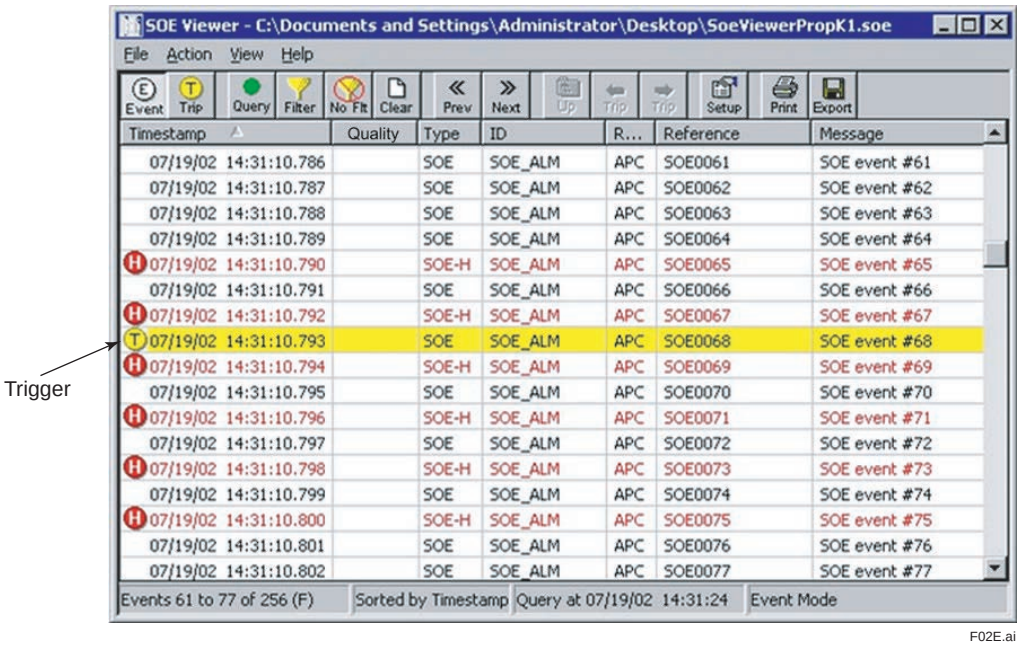

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Figure: SOE Viewer Screen

● SOE Server Configurator (Model: LPC6910)

The SOE Server Configurator is designed to configure the SOE Server. The Configurator is used to define various settings such as the station configuration, SOE input terminals and the trip report configuration.

● SEM OPC Interface (Model: LPC6930)

The SEM provides the OPC interface function which OPC clients such as Exaquantum can access the SOE data stored in the SOE server through Ethernet. The OPC interface works as an OPC Alarm and Events (A&E) server and an OPC Historical Data Access (HDA) server.

● Human Interface Stations (HISs)

Using the SOE Viewer Software an HIS can be used to access the SOE data stored in a SOE Server via Vnet/IP. The status of SOE modules, ADV151-E/AGP813-S can be displayed on the Station Status Display window of the HIS.

● Vnet/IP Network

The CENTUM VP system synchronizes the system time across Vnet/IP using own time synchronization protocol. When the time synchronization with an external master clock is required, the Vnet/IP system allows connection with a Simple Network Time Protocol (SNTP) server. A SNTP server incorporating a Global Positioning System (GPS) receiver or similar is used for more accurate time reference.

■ SYSTEM SPECIFICATIONS

Number of SOE inputs:
Up to 2048 points per SOE Server
Number of SOE Servers:
One server per SEM system
Number of FCSs per SOE Server: Up to 32 (*1)
Number of ADV151-E:
Up to 78 modules per FCS with LFS1550 Node Expansion Package
Up to 110 modules FCS with LFS1750 Node Expansion Package
Number of AGP813-S:
Up to 8 modules (*2) including ALR111/ALR121/ALE111/ALP111/ALP121 (*3)/AGS813/AGP813 per FCS.
Number of Events retained in CP461/CP451 event buffer:
Up to 10,000 events
Number of Events retained in ADV151-E event buffer:
Up to 512 events per two seconds
Number of Events retained in AGP813-S event buffer:
Up to 256 events per two seconds
Time stamp resolution: One millisecond (*4)
Time-stamp delay compensation setting:
Zero to 100 milliseconds
Automatic event deletion:
Selection from among 15 options from no auto-deletion to auto-deletion of the five oldest events occurring within the last 3.5 seconds.
Software filter setting:
4 to 512 milliseconds (can be set increments of two milliseconds).

*1: Up to 16 FCSs per SOE Server for CENTUM VP R5.03.20 or earlier
*2: Up to 16 modules with LFS1550 or LFS1750-V1☐
Up to 32 modules with LFS1750-V2☐
*3: ALP111 and ALP121 cannot be mounted in the same FCS.
*4: The time stamp resolution within the same domain is ±1 ms. However, this applies to events from an I/O module installed within a 4 km distance from the CPU node. The time stamp resolution when using an ESB bus optical repeater module for an extended distance of up to 50 km is ±3 ms.

When the number of SOE inputs or FCSs exceeds the limitations for a single SEM system, multiple SEM systems can be installed, up to eight servers.

The SOE Viewers can access the SOE stored data from multiple SOE Servers via Ethernet and display the SOE data on a single SOE Viewer window.

■ SPECIFICATIONS OF SOE SERVER

SOE Server (*1):
Dedicated server for the installation of SOE Server, SOE Viewer and SOE Server Configurator packages. It is not allowed to install any CENTUM VP software packages other than SOE software packages.

*1: When the conditions for “Installation in an HIS” in the following are met, SOE Server can be resided in HIS.

Event acquisition rate:
Up to 2000 events per second in AFV10☐
Up to 4000 events per second in AFV30☐/AFV40☐

Number of Clients for SOE Viewer and SOE Server Configurator:
Up to the number allowed by the licenses purchased for Microsoft SQL Server 2005/2008/2008 R2/2012, and Microsoft Windows Server 2008 or Microsoft Windows Server 2008 R2

Database capacity:
A disk size of 200 MB is required for retaining 365,000 historical events, assuming 1,000 events per day for one year.
Microsoft SQL Server is used as a database management system. The database capacity is limited by the hard disk capacity except for the following Microsoft SQL Server.
- 4 GB for Microsoft SQL Server 2005 Express Edition and Microsoft SQL Server 2008 Express with Tools.
- 10 GB for Microsoft SQL Server 2008 R2 Express with Management Tools and Microsoft SQL Server 2012 Express With Tools.

● Installation in an HIS

The SOE server packages are allowed to reside an HIS under the following conditions.

Total number of SOE inputs:
Up to 512 points

Event acquisition rate:
Up to 500 events per second

PC Operating system for HIS:
See “Table Compatibilities of SQL Servers and Operating Systems” in “● Software Requirements”.

Database management system:
Microsoft SQL Server 2005 Express Edition, Microsoft SQL Server 2008 Express with Tools or Microsoft SQL Server 2008 R2 Express with Management Tools. Refer to the “Database capacity” as described above.

Other specifications for SEM and HIS:
Same specifications as standard

■ SPECIFICATIONS OF SOE VIEWER

Number of data acquisition sources:
Up to eight data sources or up to eight SOE Servers

Data acquisition source types:
SOE Server, historical messages in HIS, Unified Operator Interface (UOI) messages

Number of events displayed:
Up to 99,999 events

Display items in the SOE Viewer screen:
- Time stamp: Date and time of occurrence of the corresponding event signal
- Quality: Single letter indicating the time synchronization state at the event occurrence
- Type: Importance level of the corresponding event, either “SOE” (ordinary) or “SOE-H” (important)
- ID: Either “SOE_ALM” (occurrence of the alarm state) or “SOE_RTN” (return to normal state)
- Resource: Equipment name (plant hierarchy name) associated with the corresponding SOE event signal
- Reference: Reference number (tag name) of the corresponding SOE event signal
- Message: Message text of the corresponding SOE event signal

■ SPECIFICATIONS OF SOE SERVER CONFIGURATOR

Number of SOE input assignments:
Selection from 128, 512, and 2048 input points

Number of Trip trigger assignments:
Up to 50 triggers

■ NETWORKING SPECIFICATIONS

The SEM uses an open communication network adopting IEEE802.3 standards on the bus 2 of Vnet/IP for SOE Server, SOE Viewers and SOE Server Configurator.

When the Simple Network Time Protocol (SNTP) server is required for the time synchronization with an external master clock, the server can be also connected on the bus 1 of Vnet/IP.

For the networking specifications of SEM, see the “Vnet/IP network specifications” of “Integrated Control System CENTUM VP System Overview (GS 33K01A10-50E)”.

■ OPERATING ENVIRONMENT

● Hardware Requirements

SOE Server

The SOE Server function runs on a PC which meets the following requirements:

PC: A personal computer (IBM PC/AT-compatible) following the basic specifications of HIS.
For details of HIS, see GS 33K05D10-50E.
Hard disk: Refer to the “Database capacity” in the “■ SPECIFICATIONS OF SOE SERVER”
Network: One Ethernet network on the bus2 of Vnet/IP for the SOE Server.
For details of Vnet/IP network specifications, see GS 33K01A10-50E.
Peripherals: DVD drive
Tape drive for data backup (optional)

SOE Viewer and/or SOE Server Configurator

PC: A personal computer (IBM PC/AT-compatible) following the basic specifications of HIS.
For details of HIS, see GS 33K05D10-50E.
Network: One Ethernet network on the bus2 of Vnet/IP for the SOE Server.
For details of Vnet/IP network specifications, see GS 33K01A10-50E.
Peripherals: DVD drive

Other Components

AFV30□: Field Control Unit.
AFV40□: Field Control Unit.
AFV10□: Field Control Unit. Style 2 or later (Style No. is indicated on the component tag)
EC402: ESB Bus Coupler Module.
EC401: ESB Bus Coupler Module. Style 2 or later (Style No. is indicated on the component tag)
VI702/VI701: Vnet/IP Interface Card. For VI701, firmware revision should be R6 or later
(Firmware revision No. is indicated under “F” on the revision sticker on the component)
AVR10D: Duplexed V net Router. Firmware revision of VI451 should be R6 or later
(Firmware revision No. is indicated under “F2” on the revision sticker on the component)

● Software Requirements

SOE Server

Database management system and operating system:

The conditions of the following tables must be met for the SOE server. The 32-bit versions of Microsoft SQL Server shown below are supported. Even in 64-bit operating systems, 32-bit Microsoft SQL Server must be used.

Table Compatibilities of SQL Servers and CENTUM VP

SQL Server / CENTUM VP	Microsoft SQL Server 2005 (*1)			Microsoft SQL Server 2008			Microsoft SQL Server 2008 R2	Microsoft SQL Server 2012
	SP2	SP3	SP4	SP1	SP2	SP3	SP2	SP1
R5.01	X	X	–	X	X	–	–	–
R5.02	X	X	–	X	X	–	–	–
R5.03.00	X	X	X	X	X	X	X	–
R5.03.20	X	X	X	X	X	X	X	X

X: Compatible –: Incompatible

Note: Service Pack is abbreviated as SP (Example: SP1 stands for Service Pack 1).

*1 : When using Microsoft SQL Server 2005 on Windows 7 or Windows Server 2008 R2, Microsoft SQL Server 2005 must be SP3 or later.

Table Compatibilities of SQL Servers and Operating Systems

SQL Server	Operating system	Windows 7 Professional (*1) (*2)	Windows Vista Business Edition (*2)	Windows Server 2008 Standard Edition	Windows Server 2008 Standard Edition R2 (*1)
		64-bit	32-bit	32-bit	64-bit
		SP1	SP2	SP2	SP1
Microsoft SQL Server 2005 (*1)	Enterprise	–	–	X	X
	Standard	X	X	X	X
	Workgroup	X	X	X	X
	Express	X (*3)	X (*3)	X (*3)	X (*3)
Microsoft SQL Server 2008	Enterprise	–	–	X	X
	Standard	X	X	X	X
	Workgroup	X	X	X	X
	Express with Tools	X (*3)	X (*3)	X (*3)	X (*3)
Microsoft SQL Server 2008 R2	Datacenter	–	–	X	X
	Enterprise	–	–	X	X
	Standard	X	X	X	X
	Workgroup	X	X	X	X
	Express with Management Tools	X (*3)	X (*3)	X (*3)	X (*3)
Microsoft SQL Server 2012	Enterprise	–	–	X	X
	Business Intelligence	–	–	X	X
	Standard	X	X	X	X
	Express with Tools	X	X	X	X

X: Compatible –: Incompatible

Note: Service Pack is abbreviated as SP (Example: SP1 stands for Service Pack 1).

*1 : When using Microsoft SQL Server 2005 on Windows 7 or Windows Server 2008 R2, Microsoft SQL Server 2005 must be SP3 or later.

*2 : Can be used Windows 7 or Windows Vista, if the amount of PCs is 10 or less which are equipped with SOE Server Configurator, or SOE Viewer.

*3 : Can be resided with HIS if the total number of SOE samples are limited.

SOE software packages:
LPC6900 SOE Server Package
LPC6910 SOE Server Configurator Package
LPC6920 SOE Viewer Package
LPC6930 SEM OPC Interface Package

For R5.04.00 or later, revision of SOE Server, SOE Server Configurator, and SOE Viewer must be the same.

SOE Server, SOE Server Configurator, SOE Viewer, and SEM OPC Interface can reside in a single PC.
SOE Server, SOE Server Configurator, SOE Viewer, and SEM OPC Interface can reside in a single HIS if the total number of SOE samples is limited.
SEM OPC Interface must be resided in a single PC or an HIS equipped with the SOE Server.
SOE Server Configurator and SOE Viewer can be used in a PC or an HIS equipped with or without the SOE Server.

The number of client licenses to be purchased for Microsoft SQL Server 2005/2008/2008 R2/2012 and Microsoft Windows Server 2008/2008 R2 is determined by counting the number of clients (SOE Viewers and SOE Server Configurator) to be connected to the SOE Server.

SOE Viewer and/or SOE Server Configurator
Operating system: Follow the requirements for the HIS.
SOE software packages:
LPC6910 SOE Server Configurator Package
LPC6920 SOE Viewer Package

HIS
One OPC package is required for receiving the SOE Server system messages on to the HIS.
OPC software package: LHS2411 Exaopc OPC Interface Package

For the general specifications of the HIS, see GS 33K05D10-50E.

■ LIMITATION OF INSTALLATION AND NOTICES

● Limitations of ADV151-E/AGP813-S Installation

The ADV151-E/AGP813-S is not allowed to install in the ER bus node unit. The SOE capture function of ADV151-E/AGP813-S can be used only when it is installed in the ESB bus node unit and optical ESB bus node unit.

See General Specifications GS 33K50F70-50E “Digital I/O Modules (for FIO)” and GS 33K50F10-50E “FIO System Overview (for Vnet/IP)” for other limitations and precautions for installation.

■ MODEL AND SUFFIX CODES

Digital Input Module with SOE Capture

		Description
Model	ADV151	Digital Input Module (32-channel, 24 V DC, Isolated)
Suffix Codes	-E	With SOE capture
	5	Without status display; with no explosion protection
	6	With status display; with no explosion protection
	E	Without status display; with explosion protection
	F	With status display; with explosion protection
	0	Basic type
	3	With ISA Standard G3 option and temperature (-20°C to 70°C) option
Option Codes	/D5A00	With KS Cable Interface Adapter for 32-channel Digital Input [Model: ATD5A-00]
	/B5S00	With Pressure Clamp Terminal Block for Digital Input [Model: ATB5S-00]
	/B5S10	With Pressure Clamp Terminal Block for Digital Input (surge absorber) [Model: ATB5S-10]
	/B5D00	With Dual Pressure Clamp Terminal Block for Digital Input [Model: ATB5D-00]
	/B5D10	With Dual Pressure Clamp Terminal Block for Digital Input (surge absorber) [Model: ATB5D-10]
	/CCC01	With Connector Cover for MIL Cable [Model: ACCC01]

SOE Server Package (for new installation)

		Description
Model	LPC6900	SOE Server Package (for new installation) [Media model: LHSKM50-V11]
Suffix Codes	-V	Software license
	1	For PC
	1	English version
Option Codes	/N0001	Total number of SOE input point is 128 or less (*1)
	/N0005	Total number of SOE input point is 512 or less (*2)
	/N0099	Total number of SOE input point is 2048 or less (*3)

Note: Refer to ●Software Requirements/SOE Server about the Microsoft SQL Servers and Windows Operating Systems which can be used for this package.
Note: The number of client licenses for Microsoft Windows 2008 Server or Microsoft Windows Server 2008 R2 and Microsoft SQL Server 2005/2008/2008 R2/2012 is determined by counting the number of clients (SOE Viewers and SOE Server Configurator) to be connected to the SOE Server.
*1: 100 points or less for CENTUM VP R5.01.20 or earlier.
*2: 500 points or less for CENTUM VP R5.01.20 or earlier.
*3: 2000 points or less for CENTUM VP R5.01.20 or earlier.

SOE Server Package (for addition)

		Description
Model	LPC6900	SOE Server Package (for addition) [Media model: LHSKM50-V11]
Suffix Codes	-E	Software license for SOE input points addition
	3	To add the number of SOE input points (for PC)
	1	English version
Option Codes	/N0105	From (128 SOE inputs or less) to (512 SOE inputs or less) (*1)
	/N0199	From (128 SOE inputs or less) to (2048 SOE inputs or less) (*2)
	/N0599	From (512 SOE inputs or less) to (2048 SOE inputs or less) (*3)

*1: From 100 or less to 500 or less for CENTUM VP R5.01.20 or earlier.
*2: From 100 or less to 2000 or less for CENTUM VP R5.01.20 or earlier.
*3: From 500 or less to 2000 or less for CENTUM VP R5.01.20 or earlier.

SOE Server Configurator Package

		Description
Model	LPC6910	SOE Server Configurator Package [Media model: LHSKM50-V11]
Suffix Codes	-V	Software license
	1	For PC
	1	English version

Note: This package is able to run in the HIS, SOE Server, Builder PC or PC.

SOE Viewer Package

		Description
Model	LPC6920	SOE Viewer Package [Media model: LHSKM50-V11]
Suffix Codes	-V	Software license
	1	For PC
	1	English version

Note: This package is able to run in the HIS, SOE Server or PC.
Note: If you display SCS events on the CENTUM VP SOE Viewer, ProSafe-RS R1.01.30 or later does not require ordering the software license for the ProSafe-RS SOE Viewer (CHS2100).
For specifications of the ProSafe-RS SOE Viewer, refer to the GS for ProSafe-RS (GS 32Q02D10-31E)

SEM OPC Interface Package

		Description
Model	LPC6930	SEM OPC Interface Package [Media model: LHSKM50-V11]
Suffix Codes	-V	Software license
	1	For PC
	1	English version

Note: This package must be resided in a single PC or an HIS equipped with the SOE Server.

■ ORDERING INFORMATION

Specify the model and suffix codes when ordering.

■ TRADEMARKS

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