General Specifications

### FAST/TOOLS, ProSafe-RS Integration for Upstream

GS 50A01A11-01EN

■ GENERAL

The development of oil and gas resources is growing at a fast pace due to rising worldwide demand for energy. Consequently, modern oil and gas fields are attracted to the deployment of new digital technologies in upstream well and pipeline processes in oil and gas exploration and production in order to achieve higher levels of efficiency and safety. Upstream well and pipeline processes at oil and gas fields have the following characteristics:

• Wide geographical distribution of control points
• Small number of I/O points (several ten points) at each control point
• Unstaffed control points
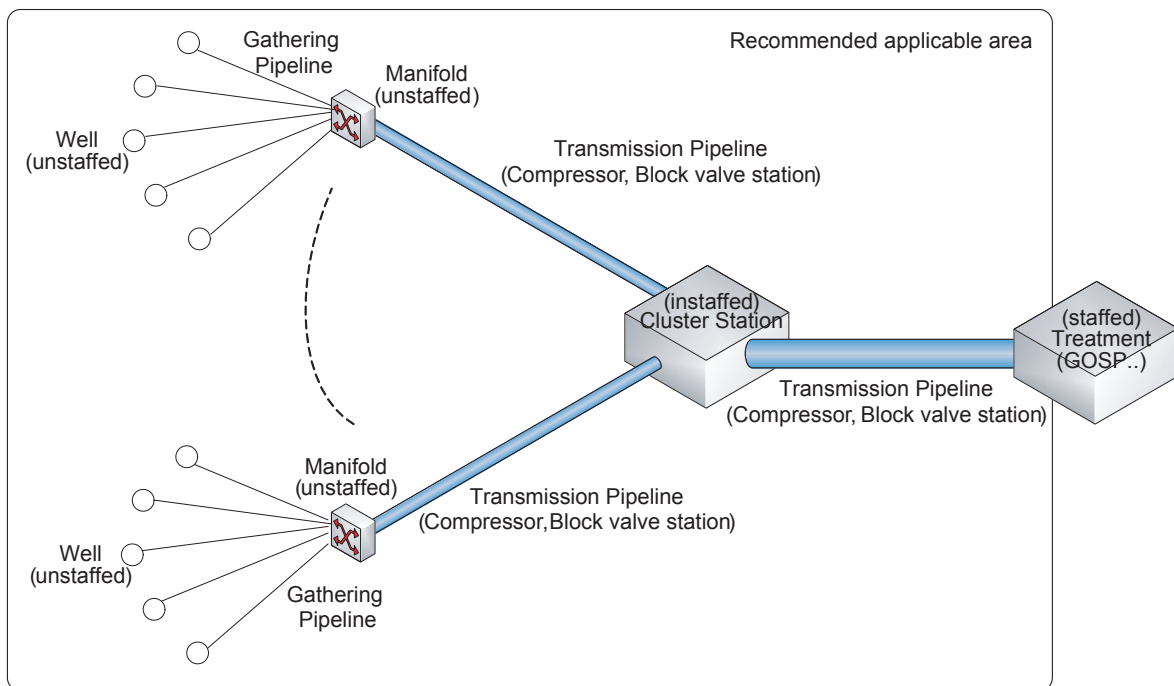
F01E.ai

Figure Features of upstream processes

As a solution to address the needs of modern oil and gas fields, YOKOGAWA provides a new integration system for integrating the SCADA system, network controller, safety instrumented system and asset management system to support digital integration of upstream applications.

■ INTEGRATED SYSTEM CONFIGURATION

This system consists of the following products:

• SCADA   : FAST/TOOLS R9.02 or later version
• Safety instrumented system   : ProSafe-RS R2.02 or later version
• Control system   : STARDOM FCN/FCJ R2.02 or later version
• Asset management system   : PRM (Plant Resource Manager) R3.03 or later version
• Network   : 100 Mbps Vnet/IP

FAST/TOOLS: YOKOGAWA SCADA System
PRM: YOKOGAWA Asset Management System
SNTP Server:
    Simple Network Time Protocol Server
FCN/FCJ: STARDOM Controller
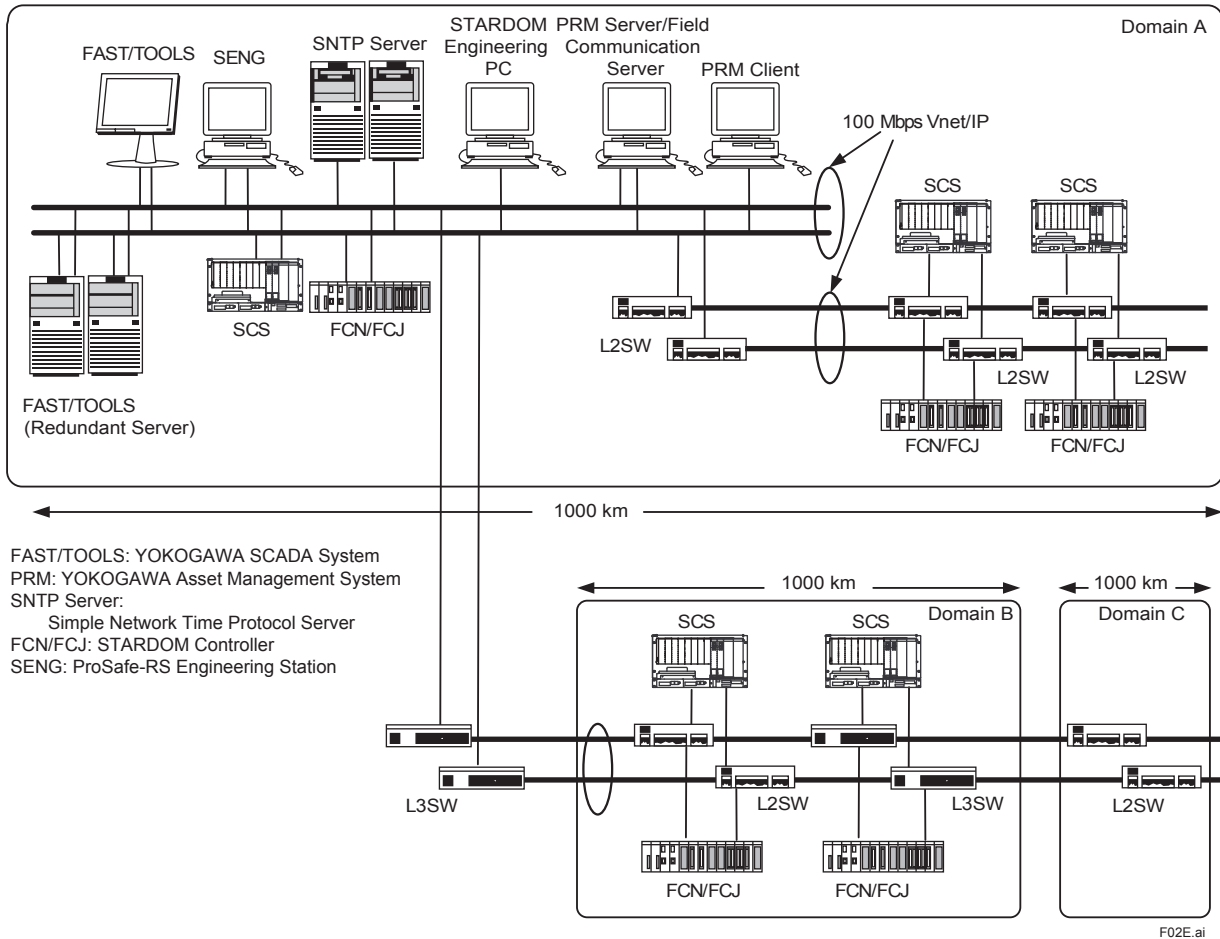SENG: ProSafe-RS Engineering Station

Figure FAST/TOOLS Integrated system configuration

With this integration, FAST/TOOLS is directly connected to ProSafe-RS, as well as STARDOM and PRM on the 100 Mbps Vnet/IP. Direct access from FAST/TOOLS to ProSafe-RS without going through an OPC server or serial communication such as Modbus merits of improved performance and lower engineering cost.

Moreover, as the Vnet/IP supports 100 Mbps Ethernet, unlike 1Gbps Vnet/IP, low cost network devices can be used. The maximum distance between nodes within the same domain is also longer at 1,000 km for 100 Mbps Vnet/IP, making it ideal for widely distributed systems such as oil/gas well and pipeline applications.

Beware, however, that CENTUM VP/CS3000 cannot be connected to 100 Mbps Vnet/IP.

■ COMPONENT PRODUCTS

● FAST/TOOLS

FAST/TOOLS is a SCADA system used for centralized supervision and operation of ProSafe-RS and STARDOM.

Using FAST/TOOLS R9.02 or later versions, direct access from FAST/TOOLS to ProSafe-RS and STARDOM FCN/FCJ via 100 Mbps Vnet/IP can be achieved by inserting a Vnet/IP communication card (VI702) on the server running FAST/TOOLS. For details on the functions of FAST/TOOLS, read GS "FAST/TOOLS" (GS 50A01A10-01E).

● ProSafe-RS

ProSafe-RS is a safety instrumented system which is adapted SIL3 for controlling safety operation in widely-distributed applications such as oil/gas well and pipeline applications. FAST/TOOLS and ProSafe-RS can be integrated by running the "FAST/TOOLS integration engineering package" (CHS5700) on a safety engineering PC (SENG). The inter-ProSafe-RS communication and remote maintenance from the SENG PC is also enabled by using 100Mbps Vnet/IP as well as Vnet/IP.

For details on the functions of CHS5700, read GS "Model CHS5700 FAST/TOOLS Integration Engineering Package" (GS 32R04D20-21E).

For details on the functions of ProSafe-RS, read GS "ProSafe-RS Safety Instrumented System Overview" (GS 32R01B10-21E).

● STARDOM FCN/FCJ

STARDOM FCN/FCJ is a network controller, which enables remote monitoring and control of pressures, flow rates and valves at unstaffed oil/gas wells and pipelines via a network. It communicates with FAST/TOOLS using the Open Channel (to be described later) of 100 Mps Vnet/IP. It can also communicate with a (manned) engineering station via 100 Mbps Vnet/IP to enable remote maintenance of a STARDOM FCN/FCJ system installed at unstaffed wells and pipelines.

For details on the functions of STARDOM FCN/FCJ, see GS "FCN/FCJ Autonomous Controller Functions" (GS 34P02Q01-01E).

● PRM (Plant Resource Manager)

The PRM (Plant Resource Manager) collects the status data from field devices connected to ProSafe-RS and STARDOM for remote monitoring purposes through 100 Mbps Vnet/IP.

Its diagnostic functions also allow preventive diagnosis.

For details on the functions of PRM, see GS "Models SSS7700, SSS7710, SSS7711, SSS7720, SSS7750 Plant Resource Manager" (GS 33Y05Q10-32E).

● 100Mbps Vnet/IP

The 100Mbps Vnet/IP network supports from 100 Mbps to 1Gbps data transmission using Ethernet at the physical layer.

This network is configured for redundancy with two buses named Bus1 and Bus2 so that even if one of the networks is down, communication can continue with the other network. It allows for redundant configuration of FAST/TOOLS, ProSafe-RS and STARDOM. Each Bus1 or Bus2 has an Open Channel and a Control Channel. The Open Channel supports normal Ethernet communication between FAST/TOOLS, STARDOM, PRM and other Ethernet devices. The Control Channel supports Vnet communication between FAST/TOOLS, ProSafe-RS and PRM.

● VI702 Card

The VI702 card is required for making FAST/TOOLS, SENG, PRM and other applications running on PCs available for access via 100 Mbps Vnet/IP. This card comes with two ports (connectors) for Bus 1 and Bus 2 so that only one card is required for redundant connection.

For details on the VI702 card, see GS "Model VI702 Vnet/IP Interface Card" (GS 33K50C10-50E).

■ FUNCTIONS SPECIFICATION OF FAST/TOOLS

● Integration of FAST/TOOLS and ProSafe-RS

FAST/TOOLS R9.02 or later version provides additional functions for communication with ProSafe-RS, which allow ProSafe-RS variable data and function block data to be read and assigned to internal data (items) of FAST/TOOLS. It also allows station status information, node status information, as well as other network status information to be read for monitoring purposes.

To use this function, a Model VI702 Vnet/IP Interface Card must be installed on the server running FAST/TOOLS.

● Engineering tool

The engineering tool ("FTExchange") is available for importing variables and function blocks created using ProSafe-RS engineering tool into FAST/TOOLS, automatically generating items in FAST/TOOLS and, in addition, automatically generating faceplates.

For enquiries or purchases, contact your nearest Yokogawa sales office

● Accessible ProSafe-RS items

The following ProSafe-RS items are accessible in FAST/TOOLS R9.02 and later versions.

These items can be polled periodically from FAST/TOOLS at user-defined intervals.

Data can also be written to ECW_B, ECW_I or ECW_R function block from FAST/TOOLS.

Type of Variable and Function Block	Defined Application Logics		Mapping Blocks/Elements		Access by FAST/TOOLS
	Class	Type	Class	Blocks/Element symbol	
BOOL	Internal variable	BOOL	Mapping element	%WB	R
Integer(32-bit)	Internal variable	DINT	Mapping element	%WB	
Integer(32-bit)	Internal variable	REAL	Mapping element	%WB	
Discrete I/O	I/O structure	IO_BOOL	Mapping element	%Z	R
Analog I/O	I/O structure	IO_REAL	Mapping element	%WB	
DATA Set (BOOL)	Function block	ECW_B	Mapping element	%WB	R/W
DATA Set (Integer)	Function block	ECW_I	Mapping element	%WB	R/W
DATA Set (Real)	Function block	ECW_R	Mapping element	%WB	R/W
Analog Input indicator	Function block	ANLGI	Mapping block	S_ANLGI	EG
Analog Input with Data Status	Function block	ANLG_S	Mapping block	S_ANLG_S	R
Velocity Alarm	Function block	VEL	Mapping block	S_VEL	EG
Annunciator	Function block	ANN	Mapping block	%AN	R
Override (BOOL)	Function block	OVR_B	Mapping block	S_OVR_B	NA
Override (Integer)	Function block	OVR_I	Mapping block	S_OVR_I	
Override (Real)	Function block	OVR_R	Mapping block	S_OVR_R	
Override (I/O)	Function block	OVR_IB	Mapping block	S_OVR_IB	
Override (Analog)	Function block	OVR_IR	Mapping block	S_OVR_IR	
Grouping Override (BOOL)	Function block	GOV_B	Mapping block	S_GOV_B	
Grouping Override (I/O)	Function block	GOV_IB	Mapping block	S_GOV_IB	
Password	Function block	PASSWD	Mapping block	S_PASSWD	NA
Subsystem Communication Input (BOOL)	Function block	SCI_B	Mapping element	%WB	R
Subsystem Communication Input (Integer) *2	Function block	SCI_I	Mapping element	%WB	EG
Subsystem Communication Input (Real)	Function block	SCI_R	Mapping element	%WB	R
Subsystem Communication Output (BOOL)	Function block	SCO_B	Mapping element	%WB	
Subsystem Communication Output (Integer)*2	Function block	SCO_I	Mapping element	%WB	EG
Subsystem Communication Output (Real)	Function block	SCO_R	Mapping element	%WB	R
BOOL-Type Data Manual Operation with Three-Position Answerback	Function block	MOB_21	Mapping block	S_MOB_21	NA
BOOL-Type Data Manual Operation with Two-Position Answerback	Function block	MOB_11	Mapping block	S_MOB_11	
Auto-Reset BOOL-Type Data Manual Operation	Function block	MOB_RS	Mapping block	S_MOB_RS	
Analog-Type Data Manual Operation	Function block	MOA	Mapping block	S_MOA	
Common Switches *1	—	—	System SW	%SW	R

R: Can be read by FAST/TOOLS
W: Can be written by FAST/TOOLS
EG: The tag name cannot be imported into FAST/TOOLS but can be made accessible by FAST/TOOLS with some engineering work in FAST/TOOLS
NA: Not accessible by FAST/TOOLS

*1   The TAG name of common switches cannot be defined. Only system switch (%SW) is accessible by FAST/TOOLS.
*2   Only "SCI_I" and "SCO_O" can be read by FAST/TOOLS. The mapping element cannot be read correctly from FAST/TOOLS because FAST/TOOLS cannot distinguish between I16, U16, and I32 data types.

● **Detection of process alarms**

FAST/TOOLS detects process alarms by reading status flags of ProSafe-RS function blocks and generates alarm messages in FAST/TOOLS. Separate engineering in FAST/TOOLS is required, however, for displaying generated alarm messages. The table below lists the ProSafe-RS function blocks (FB) and status flags read for generation of alarm messages.

Function Block	Status flag	Description
ANLG/ANLG_S	NORMAL	Normal
	IOP	I/O open (abnormal analog input)
	HTRP	High trip occurrence flag
	LTRP	Low trip occurrence flag
	HHH	High pre-alarm occurrence flag
	LLL	Low pre-alarm occurrence flag
VEL	NORMAL	Normal
	VELOCTY+	Rate of change + alarm occurrence flag
	VELOCTY-	Rate of change - alarm occurrence flag

● **Detection of annunciator status**

FAST/TOOLS can generate annunciator messages in FAST/TOOLS by reading status flags of AN-type tag data. Separate engineering in FAST/TOOLS is required, however, for displaying generated annunciator messages. The table below lists the function blocks (FB) and status flags read for generation of annunciator messages.

Function Block	Status flag	Value	Description
ANN	AN PV state	BOOLEAN 0	Normal
		BOOLEAN 1	Alarm occurrence

● **Detection of simple variable and I/O variable data status**

FAST/TOOLS can generate data exception messages by reading status flags of simple variables (of BOOL, DINT and REAL types) and I/O variables (of IO_BOOL and IO_REAL types) defined in ProSafe-RS. Separate FAST/TOOLS engineering is required, however, for displaying data exception messages.

| Status flag	Value	Description
Simple type status	BOOLEAN 0	Normal
	BOOLEAN 1	Alarm occurrence

● **Alarm Acknowledgement**

Acknowledgement cannot be written to ProSafe-RS from FAST/TOOLS. FAST/TOOLS manages ACK/DEL of detected alarms internally.

■ CONFIGURATION FOR FAST/TOOLS
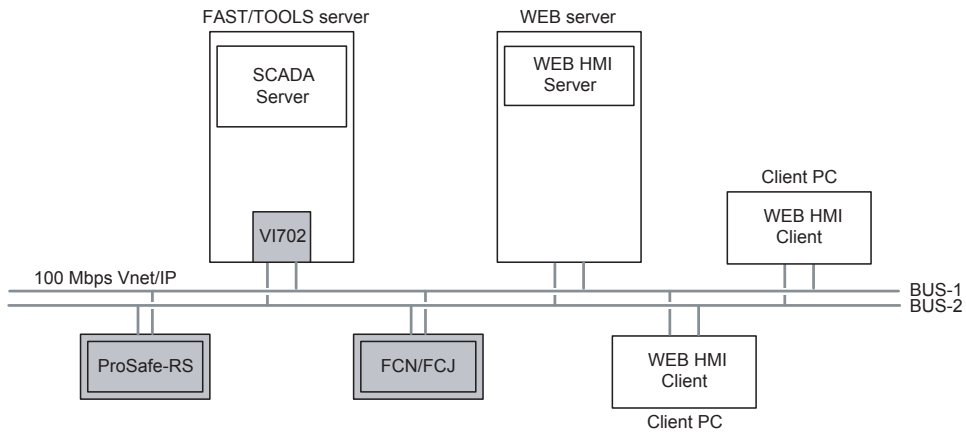
● Standalone Server and Remote Clients

In this configuration, the FAST/TOOLS SCADA Server, Web HMI Server are installed on the same server and accessed from remote Web HMI Client.
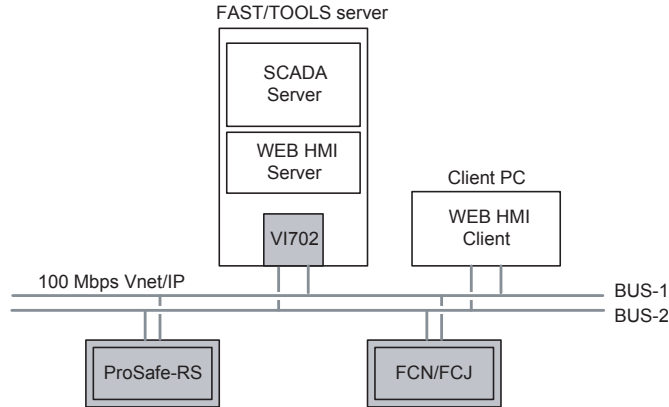
F03E.ai

● Remote Web HMI Server and Clients

In this configuration, the SCADA Server and Web HMI Server are installed on separate servers and accessed from remote clients.
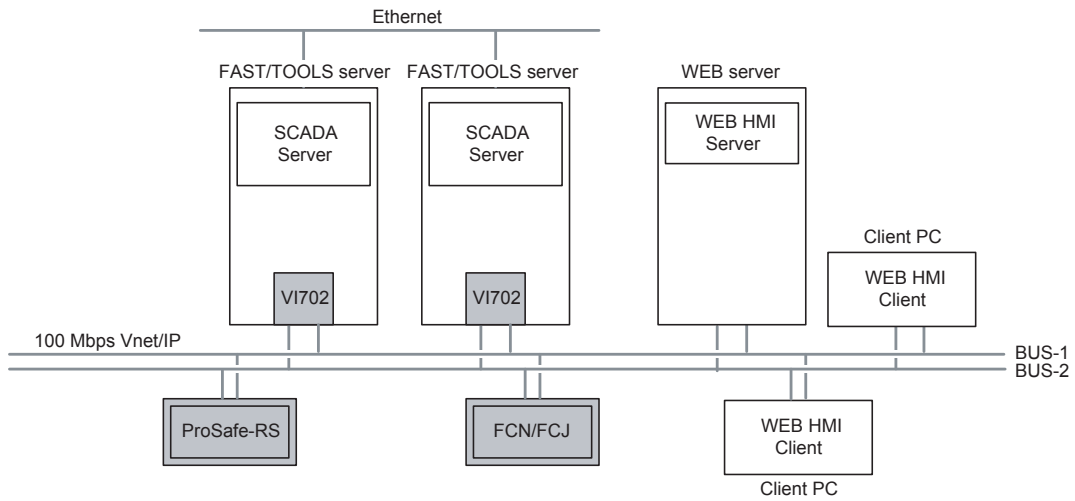
F04E.ai

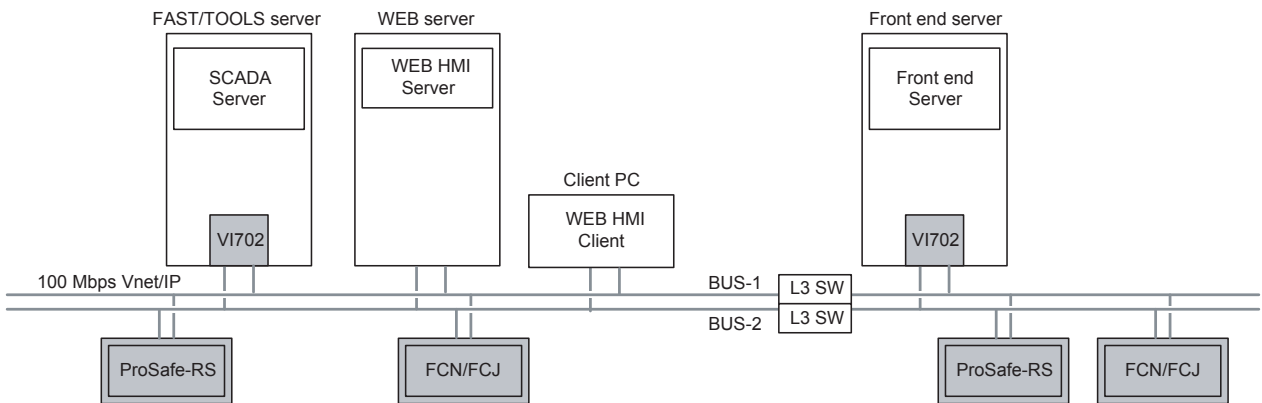● **Redundant SCADA Servers with Remote Web HMI Server and Clients**

In this configuration, the SCADA Servers are configured for redundant.

For synchronization of data between each SCADA Servers, a dedicated Ethernet LAN should be used.

F05E.ai

● **Distributed Servers**

The example configuration below shows the use of front-end servers.

F06E.ai

■ SYSTEM REQUIREMENTS FOR FAST/TOOLS

For system requirement on PC equipment for FAST/TOOLS, please refer the General Specification of FAST/TOOLS (GS 50A01A10-01EN).

■ MODEL AND SUFFIX CODES

● FAST/TOOLS

The specifications and model code of FAST/TOOLS are the same as Standard FAST/TOOLS. Please refer to GS 50A01A10-01EN.

● EQUIPMENT/FAST for ProSafe-RS

To communicate with ProSafe-RS through 100Mbps Vnet/IP, the communication driver (equipment fast for ProSafe-RS) should be required.

		Description
Model	EQP-S11-XCS	Vnet/IP driver

● Vnet/IP interface card for PC

		Description
Model	VI702	Vnet/IP interface card

■ ORDERING INFORMATION

Specify the required model and suffix codes when placing an order for FAST/TOOLS.

How to specify ordering information is the same as for Standard FAST/TOOLS. For details, refer to GS 50A01A10-01EN.

■ PRECAUTION

AS FAST/TOOLS is used on 100 Mbps Vnet/IP, a "VI702" card, which can be purchased separately, is required.
 Beware that the "VI702" card cannot be used with a Stratus fault tolerant server.

■ TRADEMARK ACKNOWLEDGEMENT

The names of corporations, organizations, products and logos herein are either registered trademarks or trademarks of Yokogawa Electric Corporation and their respective holders.