OMRON

Machine Automation Controller

NJ-series SECS/GEM CPU Units

User's Manual

NJ501-1340





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Introduction

Thank you for purchasing an NJ-series CPU Unit.

This manual contains information that is necessary to use the NJ-series CPU Unit. Please read this manual and make sure you understand the functionality and performance of the NJ-series CPU Unit before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- · Personnel in charge of installing and maintaining FA systems.
- · Personnel in charge of managing FA systems and facilities.

This manual is intended also for personnel with the following knowledge.

- For programming, the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B 3503
- The contents of the SEMI E5, SEMI E30, and SEMI E37 documents

Applicable Products

This manual covers the following products.

- · NJ-series SECS/GEM CPU Unit
 - NJ501-1340
- · Sysmac Studio Automation Software
 - SYSMAC-SE2□□□ version 1.10 or higher
- · GEM Setting Tools, SECS/GEM Configurator
 - WS02-GCTL1

Part of the specifications and restrictions for the CPU Units are given in other manuals. Refer to *Relevant Manuals* on page 2 and *Related Manuals* on page 22.

Relevant Manuals

The following table provides the relevant manuals for the NJ-series CPU Units. Read all of the manuals that are relevant to your system configuration and application before you use the NJ-series CPU Unit.

Most operations are performed from the Sysmac Studio Automation Software. Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for information on the Sysmac Studio.

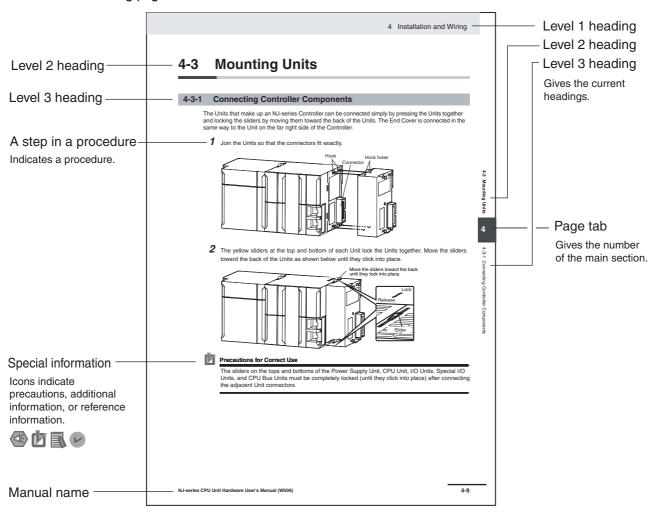
		Manual Basic information																						
			_		1		Z	S	<u> </u>	Re	င္ပ	z	Us	B 5	Ро	Ви	ž	S	ဂ္ဂ	ž	Us	유	ž	sh N
Purpose of use	Manual Seria	NJ-series CPU Unit	Manual	NJ/NX-series CPU Unit Software User's	Reference Manual	Instructions	NJ/NX-series	Manual	NJ/NX-series CPU Unit Motion Control User's	Reference Manual	Control Instructions	NJ/NX-series Motion	User's Manual	NJ/NX-series CPU Unit Built-in EtherCAT Port	Port User's Manual	Built-in EtherNet/IP	NJ/NX-series CPU Unit	User's Manual	Connection CPU Unit	NJ-series Database	User's Manual	CPU Unit	NJ-series SECS/GEM	NJ/NX-series Trouble- shooting Manual
Introduction to NJ-series Controllers		•																						
Setting devices and hardware																								
Using motion control								(•															
Using EtherCAT														•										
Using EtherNet/IP																•								
Using the database connection service																			•					
Using GEM Services																				П		•		
Software settings																								
Using motion control								(•											П				
Using EtherCAT				•										•						П				
Using EtherNet/IP																•								
Using the database connection service																			•					
Using GEM Services																						•		
Writing the user program																								
Using motion control								(•		•													
Using EtherCAT							ſ							•										
Using EtherNet/IP				•		•	ſ									•								
Using the database connection service							ſ												•					
Using GEM Services							ſ															•		
Programming error processing							ſ																	•
Testing operation and debugging				•																				
Using motion control								(•															
Using EtherCAT														•						П				
Using EtherNet/IP												Ī				•								
Using the database connection service												Ī							•					
Using GEM Services												[•		
Learning about error management and corrections*1	4			A				4	A					A		•			A			A		•
Maintenance					1					1		1						_		\dashv			7	
Using motion control		_			T			(•			1								\dashv			\dashv	
Using EtherCAT	- •	•			T							1		•						\dashv			\dashv	
Using EtherNet/IP	\dashv				1							1				•				\dashv			_	

^{*1.} Refer to the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503) for the error management concepts and an overview of the error items. Refer to the manuals that are indicated with triangles for details on errors for the corresponding Units.

Manual Structure

Page Structure

The following page structure is used in this manual.



This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautio

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.



Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.



Version Information

Information on differences in specifications and functionality for CPU Units with different unit versions and for different versions of the Sysmac Studio is given.

Note References are provided to more detailed or related information.

Precaution on Terminology

In this manual, "download" refers to transferring data from the Sysmac Studio to the physical Controller and "upload" refers to transferring data from the physical Controller to the Sysmac Studio.

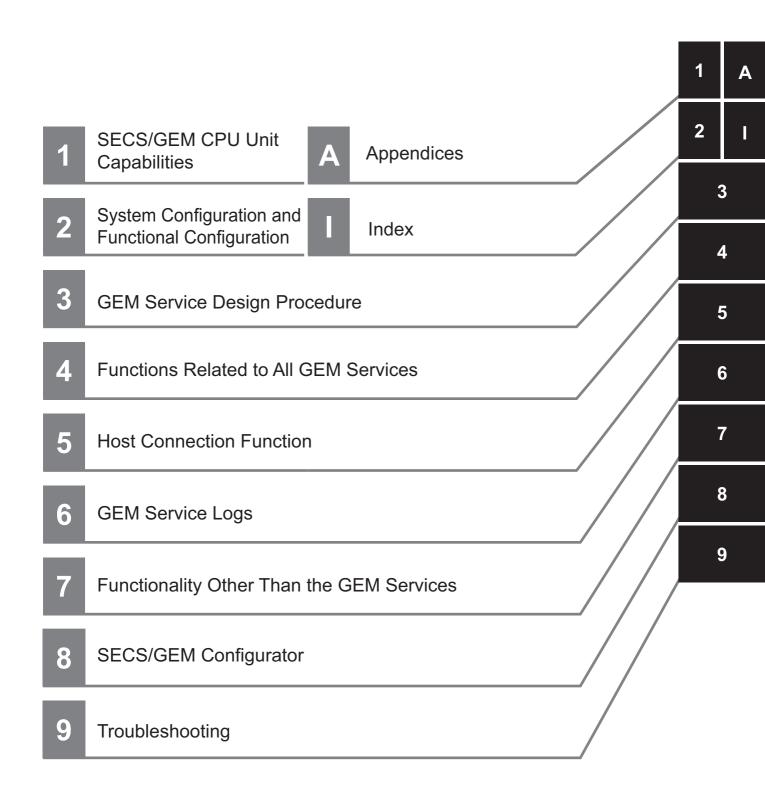
For the Sysmac Studio, synchronization is used to both upload and download data. Here, "synchronize" means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.

The streams and functions that are defined in SEMI E5-0707 (SEMI Equipment Communications Standard 2 Message Content (SECS-II)) are given as follows:

Function_name (Sstream_number, Ffunction number)

Example: Abort Transaction (S1,F0)

Sections in this Manual



CONTENTS

Int	roduction	
	Intended Audience	
	Applicable Products	I
Re	levant Manuals	2
Ма	nual Structure	3
	Special Information	4
Se	ctions in this Manual	5
Ter	rms and Conditions Agreement	12
	Warranty, Limitations of Liability	
	Application Considerations	
	Disclaimers	13
Sat	fety Precautions	14
Pre	ecautions for Safe Use	15
Pre	ecautions for Correct Use	16
Do.	gulations and Standards	10
Ke	Conformance to EC Directives	
	Conformance to EC Birectives	
	Conformance to Shipbuilding Standards	
	Software Licenses and Copyrights	19
Vei	rsions	20
	Types of Versions	
	Checking Versions	20
	Unit Versions of CPU Units and Sysmac Studio Versions	21
Re	lated Manuals	22
Tor	minology	24
Re	vision History	26
Section 1	SECS/GEM CPU Unit Capabilities	
1-1		_
1-2		
	1-2-1 SEMI Standard Compliance	
	1-2-3 Supported SECS Messages	
		
Section 2	System Configuration and Functional Conf	iguration
2-1	System Configuration	2-2
2-2	Functional Configuration of SECS/GEM CPU Unit	2-5
2-3	Overview of GEM Service Operation	
	2 0 . O200 mossages vinem most ochas the military wessage	2-1

	2-3-2 SECS Messages When Equipment Sends the Primary Message	
Section 3	GEM Service Design Procedure	
3-1	Overview of GEM Service Design Procedure	3-2
3-2	Using the SECS/GEM Configurator to Create the GEM Setting Data	3-4
3-3	Using the Sysmac Studio to Create the SECS/GEM Operation Programming	
	3-3-1 Starting the Sysmac Studio and Creating a Project	
	3-3-2 FTP Settings	
	3-3-4 Restrictions When Defining Link Variables for User-defined Variables	
3-4	Debugging	3-9
Section 4	Functions Related to All GEM Services	
4-1	Starting the GEM Services	
	4-1-1 Procedure to Change the GEM Service Status to Run	
4.0	4-1-2 Conditions That Prevent the GEM Service Status from Entering Run	
4-2	Ending the GEM Services	
	4-2-2 Operation When Shutdown Processing Is Completed	
4-3	GEM Service Status	4-4
	4-3-1 GEM Service Status	
	4-3-2 Changes in the GEM Service Status	
	4-3-4 Relation between GEM Service Status and GEM Instructions	
Section 5	Host Connection Function	
5-1	Basic Processing of the Host Connection Function	5-3
	5-1-1 Starting and Pausing the Host Connection Function	5-3
	5-1-2 Interlocks	
	5-1-4 Checking the Number of Buffered SECS Messages	
5-2	HSMS Communications	5-14
	5-2-1 Setting HSMS Conditions	
	5-2-2 HSMS Communications Connection States	
5-3	Item Definitions	
5-4	Variable Data Definitions	
0.4	5-4-1 Types of Variable Data	
	5-4-2 Link Variables for Variable Data	
	5-4-3 List Specifications for Variable Data	
5-5	GEM Capabilities	5-26
	5-5-1 Communications State Model	
	5-5-2 Control State Model	
	5-5-4 Event Notification	
	5-5-5 Error Messages	
	5-5-6 Documentation	
	5-5-8 Variable Data Collection	5-48
	5-5-9 Trace Data Collection	5-49

	5-5-10 Status Data Collection	
	5-5-11 Alarm Management	
	5-5-12 Host Commands	
	5-5-14 Equipment Constants	
	5-5-15 Process Program Management	
	5-5-16 Material Movement	5-87
	5-5-17 Equipment Terminal Service	
	5-5-18 Clock	
	5-5-19 Limit Monitoring	
	5-5-20 Spooling	
5-6	Message Settings	
	5-6-1 GEM Standard Messages	
Section 6	GEM Service Logs	
	CEM Service Leve	
6-1	GEM Service Logs	
	6-1-2 Saving Destinations for GEM Service Logs	
	6-1-3 Restrictions on GEM Service Logs	
6-2	Application Procedures for the GEM Service Logs	
	6-2-2 Displaying the Contents of the GEM Service Logs	
6-3	Log Viewer Operations	
	6-3-1 Installation of GEM Setting Tools	
	6-3-3 Configuration of the Main Window	
	6-3-4 Procedure to Display a GEM Service Log	
	6-3-5 Displaying the SECS Message Log	
	6-3-6 Displaying the HSMS Communications Log	
	6-3-7 Displaying the Execution Log	
	6-3-8 Filters	
	6-3-9 Saving the Current Settings	
	6-3-10 Outputting Logs to Files	
	6-3-12 Help	
	0 0 12 1101p	0 22
Section 7	Functionality Other Than the GEM Services	
7-1	SD Memory Cards	7-2
• •	7-1-1 Directory Structure of the SD Memory Card	
	7-1-2 Restrictions When No SD Memory Card Is Inserted	7-2
	7-1-3 Operation When Data Cannot Be Saved in the SD Memory Card	
	7-1-4 Operation When the SD Memory Card Is Replaced	7-3
7-2	Backup Functions	7-5
	7-2-1 Data That Is Backed Up	
	7-2-2 Data That Is Not Backed Up	
	7-2-3 Backup Functions for GEM Setting Data	
	7-2-4 Compatibility between CPU Unit Models	
	7-2-5 Compatibility between Versions of CPU Units	
Section 8	SECS/GEM Configurator	
8-1	Installing and Uninstalling the GEM Setting Tools	8-3
	8-1-1 Installation Precautions	8-3
	8-1-2 Applicable Operating Systems for the GEM Setting Tools	8-3

	8-1-3 8-1-4 8-1-5	Installed Application Software	8-4
8-2	Startin 8-2-1 8-2-2	ag and Exiting the SECS/GEM Configurator	8-8
8-3		Juration of the SECS/GEM Configurator Window Configuration Menu Structure Operating Buttons	8-10 8-10
8-4	Menu 8-4-1 8-4-2 8-4-3 8-4-4 8-4-5 8-4-6 8-4-7	Bar Functions File Build Controller Tool Documentation Window Help	8-15 8-19 8-21 8-26 8-30
8-5	Toolba	ar Configuration	8-36
8-6	Basic 8-6-1 8-6-2 8-6-3	Operations on the List Menus List Menu Dialog Boxes Setting Dialog Boxes Variable Dialog Boxes	8-37 8-38
8-7	Config 8-7-1	guration	
8-8	HSMS 8-8-1	Settings HSMS Condition	
8-9	Data D 8-9-1 8-9-2 8-9-3 8-9-4 8-9-5	Item	8-45 8-47 8-50 8-53
8-10	Model	Settings	
	8-10-1	Communications State Model	8-58
8-11	8-11-1 8-11-2 8-11-3 8-11-4 8-11-5 8-11-6 8-11-7 8-11-8	Event Notification Alarm Management Host Command Enhanced Remote Command Equipment Constants Process Program Management Equipment Terminal Service Limit Monitoring Spooling	8-61 8-69 8-72 8-76 8-80 8-81 8-90
8-12	8-12-1	ge Settings GEM Standard Messages User-defined Messages	8-95
8-13	8-13-1	m Settings	8-101
	8-13-3	Message List	8-102
		Report List	

Section	9	Iroubleshooting	
9	9-1	Operation for Errors and Error Confirmation Methods	9-2
9	9-2	Errors Related to SECS/GEM	9-3
		9-2-1 Error Table	
		9-2-2 Error Descriptions	9-5
Append	lice	es e	
	A-1	GEM Instructions	A-3
		A-1-1 Table of GEM Instructions	A-3
		A-1-2 Common Variables in GEM Instructions	A-4
		A-1-3 Common Precautions for Correct Use of GEM Instructions	A-4
		A-1-4 Error Codes That Occur for GEM Instruction Execution	
		A-1-5 Global Variables Used in the Sample Programming for GEM Instructions	
		A-1-6 Specifications of Individual GEM Instructions	
		A-1-7 Events That Occur for GEM Instruction Execution	
A	۹-2	System-defined Variables	
		A-2-1 GEM Service Version	
		A-2-2 Equipment Information	
		A-2-3 GEM Service Status	— . —
		A-2-4 SECS Communications.	
		A-2-5 Interlocks	
		A-2-7 Communications State Model	
		A-2-8 Equipment Processing State	
		A-2-9 Control State Model	
		A-2-10 Remote Control	
		A-2-11 Equipment Constants	
		A-2-12 Process Program Management	
		A-2-13 Equipment Terminal Services	
		A-2-14 Error Messages	
		A-2-15 Clock	
		A-2-16 Spooling	
		A-2-17 User-defined Messages	
Į.	A-3	Correspondence between Formats and Data Types	.A-230
A	۸-4	Designing Tasks to Use the GEM Services	.A-231
-		A-4-1 GEM Service Startup Time	
		A-4-2 Communications Performance of GEM Instructions	
		A-4-3 Checking the Task Execution Time Ratio	
A	A-5	Basic Specifications, Performance Specifications, and Functional Specifications	.A-235
A	4-6	Version Information	.A-236
		A-6-1 Checking Versions	
		A-6-2 Relationship between Unit Version and GEM Service Version	A-236
		A-6-3 Relationship between Unit Version and Sysmac Studio Version	A-237
		A-6-4 Combinations of Versions That Require Attention and How to Deal with Them	A-237
Section	1	Index	

Index 2

Terms and Conditions Agreement

Warranty, Limitations of Liability

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Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

Refer to the following manuals for safety precautions.

- NJ-series CPU Unit Hardware User's Manual (Cat No. W500)
- NJ/NX-series CPU Unit Software User's Manual (Cat No. W501)

Precautions for Safe Use

Refer to the following manuals for precautions for safe use.

- NJ-series CPU Unit Hardware User's Manual (Cat No. W500)
- NJ/NX-series CPU Unit Software User's Manual (Cat No. W501)

Precautions for Correct Use

Refer to the following manuals for safety precautions.

- NJ-series CPU Unit Hardware User's Manual (Cat No. W500)
- NJ/NX-series CPU Unit Software User's Manual (Cat No. W501)

Host Connection Function

- Normal communications with the host may not be possible if incorrect settings are made for the host connection function. Also, if you specify an incorrect host address, you may communicate with the wrong host.
 - Make all settings carefully when you transfer the GEM setting data to the Controller.
- The host connection function will not operate if the variables assigned to the host connection function do not exist in the Controller. Also, the host connection function may not operate normally if the data types of the variables are not correct.
 - Confirm that the variables assigned to the host connection function agree with the variables in the Controller before you transfer the GEM setting data to the controller.
- If you delete a variable used for the host connection function or change a variable name or data type, make the same change in the variable assigned in the host connection function.

Testing Operation

- If you cannot connect to the host, check the value of the _GEM_HSMSState (HSMS Communications Status) system-defined variable. If the value of _GEM_HSMSState is FALSE, check the Ether-Net/IP settings and cable wiring to see if they are correct.
- If you operate the system while connected to the host, use the Host Simulator to sufficiently check functionality.

Operation

- If there are network problems during operation, the host will be disconnected and message communications will not be performed. Do not replace network devices or disconnect the LAN cable during operation.
- If an SD Memory Card is not inserted, the GEM Service logs and spool data will not be recorded. Also, it will not be possible to upload or download the GEM setting data between the SECS/GEM Configurator and the CPU Unit.
 - Inset an SD Memory Card to use the host connection function.
- Stop the GEM Services before you replace the SD Memory Card. Do not upload or download the GEM setting data between the SECS/GEM Configurator and the CPU Unit while you are replacing the SD Memory Card.
- Before you turn OFF the power supply to the Controller, execute the GEM_Shutdown instruction and save the GEM Service logs and spool data to the SD Memory Card.
 If you do not execute the GEM_Shutdown instruction before you turn OFF the power supply to the Controller, the GEM Service logs and spool data may be corrupted.
- To prevent loosing data for unexpected power interruptions, we recommend that you implement countermeasures for power interruptions, such as installing an uninterruptible power supply.

Unit Replacement

• The GEM Service logs and spool data in the SD Memory Card are not backed up. If you replace the CPU Unit, you cannot continue to use the previous GEM Service logs and spool data.

SD Memory Card Replacement

- If the end of the life of the SD Memory Card is detected, a SD Memory Card Life Exceeded event occurs and the value of the SD Memory Card Life Warning Flag _Card1Deteriorated changes to TRUE. Save the data that is on the SD Memory Card and replace the SD Memory Card.
- If you replace the SD Memory Card, any existing GEM Service logs and spool data are deleted. If necessary, use the Log Viewer to back up the GEM Service logs to a computer.
- Do not replace the SD Memory Card when the value of the _GEM_SpoolingState (Spooling State) system-defined variable is SPOOL ACTIVE. If you do, the sppl data will be deleted.
- We recommend that you use a new SD Memory Card when you replace the SD Memory Card. If you replace the SD Memory Card with one that was previously used, format it to delete any old files.

Regulations and Standards

Conformance to EC Directives

Applicable Directives

- · EMC Directives
- · Low Voltage Directive

Concepts

EMC Directive

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*

Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

* Applicable EMC (Electromagnetic Compatibility) standards are as follows:

EMS (Electromagnetic Susceptibility): EN 61131-2 EMI (Electromagnetic Interference): EN 61131-2

(Radiated emission: 10-m regulations).

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61131-2.

Conformance to EC Directives

The NJ-series Controllers comply with EC Directives. To ensure that the machine or device in which the NJ-series Controller is used complies with EC Directives, the Controller must be installed as follows:

- The NJ-series Controller must be installed within a control panel.
- · You must use reinforced insulation or double insulation for the DC power supplies connected to DC Power Supply Units and I/O Units.
- NJ-series Controllers that comply with EC Directives also conform to the Common Emission Standard (EN 61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.

You must therefore confirm that the overall machine or equipment complies with EC Directives.

Conformance to KC Standards

Observe the following precaution if you use NX-series Units in Korea.

A 급 기기 (업무용 방송통신기자재) 이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Class A Device (Broadcasting Communications Device for Office Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes.

Sellers and/or users need to take note of this.

Conformance to Shipbuilding Standards

The NJ-series Controllers comply with the following shipbuilding standards. Applicability to the ship-building standards is based on certain usage conditions. It may not be possible to use the product in some locations. Contact your OMRON representative before attempting to use a Controller on a ship.

Usage Conditions for NK and LR Shipbuilding Standards

- The NJ-series Controller must be installed within a control panel.
- Gaps in the door to the control panel must be completely filled or covered with gaskets or other material.
- The following noise filter must be connected to the power supply line.

Noise Filter

Manufacturer	Model
Cosel Co., Ltd.	TAH-06-683

Software Licenses and Copyrights

This product incorporates certain third party software. The license and copyright information associated with this software is available at http://www.fa.omron.co.jp/nj info e/.

Versions

Hardware and software versions are used to manage NJ-series Units. You can check versions on the ID information indications or with the Sysmac Studio.

Types of Versions

There are two types of versions: the unit version and the GEM Service version. These versions are managed separately, so either version can be updated without updating the other version.

Unit Version

The unit version applies to the hardware and software in the Unit. The unit version is updated each time there is a change in hardware or software specifications. Even when two Units have the same model number, they will have functional or capability differences if they have different unit versions.

GEM Service Version

The GEM Service version gives the version of the GEM Services that are implemented in the SECS/GEM CPU Unit. The GEM Service version is updated when there are changes to the specifications for the GEM Services.

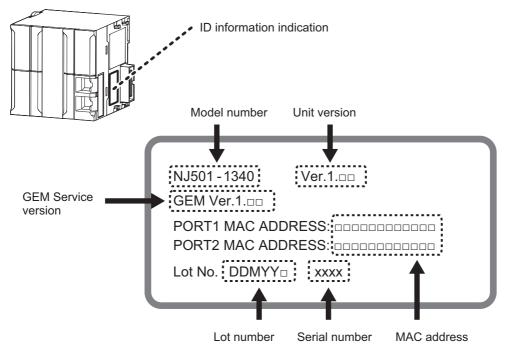
Checking Versions

You can check versions on the ID information indications or with the Sysmac Studio.

Checking Versions on ID Information Indications

The version is given on the ID information indication on the side of the product.

The ID information on the NJ-series NJ501-1340 CPU Unit is shown below.



Confirming Versions with the Sysmac Studio

You can use the Sysmac Studio to check versions.

Checking the Unit Version of a Unit

You can use the Unit Production Information while the Sysmac Studio is online to check the unit version of a Unit. You can do this for the CPU Unit, CJ-series Special I/O Units, and CJ-series CPU Bus Units. You cannot check the unit versions of CJ-series Basic I/O Units with the Sysmac Studio.

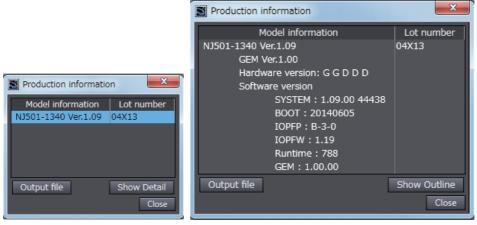
Use the following procedure to check the unit version.

1 Double-click CPU/Expansion Racks under Configurations and Setup in the Multiview Explorer. Or, right-click CPU/Expansion Racks under Configurations and Setup and select Edit from the menu.

The Unit Editor is displayed.

- **2** Right-click any open space in the Unit Editor and select **Production Information**. The Production Information Dialog Box is displayed.
- **3** Click the **Show Detail** or **Show Outline** Button at the lower right of the Production Information Dialog Box.

The view will change between the production information details and outline.



Outline View Detail View

The information that is displayed is different for the Outline View and Detail View. The Detail View displays the unit version and GEM Service version. The Outline View displays only the unit version.

Unit Versions of CPU Units and Sysmac Studio Versions

The functions that are supported depend on the unit version of the NJ-series CPU Unit. The version of Sysmac Studio that supports the functions that were added for an upgrade is also required to use those functions.

For functions that are shared with the NJ-series CPU Units, refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for the relationship between the unit versions of the CPU Units and the Sysmac Studio versions, and for the functions that are supported by each unit version. Refer to *A-6-3 Relationship between Unit Version and Sysmac Studio Version* for the relationship between the unit versions of the SECS/GEM CPU Unit and the Sysmac Studio versions.

Related Manuals

The followings are the manuals related to this manual. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection Use this manual together with the NJ-series CPU Unit Software User's Manual (Cat. No. W501).
NJ/NX-series CPU Unit Software User's Manual	W501	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.	 The following information is provided on a Controller built with an NJ/NX-series CPU Unit. CPU Unit operation CPU Unit features Initial settings Programming based on IEC 61131-3 language specifications Use this manual together with the NJ-series CPU Unit Hardware User's Manual (Cat. No. W500).
NJ/NX-series Instructions Reference Manual	W502	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit.	The instructions in the instruction set (IEC 61131-3 specifications) are described. When programming, use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ/NX-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ/NX-series CPU Unit Motion Control User's Manual	W507	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about motion control settings and programming concepts.	The settings and operation of the CPU Unit and programming concepts for motion control are described. Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ/NX-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ/NX-series Motion Control Instructions Reference Manual	W508	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about the specifications of the motion control instructions that are provided by OMRON.	The motion control instructions are described. When programming, use this manual together with the NJ-series CPU Unit Hardware User's Manual (Cat. No. W500), NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) and NJ/NX-series CPU Unit Motion Control User's Manual (Cat. No. W507).
NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual	W505	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Using the built-in EtherCAT port on an NJ/NX-series CPU Unit.	Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup. Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ/NX-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ/NX-series CPU Unit Built-in EtherNet/IP TM Port User's Manual	W506	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Using the built-in Ether- Net/IP port on an NJ/NX- series CPU Unit.	Information on the built-in EtherNet/IP port is provided. Information is provided on the basic setup, tag data links, and other features. Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ/NX-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ-series Database Connection CPU Units User's Manual	W527	NJ501-1□20	Using the database connection service with NJ-series Controllers	Describes the database connection service.

Manual name	Cat. No.	Model numbers	Application	Description
NJ-series SECS Connection CPU Units User's Manual	W528	NJ501-1340	Using the GEM Services with NJ-series Controllers	Information is provided on the GEM Services.
NJ/NX-series Troubleshooting Manual	W503	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about the errors that may be detected in an NJ/NX-series Controller.	Concepts on managing errors that may be detected in an NJ/NX-series Controller and information on individual errors are described. Use this manual together with the NJ-series CPU Unit Hardware User's Manual (Cat. No. W500) and NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501).
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC- SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.

Terminology

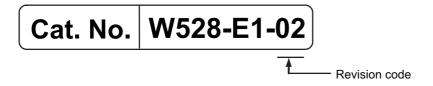
Term	Description
controller variable	A variable that is registered on the SECS/GEM Configurator and can be imported and exported between the SECS/GEM Configurator and the Sysmac Studio.
GEM	An acronym for Generic Equipment Model.
GEM capability	An operation that is executed by the equipment and specified in the GEM. All operations are executed using SECS-II message sequences and scenarios through the communications interface.
GEM instruction	An instruction that is related to the GEM Services. GEM instructions are used in the user program in the same way as other instructions.
GEM Service logs	Functionality to record the operation of the GEM Services. The following logs are recorded: a SECS message log, an HSMS communications log, and an execution log. All of the logs are recorded on an SD Memory Card.
GEM Services	Functionality based on SECS/GEM standard for host communications, GEM capability execution, communications logging, etc.
GEM setting data	Data required for the GEM Services to operate.
GEM Setting Tool	A generic name for Support Software for the SECS/GEM CPU Unit. The Log Viewer and SECS/GEM Configurator are included.
host	A computer that performs communications with SECS-compliant equipment, collects equipment data, and sends equipment commands.
	A system consisting of ERP, MES, etc., in a semiconductor manufacturing system. The overall system consists of the host and manufacturing equipment.
host connection function	A function to connect to a host based on SECS/GEM standards.
HSMS	An acronym for High-speed SECS Message Services. This communications protocol uses Ethernet as the physical layer and TCP/IP as the transport layer.
link variable	A variable that is used to pass data between a host connection function item and the user program.
Log Viewer	A Support Software application that is used to view logs recorded in the SECS/GEM CPU Unit on a computer screen.
primary message	A SECS message with an odd-number function code. A primary message is sent at the beginning of a transaction.
secondary message	A SECS message with an even-number function code. A secondary message is sent in response to a primary message.
SECS	An acronym for Semiconductor Equipment Communications Standard. A communications standard that was created for communications between semiconductor manufacturing equipment and a host.
SECS-II	SEMI standard E5. The same as SEMI Equipment Communications Standard 2 Message Content (SECS-II).
	This standard defines the formats and meanings of the messages that are sent between the host and equipment. Messages are organized functionally by streams and assigned codes. Functions are assigned within each stream. The combination of the stream and function identifies a message.
SECS/GEM	An industry standard for communications between a host and manufacturing equipment in a semiconductor manufacturing system.
SECS/GEM Configurator	A Support Software application that is used to set GEM setting data and upload/download data to/from a SECS/GEM CPU Unit.

Term	Description
SEMI	An acronym for Semiconductor Equipment and Materials International. SEMI is an international trade association that provides manufacturing equipment, materials, and related services to the semiconductor, FPD, nanotechnology, MEMS, solar power, and other industries.
stream and function	Identifiers of the contents of messages between host and equipment defined by SECS-II.

Note This manual uses terminology defined in SEMI standards. Refer to the SEMI standards for details on the above terms and for information on terms that are not given above.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	September 2014	Original production
02	April 2016	Added information on the NX701-□□□ and NJ101-□□□□.
		Added version information.
		Corrected mistakes.



SECS/GEM CPU Unit Capabilities

A SECS/GEM CPU Unit is an NJ-series Standard CPU Unit that provides GEM Services. This section describes the capabilities that are provided by the GEM Services.

1-1	SECS/GEM CPU Unit Features1-				
1-2	Standard Compliance of the SECS/GEM CPU Unit				
	1-2-1	SEMI Standard Compliance	. 1-4		
	1-2-2	SECS/GEM Standard Compliance	. 1-4		
	1-2-3	Supported SECS Messages	. 1-5		

SECS/GEM CPU Unit Features

The SYSMAC NJ-series Controllers are next-generation machine automation controllers that provide the functionality and high-speed performance that are required for machine control.

They provide the safety, reliability, and maintainability that are required of industrial controllers. The NJ-series Controllers provide the functionality of previous OMRON PLCs, and they also provide the functionality that is required for motion control. Synchronized control of I/O devices on high-speed EtherCAT can be applied to safety devices, vision systems, motion equipment, discrete I/O, and more.

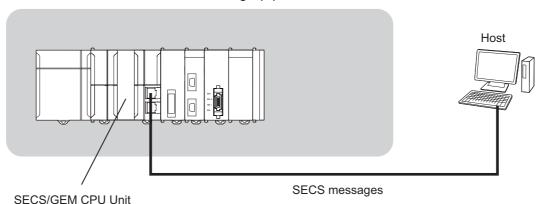
OMRON offers the new Sysmac Series of control devices designed with unified communications specifications and user interface specifications. The NJ-series Machine Automation Controllers are part of the Sysmac Series. You can use them together with EtherCAT slaves, other Sysmac products, and the Sysmac Studio Automation Software to achieve optimum functionality and ease of operation. With a system that is created from Sysmac products, you can connect components and operate the system through unified concepts and usability.

In the same way as the NJ-series Standard CPU Units, the SECS/GEM CPU Unit supports the programming languages defined in IEC 61131-3. It also provides GEM Services that can implement streams and functions defined in the SEMI SECS/GEM standard.

Processing Communications between Semiconductor Equipment Control **Processes and a Host**

The SECS/GEM CPU Unit provides both the functionality of an NJ-series Standard CPU Unit and functionality compliant with the SECS/GEM standard to enable processing communications between semiconductor equipment control processes and a host with just one Controller.





Programming without Worrying about SECS Message Formats

A host connection function handles SECS messages between the host and equipment so you do not have to handle it directly in the user program. The host connection function is one of the GEM Services. It is located between the host and user program and transmits commands sent from the host to the user program and transmits commands from the user program to the host.

Therefore, the user does not need to interpret SECS messages sent from the host or prepare SECS message formats to send to the host.

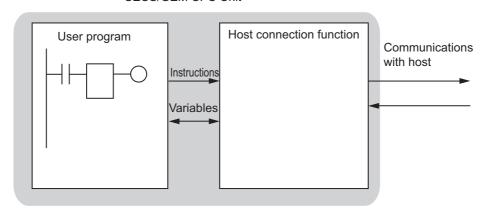
For example, the following procedure is used to execute a host command using the remote command GEM capability.

- 1 The host sends Host Command Send (S2,F41).
- The host connection function interprets the SECS message and informs the user program that a host command was received.
- The user processes the host command.

- **4** When processing is completed, the user executes the Acknowledge Host Command (GEM AckHostCmd) GEM instruction.
- **5** The host connection function returns Host Command Acknowledge (S2,F42).

Commands from the user program to the host connection function are performed with special GEM instructions. Information between the user program and host connection function is passed using special variables called link variables.

SECS/GEM CPU Unit



User-defined Messages to Expand GEM Capabilities

In addition to the SECS messages defined in the SECS/GEM standard, the SECS/GEM CPU Unit supports user-defined messages that are uniquely set by the user. This allows you to flexibly implement functions for unique user semiconductor equipment.

Setting GEM Setting Data with the SECS/GEM Configurator

To use a SECS/GEM CPU Unit, you use the standard Sysmac Studio Support Software for NJ-series Controllers, but you also use special Support Software called the SECS/GEM Configurator to make settings related to the GEM. You create the GEM setting data with the SECS/GEM Configurator and then transfer it to the SECS/GEM CPU Unit.

Work Separation for Host Communications Design and Control Sequence Design

To execute an application with a SECS/GEM CPU Unit, you must design communications with the host and you must design the control sequences, including I/O controls. Both of these can be performed in parallel because settings for host communications are performed on the SECS/GEM Configurator and control sequence programming is performed on the Sysmac Studio.

Complete Logging Functions

The SECS/GEM CPU Unit records three different logs on an SD Memory Card. You can check these logs from the Log Viewer or from the user program. Checking the logs simplifies troubleshooting when unintended operation occurs when building or operating the system.

- The SECS message log records the SECS messages sent between the host and equipment.
- The HSMS communications log records HSMS communications executed between the host and equipment.
- The execution log records GEM instruction execution in the user program and the writing of shared variables by the host connection function.

Standard Compliance of the SECS/GEM CPU Unit

The SECS/GEM CPU Unit complies with SEMI and SECS/GEM standards.

1-2-1 **SEMI Standard Compliance**

The SECS/GEM CPU Unit complies with the following SEMI standards.

Standard number	Standard name		
E37-0303	High-speed SECS Message Services (HSMS) Generic Services		
E37.1-0702	High-speed SECS Message Services Single-session Mode (HSMS-SS or HSMS-SSS)		
E5-0707	SEMI Equipment Communications Standard 2 Message Content (SECS-II)		
E30-0307	Generic Model for Communications and Control of Manufacturing Equipment (GEM)*1		

^{*1.} E42 recipes, large process programs, and E139 recipes are not supported.

1-2-2 **SECS/GEM Standard Compliance**

The SECS/GEM CPU Unit complies with the following SECS/GEM standards.

GEM compliance			
Fundamental GEM requirement	Implemented	GEM compliant	
State models	■ Yes □ No	■ Yes □ No	
Equipment processing states	■ Yes □ No	1	
Host-initiated S1,F13/F14 scenario	■ Yes □ No	=	
Event notification	■ Yes □ No	1	
On-line identification	■ Yes □ No	1	
Error messages	■ Yes □ No	=	
Control (operator-initiated)	■ Yes □ No	1	
Documentation	■ Yes □ No	1	
Additional capabilities	Implemented	GEM compliant	
Establish communications	■ Yes □ No	■ Yes □ No	
Dynamic event report configuration	■ Yes □ No	■ Yes □ No	
Variable data collection	■ Yes □ No	■ Yes □ No	
Trace data collection	■ Yes □ No	■ Yes □ No	
Status data collection	■ Yes □ No	■ Yes □ No	
Alarm management	■ Yes □ No	■ Yes □ No	
Remote control	■ Yes □ No	■ Yes □ No	
Equipment constants	■ Yes □ No	■ Yes □ No	
Process recipe management	■ Yes □ No	Process programs	
		■ Yes □ No	
		E42 recipes	
		☐ Yes ■ No	
		E139 recipes	
		☐ Yes ■ No	
Material movement	■ Yes □ No	■ Yes □ No	
Equipment terminal services	■ Yes □ No	■ Yes □ No	
Clock	■ Yes □ No	■ Yes □ No	
Limits monitoring	■ Yes □ No	■ Yes □ No	

GEM compliance			
Fundamental GEM requirement	Implemented	GEM compliant	
Spooling	■ Yes □ No	■ Yes □ No	
Control (host-initiated)	■ Yes □ No	■ Yes □ No	

1-2-3 Supported SECS Messages

The SECS messages that are supported by the SECS/GEM CPU Unit are listed in the following table. In addition to these SECS messages, the use of user-defined messages is also supported.

Stream	Function	Communications direction H: Host E: Equipment	Function name
Sx	F0	H↔E	Abort Transaction
S1:	F1	H↔E	Are You There Request
Equipment Status	F2	H↔E	On Line Data
	F3	H→E	Selected Equipment Status Request
	F4	H←E	Selected Equipment Status Data
	F11	H→E	Status Variable Namelist Request
	F12	H←E	Status Variable Namelist Reply
	F13	H↔E	Establish Communications Request
	F14	H↔E	Establish Communications Request Acknowledge
	F15	H→E	Request OFF-LINE
	F16	H←E	OFF-LINE Acknowledge
	F17	H→E	Request ON-LINE
	F18	H←E	ON-LINE Acknowledge

		Communica-		
		tions direction		
Stream	Function	H: Host	Function name	
		E: Equipment		
S2:	F13	H→E	Equipment Constant Request	
Equipment Control	F14	H←E	Equipment Constant Data	
and Diagnostics	F15	H→E	New Equipment Constant Send	
3	F16	H←E	New Equipment Constant Send New Equipment Constant Acknowledge	
	F17	H↔E	Date and Time Request	
	F18	H↔E	Date and Time Data	
	F23	H→E	Trace Initialize Send	
	F24	H←E	Trace Initialize Acknowledge	
	F25	H→E	Loopback Diagnostic Request	
	F26	H←E	Loopback Diagnostic Data	
	F29	H→E	Equipment Constant Namelist Request	
	F30	H←E	Equipment Constant Namelist	
	F31	H→E	Date and Time Set Request	
	F32	H←E	Date and Time Set Acknowledge	
	F33	H→E	Define Report	
	F34	H←E	Define Report Acknowledge	
	F35	H→E	Link Event Report	
	F36	H←E	Link Event Report Acknowledge	
	F37	H→E	Enable/Disable Event Report	
	F38	H←E	Enable/Disable Event Report Acknowledge	
	F39	H→E	Multi-block Inquire	
	F40	H←E	Multi-block Grant	
	F41	H→E	Host Command Send	
	F42	H←E	Host Command Acknowledge	
	F43	H→E	Reset Spooling Streams and Functions	
	F44	H←E	Reset Spooling Acknowledge	
	F45	H→E	Define Variable Limit Attributes	
	F46	H←E	Variable Limit Attribute Acknowledge	
	F47	H→E	Variable Limit Attribute Request	
	F48	H←E	Variable Limit Attributes Send	
	F49	H→E	Enhanced Remote Command	
	F50	H←E	Enhanced Remote Command Acknowledge	
S5:	F1	H←E	Alarm Report Send	
Exception Han-	F2	H→E	Alarm Report Acknowledge	
dling	F3	H→E	Enable/Disable Alarm Send	
	F4	H←E	Enable/Disable Alarm Acknowledge	
	F5	H→E	List Alarms Request	
	F6	H←E	List Alarms Data	
	F7	H→E	List Enabled Alarm Request	
	F8	H←E	List Enabled Alarm Data	
S6:	F1	H←E	Trace Data Send	
Data Collection	F2	H→E	Trace Data Acknowledge	
	F11	H←E	Event Report Send	
	F12	H→E	Event Report Acknowledge	
	F15	H→E	Event Report Request	
	F16	H←E	Event Report Data	
	F19	H→E	Individual Report Request	
	F20	H←E	Individual Report Data	
	F23	H→E	Request Spooled Data	
	F24	H←E	Request Spooled Data Acknowledgement Send	
	1	1	<u> </u>	

Stream	Function	Communica- tions direction H: Host E: Equipment	Function name
S7:	F1	H↔E	Process Program Load Inquire
Process Program	F2	H↔E	Process Program Load Grant
Management	F3	H↔E	Process Program Send
	F4	H↔E	Process Program Acknowledge
	F5	H↔E	Process Program Request
	F6	H↔E	Process Program Data
	F17	H→E	Delete Process Program Send
	F18	H←E	Delete Process Program Acknowledge
	F19	H→E	Current EPPD Request
	F20	H←E	Current EPPD Data
	F23	H↔E	Formatted Process Program Send
	F24	H↔E	Formatted Process Program Acknowledge
	F25	H↔E	Formatted Process Program Request
	F26	H↔E	Formatted Process Program Data
	F27	H←E	Process Program Verification Send
	F28	H→E	Process Program Verification Acknowledge
S9:	F1	H←E	Unrecognized Device ID
System Errors	F3	H←E	Unrecognized Stream Type
	F5	H←E	Unrecognized Function Type
	F7	H←E	Illegal Data
	F9	H←E	Transaction Timer Timeout
	F11	H←E	Data Too Long
	F13	H←E	Conversation Timeout
S10:	F1	H←E	Terminal Request
Terminal Services	F2	H→E	Terminal Request Acknowledge
	F3	H→E	Terminal Display, Single
	F4	H←E	Terminal Display, Single Acknowledge
	F5	H→E	Terminal Display, Multi-block
	F6	H←E	Terminal Display, Multi-block Acknowledge
	F7	H←E	Multi-block Not Allowed



System Configuration and Functional Configuration

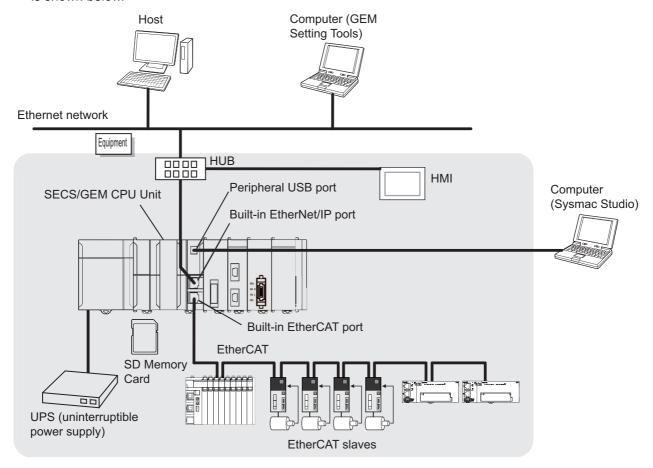
This section describes the system configuration of an NJ-series Controller in which a SECS/GEM CPU Unit is connected and the functional configuration of the SECS/GEM CPU Unit. It also introduces the GEM Services, which are the most characteristic functional configuration element of the SECS/GEM CPU Unit.

2-1	Syste	m Configuration	2-2	
	•	ional Configuration of SECS/GEM CPU Unit		
	Overview of GEM Service Operation			
	2-3-1	SECS Messages When Host Sends the Primary Message	2-7	
	2-3-2	SECS Messages When Equipment Sends the Primary Message	2-11	
	2-3-3	Link Variables	2-14	

System Configuration 2-1

The I/O ports of a SECS/GEM CPU Unit are the same as the I/O ports of an NJ-series Standard CPU Unit. Therefore, the connection methods for EtherCAT slaves and HMIs are the same as an NJ-series Controller in which a Standard CPU Unit is connected.

A typical system configuration for an NJ-series Controller in which a SECS/GEM CPU Unit is connected is shown below.



Host

The host computer performs communications with the equipment, collects data from the equipment, and sends commands to the equipment.

Equipment

The equipment manufacturers semiconductors, FPDs, etc. It performs communications with the host. The NJ-series Controller in which a SECS/GEM CPU Unit is connected is mounted in the equipment.

SECS/GEM CPU Unit

The SECS/GEM CPU Unit is an NJ-series NJ501-1300 Standard CPU Unit to which GEM Services were added. The GEM Services provide functionality defined in the SECS/GEM standard. Therefore, the dimensions, power consumption, operating environment, I/O ports, functions, and other capabilities of the SECS/GEM CPU Unit are the same as the NJ501-1300 except for the specifications for the SECS/GEM standard. There is no NJ501-1300 functionality that is not supported by the NJ501-1340.

For NJ501-1300 specifications, refer to the NJ-series CPU Unit Hardware User's Manual (Cat. No. W500) and NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501).

The unique specifications of the SECS/GEM CPU Unit are introduced below.

	Item	Description
Model number		NJ501-1340
Versions		Both a unit version and a GEM Service version are managed.*1
GEM Services		Functionality based on SECS/GEM standard for host communica-
		tions, GEM Service logging, etc.
SECS message	Applicable port	Built-in EtherNet/IP port
communications	Communications pro-	TCP/IP
	tocol	
	Applicable standards	HSMS-SS
	Number of connected	1
	hosts	
	Maximum message	256 ^{*2}
	length [Kbytes]	

^{*1.} Refer to Versions on page 20 for the methods to check the versions.

SD Memory Cards

The SECS/GEM CPU Unit supports the same SD Memory Cards as the NJ-series Standard CPU Units. The GEM Service logs and spool data used in the GEM Services are stored on an SD Memory Card. You can insert an SD Memory Card in the SECS/GEM CPU Unit.

Built-in EtherNet/IP Port

The SECS/GEM CPU Unit has the same built-in EtherNet/IP port as on an NJ-series Standard CPU Unit. It is used to perform communications with the host. Host communications for the GEM Services operate as one TCP/IP function of the built-in EtherNet/IP. You can use the other functions of the built-in EtherNet/IP, such as tag data links, at the same time as the GEM Services.



Precautions for Correct Use

If you use the Network Configurator with the SECS/GEM CPU Unit, set the CPU Unit model on the Network Configurator to the NJ501-1300.

Built-in EtherCAT Port

The SECS/GEM CPU Unit has the same built-in EtherCAT port as on an NJ-series Standard CPU Unit. It is not directly related to the GEM Services.

GEM Setting Tools

"GEM Setting Tools" is a generic name that includes the SECS/GEM Configurator that you use to create the setting data for the GEM Services and the Log Viewer that you use to display the GEM Service logs. The GEM Setting Tool Support Software is independent of the Sysmac Studio Support Software. The computer in which the GEM Setting Tools are installed is connected to the built-in EtherNet/IP port on the SECS/GEM CPU Unit.

You can install the SECS/GEM Configurator and the Sysmac Studio on the same computer.

The basic specifications of the GEM Setting Tools are given in the following table.

Item	Specification	
Name	SECS/GEM Configurator	
Model number	WS02-GCTL1	

^{*2.} The maximum length of a SECS message for process program management is 257 Kbytes.

Item	Specification
Connection port on SECS/GEM CPU Unit	Built-in EtherNet/IP port or peripheral USB port
Number of connected Units	1
Communications protocol	TCP/IP
Communications port	Always 9700.
Data transfer method	FTP

The SECS/GEM Configurator provides the following functionality.

- · Creating, editing, and saving GEM setting data
- · Uploading and downloading GEM setting data
- · Importing and exporting controller variables
- · Creating SML files



Precautions for Correct Use

The contents of the GEM setting data that is uploaded with the SECS/GEM Configurator is the same as the contents of the GEM setting data that was previously downloaded with the SECS/GEM Configurator. Even if the settings in the downloaded GEM setting data were changed by the user program or host, the changes will not be reflected in the uploaded GEM setting data.

The Log Viewer provides the following functionality.

- Uploading GEM Service logs
- Displaying GEM Service logs
- · Outputting GEM Service log files

Sysmac Studio

You use the same Sysmac Studio Support Software with the SECS/GEM CPU Unit as you do with an NJ-series Standard CPU Unit. The computer in which the Sysmac Studio is installed is connected to the peripheral USB port or built-in EtherNet/IP port on the SECS/GEM CPU Unit.

The SECS/GEM CPU Unit is supported by Sysmac Studio version 1.10 or higher. The following functionality is enabled if you select the model number of the SECS/GEM CPU Unit (NJ501-1340) in Select Device Area of Project Properties Dialog Box.

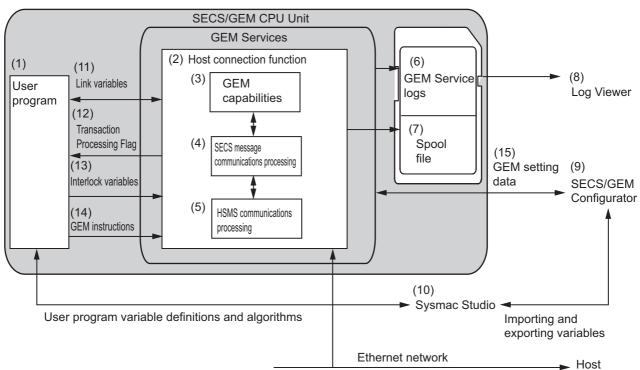
- Using system-defined variables related to GEM
- · Using GEM instructions
- Adding GEM setting data in the data to back up

UPS

A UPS is an uninterruptible power supply. It provides power to the SECS/GEM CPU Unit during power interruptions until the power supply to the SECS/GEM CPU Unit can be turned OFF safely.

2-2 Functional Configuration of SECS/GEM CPU Unit

The functional configuration of the SECS/GEM CPU Unit is shown in the following figure.



The elements in the above figure are described in the following table. Refer to the reference pages for detailed information on the elements.

No.	Element	Description	Reference
(1)	User program	The user program is the same as for an NJ-series Standard CPU Unit.	
(2)	Host connection function	This software handles SECS messages with the host and exchanges data with the user program.	5-1 Basic Processing of the Host Connection Function on page 5-3
(3)	GEM capabilities	This software processes the GEM capabilities.	5-5 GEM Capabilities on page 5-26
(4)	SECS message commu- nications processing	This software processes SECS message communications.	
(5)	HSMS communications processing	This software processes HSMS communications.	5-2 HSMS Communica- tions on page 5-14
(6)	GEM Service logs	This is a generic name for the HSMS communications log, SECS message log, and execution log.	Section 6 GEM Service Logs
(7)	Spool file	The spool file contains SECS messages that were queued for the GEM spooling capability while communications were not being performed between the host and equipment.	5-5-20 Spooling on page 5-96
(8)	Log Viewer	This Support Software displays the contents of the GEM Service logs.	6-3 Log Viewer Operations on page 6-6
(9)	SECS/GEM Configurator	This Support Software is used to set the GEM setting data.	Section 8 SECS/GEM Configurator

No.	Element	Description	Reference
(10)	Sysmac Studio	This Support Software is used to perform settings and programming for NJ-series CPU Units. You can import and export user program variable definitions to share them between the Sysmac Studio and the	
		SECS/GEM Configurator.	
(11)	Link variables	These variables are used to share information between the user program and host connection function.	2-3-3 Link Variables on page 2-14
(12)	Transaction processing flag	This variable is used by the host connection function to tell the user program that a SECS message was received from the host.	5-1-3 Transaction Process- ing on page 5-6
(13)	Interlock variables	These variables are used to prohibit execution of commands output to the host connection function from the host.	5-1-4 Checking the Num- ber of Buffered SECS Mes- sages on page 5-12
(14)	GEM instructions	These special instructions are used for the GEM Services.	A-1 GEM Instructions on page A-3
(15)	GEM setting data	This setting data is related to the GEM Services.	

2-3 Overview of GEM Service Operation

The GEM Services perform SECS message communications with the host according to the SECS/GEM standard. There are the following two types of SECS messages exchanged between the host and equipment.

- SECS messages when host sends the primary message
- SECS messages when equipment sends the primary message

From the viewpoint of the processing performed by the equipment, there are the following two types of SECS messages.

- SECS messages processed by the GEM services alone
- SECS messages processed jointly by the GEM services and user program

If processing is performed jointly by the GEM Services and user program, the variables that are used to pass data between the GEM Services and the user program are called link variables.

2-3-1 SECS Messages When Host Sends the Primary Message

When the host sends the primary message, the GEM Services receive the message and interpret it. Some SECS messages are processed just by the GEM Services and some are processed jointly by the GEM Services and user program.

SECS Messages Processed by the GEM Services Alone

After the GEM Services receive the SECS message from the host, the message is processed automatically without notifying the user program. Therefore, you do not have to perform any processing in the user program.

SECS Messages Processed Jointly by the GEM Services and User Program

The processing performed by the GEM Services and user program is as follows:

- **1** The GEM Services receive the primary message from the host.
- **2** The GEM Services use the transaction processing flag to notify the user program that a SECS message was received.
- **3** The user program performs the required processing for the SECS message.
- **4** The user program uses a GEM instruction to notify the GEM Services that it performed the processing.
- **5** The GEM Services return a secondary message.

If an interlock variable is used to prohibit the execution of processing, the GEM Services do not notify the user program. The GEM Services automatically return a secondary message saying that the execution of processing is not permitted.

The primary SECS messages that the host can send are listed in the following table. The table also tells if processing is performed by the GEM Services alone or jointly by the GEM Services and user program, and the table gives any related transaction processing flag and interlock variables. If processing is performed jointly by the GEM Services and user program, the GEM instructions that are executed in the user program are given in the *Processing* column.

Stream	Function	Function name	Processing	Transaction processing flag	Interlock vari- able
S1: Equip-	S1: Equip- F1 Are You There Request		GEM Services		
ment Sta-	F2	On Line Data			
tus	F3	Selected Equipment Status Request	GEM Services		
	F4	Selected Equipment Status Data			
	F11	Status Variable Namel- ist Request	GEM Services		
	F12	Status Variable Namel- ist Reply			
	F13	Establish Communications Request	GEM Services		
	F14	Establish Communications Request Acknowledge			
	F15	Request OFF-LINE	GEM Services		
	F16	OFF-LINE Acknowledge			
	F17	Request ON-LINE	GEM Services		_GEM
	F18	ON-LINE Acknowledge			_Interlock _ControlState

Function	Function name	Processing	Transaction	Interlock vari-	
				able	
F13	Request	GEM Services			
F14	Equipment Constant Data				
F15	New Equipment Con-	GEM Services			
F16	New Equipment Con-				
F47		CEM Comissos		CEM	
	1	GEW Services		_GEM Interlock	
				_Time	
		GEM Services			
F24	Trace Initialize Acknowledge				
F29	Equipment Constant Namelist Request	GEM Services			
F30	Equipment Constant Namelist				
F31	Date and Time Set Request	GEM Services			
F32 Date and Time Set					
F33		GEM Services			
F34	Define Report Acknowl-	OLINI GGI VIGGO			
F35		GEM Services			
	•	OLIVI OCI VICCO			
	Acknowledge				
F37	Enable/Disable Event Report	GEM Services			
F38	Enable/Disable Event Report Acknowledge				
F39	Multi-block Inquire	GEM Services			
F40	Multi-block Grant				
F41	Host Command Send	Jointly:	_GEM_Busy	_GEM	
F42 Host Command Acknowledge		GEM_AckHost- Cmd	HostCmd	_Interlock HostCmd	
F43	Reset Spooling Streams	GEM Services			
F44	Reset Spooling				
F45	Define Variable Limit	GEM Services			
F46	Variable Limit Attribute				
F47	Variable Limit Attribute	GEM Services			
	Request				
F48	Variable Limit Attributes Send				
F49	Enhanced Remote Com-	Jointly: GEM AckEn-	_GEM_Busy	_GEM _Interlock_	
F50	Enhanced Remote Com-	hancedCmd	Cmd	EnhancedRmt	
	F15 F16 F17 F18 F23 F24 F29 F30 F31 F32 F33 F34 F35 F36 F37 F38 F39 F40 F41 F42 F43 F44 F45 F46 F47 F48	F13 Equipment Constant Request F14 Equipment Constant Data F15 New Equipment Constant F16 New Equipment Constant Send F16 New Equipment Constant F17 Date and Time Request F18 Date and Time Data F23 Trace Initialize Send F24 Trace Initialize Acknowledge F29 Equipment Constant Namelist Request F30 Equipment Constant Namelist Request F31 Date and Time Set Request F32 Date and Time Set Request F33 Define Report F34 Define Report F35 Link Event Report F36 Link Event Report F36 Link Event Report F37 Enable/Disable Event Report F38 Enable/Disable Event Report F39 Multi-block Inquire F40 Multi-block Grant F41 Host Command Acknowledge F33 Reset Spooling F44 Reset Spooling F45 Define Variable Limit Attributes F46 Variable Limit Attribute Request F47 Variable Limit Attribute Request F48 Variable Limit Attributes Send F49 Enhanced Remote Command	F13 Equipment Constant Request F14 Equipment Constant Data F15 New Equipment Constant Stant Send F16 New Equipment Constant Stant Send F17 Date and Time Request F18 Date and Time Request F23 Trace Initialize Send F24 Trace Initialize Send F29 Equipment Constant Namelist Request F30 Equipment Constant Namelist Request F31 Date and Time Set Request F32 Date and Time Set Request F32 Date and Time Set Acknowledge F33 Define Report F34 Define Report F35 Link Event Report F36 Link Event Report F37 Enable/Disable Event Report F38 Enable/Disable Event Report F39 Multi-block Inquire F39 Multi-block Inquire F40 Multi-block Grant F41 Host Command Send F42 Host Command Semd F43 Reset Spooling Streams and Functions F44 Reset Spooling Streams and Functions F45 Define Variable Limit Attribute Request F46 Variable Limit Attribute Request F47 Variable Limit Attribute Request F48 Variable Limit Attribute Send F49 Enhanced Remote Command F40 Enhanced Remote Command F40 Enhanced Remote Command F41 Equipment Constant F42 End F4	Function Function name Processing processing flag F13	

Stream	Function	Function name	Processing	Transaction processing flag	Interlock vari- able
S5: Excep-	F3	Enable/Disable Alarm	GEM Services	processing mag	able
tion Han-		Send	GLIVI SEI VICES		
dling	F4	Enable/Disable Alarm			
S9	1 4	Acknowledge			
	F5	List Alarms Request	GEM Services	 	
	F6	List Alarms Data	- OLIVI COI VICCO		
	F7	List Enabled Alarm	GEM Services		
		Request	32III 30I VI000		
	F8	List Enabled Alarm Data	-		
S6: Data	F15	Event Report Request	GEM Services		
	F16	Event Report Data	<u> </u>		
Collection	F19	Individual Report	GEM Services		
		Request	GLIVI SELVICES		
	F20	Individual Report Data	-		
	F23	Request Spooled Data	GEM Services		
	F24	Request Spooled Data	OEW COLVIOCO		
	1.2.	Acknowledgement Send			
S7: Pro-	F1	Process Program Load	GEM Services		GEM
cess Pro-	' '	Inquire	OZIVI GGI VIGGO		_Interlock_PP
gram	F2	Process Program Load	-		
Manage-	-	Grant			
ment	F3	Process Program Send	Jointly:	_GEM_Busy	GEM
	F4	Process Program	GEM AckP-	HostPPDownload	_Interlock_PP
		Acknowledge	PDownload		
	F5	Process Program	Jointly:	_GEM_Busy	GEM
		Request	GEM Re-	HostPPUpload	_Interlock_PP
	F6	Process Program Data	spPPUpload	'	
	F17	Delete Process Pro-	Jointly:	_GEM_Busy	GEM
		gram Send GE		HostPPDelete	_Interlock_PP
	F18	Delete Process Pro-	PDelete		_
		gram Acknowledge			
	F19	Current EPPD Request	GEM Services		
	F20	Current EPPD Data			
	F23	Formatted Process Pro-	Jointly:	_GEM_Busy	_GEM
		gram Send	GEM_AckFor-	HostFormatted	_Interlock_PP
	F24	Formatted Process Pro-	mattedP-	PPDownload	
		gram Acknowledge	PDownload		
	F25	Formatted Process Pro-	Jointly:	_GEM_Busy	_GEM
		gram Request	GEM_RespFor-	HostFormatted	_Interlock_PP
	F26	Formatted Process Pro-	mattedPPUp-	PPUpload	
		gram Data	load		
S9: Sys-	F1	Unrecognized Device ID	GEM Services		
tem Errors	F3	Unrecognized Stream	GEM Services		
		Туре			
	F5	Unrecognized Function	GEM Services		
		Туре			
	F7	Illegal Data	GEM Services		
	F9	Transaction Timer Time-	GEM Services		
		out			
	F11	Data Too Long	GEM Services		
	F13	Conversation Timeout	GEM Services		

Stream	Function	Function name	Processing	Transaction processing flag	Interlock vari- able
S10: Ter-	F3	Terminal Display, Single	Jointly:	_GEM_Busy	
minal Ser-	F4	Terminal Display, Single	GEM_AckTer-	HostTerminal	
vices		Acknowledge	minalMsgSB	MsgSB	
			Jointly:	_GEM_Busy	
			GEM_AckTer-	HostTerminal	
	F6	Terminal Display,	minalMsgMB	MsgMB	
		Multi-block Acknowledge			
	F7	Multi-block Not Allowed	GEM Services		

2-3-2 SECS Messages When Equipment Sends the Primary Message

When the equipment sends the primary message, the host returns a secondary message. For the secondary SECS message from the host, some messages are processed just by the GEM Services and some are processed jointly by the GEM Services and user program.

SECS Messages Processed by the GEM Services Alone

After the GEM Services receive the secondary message from the host, the message is processed automatically without notifying the user program. Therefore, you do not have to perform any processing in the user program.

SECS Messages Processed Jointly by the GEM Services and User Program

The processing performed by the GEM Services and user program is as follows:

- 1 The user program executes a GEM instruction to tell the GEM Services to send a primary message to the host.
- **2** The GEM Services send a primary message.
- **3** The GEM Services receive the secondary message from the host.
- **4** The GEM Services use the Transaction Processing Flag to notify the user program that a secondary message was received.
- **5** The user program checks the values of the Transaction Processing Result Variables.
- **6** The user program performs the required processing according to the values of the Transaction Processing Result Variables.

The primary SECS messages that the equipment can send are listed in the following table. The table also tells if processing of the secondary message from the host is performed by the GEM Services alone or jointly by the GEM Services and user program, and the table gives the GEM instructions executed by the user program along with any related transaction processing flags and transaction processing result variables.

Stream	Function	Function name	Pro- cessing	GEM instruc-	Transaction processing flag	Transaction processing result variable
S1: Equip- ment Sta- tus	F1	Are You There Request On Line Data	GEM Services	GEM_Change ControlState		
	F13	Establish Com- munications Request	GEM Services	GEM_Change CommState		
	F14	Establish Com- munications Request Acknowledge				
S2: Equip- ment Con- trol and Diagnos- tics	F17	Date and Time Request Date and Time Data	Jointly	GEM _Request ChangeTime	_GEM_Busy EquipChange Time	_GEM_Equip ChangeTime Rslt
S5: Exception Handling	F1 F2	Alarm Report Send Alarm Report Acknowledge	GEM Services	GEM_Report Alarm		
S6: Data Collection	F1 F2	Trace Data Send Trace Data Acknowledge	GEM Services	*1		
	F11	Event Report Send Event Report	GEM Services	GEM_Report Event*2		
S7: Pro- cess Pro- gram	F1	Acknowledge Process Program Load Inquire	GEM Services	GEM_Upload PP, GEM_Upload		
Manage- ment	F2	Process Program Load Grant		FormattedPP		
	F3	Process Program Send Process Pro-	Jointly	GEM_Upload PP	_GEM_Busy EquipPPUpload	_GEM_EquipPP UploadRslt
	F4	gram Acknowl- edge				
	F5 F6	Process Program Request Process Pro-	Jointly	GEM _RequestPP Download	_GEM_Busy EquipPP Download	_GEM_EquipPP DownloadRsIt
	F23	gram Data Formatted Process Program Send	Jointly	GEM_Upload FormattedPP	_GEM_Busy EquipFormatted PPUpload	_GEM_Equip FormattedPP UploadRsIt
	F24	Formatted Process Program Acknowledge			T T Opioud	opioadi toli
	F25	Formatted Process Program Request	Jointly	GEM _Request FormattedPP	_GEM_Busy EquipFormatted PPDownload	_GEM_Equip ForamattedPP DownloadRsIt
	F26	Formatted Process Program Data		Download		

Stream	Function	Function name	Pro- cessing	GEM instruc- tion	Transaction processing flag	Transaction processing result variable
S9: Sys-	F1	Unrecognized	GEM	*3		
tem Errors		Device ID	Services			
	F3	Unrecognized	GEM	*3		
		Stream Type	Services			
	F5	Unrecognized	GEM	*3		
		Function Type	Services			
	F7	Illegal Data	GEM	*3		
			Services			
	F9	Transaction	GEM	*3		
		Timer Timeout	Services			
	F11	Data Too Long	GEM	*3		
			Services			
	F13	Conversation	GEM	*3		
		Timeout	Services			
S10: Ter-	F1	Terminal	Jointly	GEM_Send	_GEM_Busy	_GEM_Equip
minal Ser-		Request		TerminalMsg	EquipTerminal	TerminalMsg
vices	F2	Terminal			Msg	RsIt
		Request				
		Acknowledge				
	F7	Multi-block Not	GEM	*4		
		Allowed	Services			

^{*1.} After Trace Initialize Send (S2,F23) is received from the host, the GEM Services automatically send Trace Data Send (S6,F1). It is not necessary for the user program to execute a GEM instruction.

^{*2.} The GEM_ChangeControlState instruction or GEM_ReportAlarm instruction is sometimes executed instead of the GEM_ReportEvent instruction. The GEM Services sometimes automatically send Event Report Send (S6,F11) depending on the GEM capability.

^{*3.} The GEM Services automatically send a SECS message for an illegal primary message from the host. It is not necessary for the user program to execute a GEM instruction.

^{*4.} If processing is not permitted for Terminal Display, Multi-block (S10,F5) from the host, the GEM Services automatically send a SECS message. It is not necessary for the user program to execute a GEM instruction.

Link Variables 2-3-3

Link variables are used to pass data between the GEM Services and the user program. Link variables include system-defined variables and user-defined variables. User-defined link variables are set on the SECS/GEM Configurator and then transferred to the CPU Unit.

The link variables and their applicable streams, functions, and items are given in the following table.

Link Variables for Equipment Constants

The link variables for equipment constants are given in the following table along with the equipment constant names (ECNAMEs).

Applicable streams and functions	Link variable	Applica- ble item	Equipment con- stant name (ECNAME)	Data type	RW *1	Retain*2
S2F14,	_GEM_Establish	EC	Establish	A-2 System-defined Va	ariables	on page
S2F15, and	Communications		Communications	A-211		
S6F11	Timeout		Timeout			
	_GEM_SpoolParam.	EC	EnableSpooling			
	EnableSpooling					
	_GEM_SpoolParam.	EC	MaxSpoolTransmit			
	MaxSpoolTransmit					
	_GEM_SpoolParam.	EC	OverWriteSpool			
	OverWriteSpool					
	_GEM_TimeFormat	EC	TimeFormat			
	Equipment constants	EC	Any	BYTE, BOOL,	R	Retained
	(ECs)			STRING, SINT, INT,		
				DINT, USINT, UINT,		
				UDINT, REAL, or		
				LREAL		

^{*1.} Gives the R/W attribute of the variable. R: Read only, RW: Read/write.

^{*2.} Gives the Retain attribute of the variable. Either "Retained" or "Not retained" is given.

Link Variables for Status Variables

The link variables for status variables are given in the following table along with the status variable names (SVNAMEs).

Applicable streams and functions	Link variable	Applica- ble item	Status variable name (SVNAME)	Data type	RW *1	Retain*2
S1F4, S6F1,	_GEM_ControlState	SV	ControlState	A-2 System-define	d Varia	bles on
and S6F11	_GEM_PPExecName	SV	PPExecName	page A-211		
	_GEM_PPFormat	SV	PPFormat			
	_GEM_ProcessState	SV	ProcessState			
	_GEM_Previous	SV	PreviousProcess			
	ProcessState		State			
	_GEM_SpoolCondi-	SV	SpoolCountActual			
	tion.SpoolCountActual					
	_GEM_SpoolCondi-	SV	SpoolCountTotal			
	tion.SpoolCountTotal					
	_GEM_SpoolCondi-	SV	SpoolFullTime			
	tion.SpoolFullTime					
	_GEM_SpoolCondi-	SV	SpoolStartTime			
	tion.SpoolStartTime					
	Status variables (SVs)	SV	Any	BYTE, BOOL,	R/W	Not
				STRING, SINT,		retained.
				INT, DINT,		
				USINT, UINT,		
				UDINT, REAL,		
				or LREAL		

^{*1.} Gives the R/W attribute of the variable. R: Read only, RW: Read/write.

Link Variables for Discrete Variables

The link variables for discrete variables are given in the following table along with the data value names (DVNAMEs).

Applicable streams and functions	Link variable	Applica- ble item	Data value name (DVNAME)	Data type	RW *1	Retain*2
S6F11	_GEM_Operator Commnd	DV	OperatorCommnd	A-2 System-defined page A-211	l Variab	les on
	_GEM_PPChange- Info.PPChangeName	DV	PPChangeName			
	_GEM_PPChange- Info.PPChangeStatus	DV	PPChangeStatus			
	Discrete variables (DVs)	DV	Any	BYTE, BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL	R/W	Not retained.

^{*1.} Gives the R/W attribute of the variable. R: Read only, RW: Read/write.

^{*2.} Gives the Retain attribute of the variable. Either "Retained" or "Not retained" is given.

^{*2.} Gives the Retain attribute of the variable. Either "Retained" or "Not retained" is given.

Other Link Variables

The following table lists link variables other than those for equipment constants, status variables, and discrete variables.

Applicable streams and functions	Link variable	Applicable item	Data type	RW *1	Retain*2
S1F2, S1F13,	_GEM_EquipInfo.MDLN	MDLN	A-2 System-defined Variable	es on p	age A-211
and S1F14	_GEM_EquipInfo.SOFT- REV	SOFTREV			
S2F41	S2F41: RCMD	RCMD	STRING	R/W	Not retained.
	S2F41: CPNAME Count	Received CPNAME count	UINT	R/W	Not retained.
	S2F41: CPNAME Table	CPNAME	STRING array	R/W	Not retained.
	S2F41: CPVAL	CPVAL	BYTE, BOOL, STRING, SINT, INT, DINT, USINT, UINT, or UDINT	R/W	Not retained.
S2F42	S2F42: Error CPNAME Table	CPNAME	STRING array	R/W	Not retained.
	S2F42: CPACK Table	CPACK	BYTE array	R/W	Not retained.
S2F49	S2F49: OBJSPEC	OBJSPEC	STRING	R/W	Not retained.
	S2F49: RCMD	RCMD	STRING	R/W	Not retained.
	S2F49: CPNAME Count	Received CPNAME count	UINT	R/W	Not retained.
	S2F49: CPNAME Table	CPNAME	STRING array	R/W	Not retained.
	S2F49: CEPVAL	CEPVAL	BYTE, BOOL, STRING, SINT, INT, DINT, USINT, UINT, or UDINT	R/W	Not retained.
S2F50	S2F50: Error CPNAME Table	CPNAME	STRING array	R/W	Not retained.
	S2F50: CEPACK Table	CEPACK	USINT array	R/W	Not retained.
S7F3	Host-initiated Download, PPID	PPID	STRING	R/W	Not retained.
	Host-initiated Download, LENGTH	PPBODY size	UINT	R/W	Not retained.
	Host-initiated Download, PPBODY	PPBODY	BYTE, STRING, SINT, INT, DINT, USINT, UINT, or UDINT array	R/W	Not retained.
	Equipment-initiated Upload, PPBODY	PPBODY	BYTE, STRING, SINT, INT, DINT, USINT, UINT, or UDINT array	R/W	Not retained.
S7F4	_GEM_EquipPPUp- loadRslt.RsltCode	ACKC7 ^{*3}	A-2 System-defined Variable	es on p	age A-211
S7F5	Host-initiated Upload, PPID of Upload Request	PPID	STRING	R/W	Not retained.

Applicable				DW	
streams and functions	Link variable	Applicable item	Data type	*1	Retain*2
S7F6	Equipment-initiated Down-load, PPID	PPID	STRING	R/W	Not retained.
	Equipment-initiated Download, LENGTH	PPBODY size	UINT	R/W	Not retained.
	Equipment-initiated Down-load, PPBODY	PPBODY	BYTE, STRING, SINT, INT, DINT, USINT, UINT, or UDINT array	R/W	Not retained.
	Host-initiated Upload, PPBODY	PPBODY	BYTE, STRING, SINT, INT, DINT, USINT, UINT, or UDINT array	R/W	Not retained.
S7F17	Deletion Requested PPID List, PPID Count	PPID element count	UINT	R/W	Not retained.
	Deletion Requested PPID List, PPID Table	PPID	STRING array	R/W	Not retained.
S7F20	PPID Management Table	PPID	STRING array	R/W	Retain
S7F23	Equipment-initiated Format-ted Upload, CCODE Table	CCODE table	STRING, INT, DINT, UINT, or UDINT array	R/W	Not retained.
	Equipment-initiated Formatted Upload, PPARM Table	PPARM table	BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL array	R/W	Not retained.
	Equipment-initiated Format- ted Upload, PPARM Count	Number of PPARMs sent	UINT	R/W	Not retained.
	Host-initiated Formatted Download, PPID	PPID	STRING	R/W	Not retained.
	Host-initiated Formatted Download, MDLN	MDLN	STRING	R/W	Not retained.
	Host-initiated Formatted Download, SOFTREV	SOFTREV	STRING	R/W	Not retained.
	Host-initiated Formatted Download, CCODE Count	Received CCODE count	UINT	R/W	Not retained.
	Host-initiated Formatted Download, CCODE Table	CCODE table	STRING, INT, DINT, UINT, or UDINT array	R/W	Not retained.
	Host-initiated Formatted Download, PPARM Table	PPARM table	BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL array	R/W	Not retained.
	Host-initiated Formatted Download, PPARM Count	Number of PPARMs sent	UINT	R/W	Not retained.
S7F24	_GEM_EquipFormatted PPUploadRslt.Rslt	ACKC7 ^{*1}	A-2 System-defined Variable	es on p	1
S7F25	Host-initiated Formatted Upload, PPID of Upload Request	PPID	BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL array	R/W	Not retained.

Applicable streams and functions	Link variable	Applicable item	Data type	RW *1	Retain*2
S7F26	Host-initiated Formatted	CCODE table	STRING, INT, DINT, UINT,	R/W	Not
	Upload, CCODE Table		or UDINT array		retained.
	Host-initiated Formatted Upload, PPARM Table	PPARM table	BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL array	R/W	Not retained.
	Host-initiated Formatted Upload, PPARM Count	Number of PPARMs sent	UINT	R/W	Not retained.
	Equipment-initiated Format- ted Download, PPID	PPID	STRING	R/W	Not retained.
	Equipment-initiated Format-ted Download, MDLN	MDLN	STRING	R/W	Not retained.
	Equipment-initiated Format-ted Download, SOFTREV	SOFTREV	STRING	R/W	Not retained.
	Equipment-initiated Format- ted Download, CCODE Count	Received CCODE count	UINT	R/W	Not retained.
	Equipment-initiated Format- ted Download, CCODE Table	CCODE table	STRING, INT, DINT, UINT, or UDINT array	R/W	Not retained.
	Equipment-initiated Format- ted Download, PPARM Table	PPARM table	BOOL, STRING, SINT, INT, DINT, USINT, UINT, UDINT, REAL, or LREAL array	R/W	Not retained.
	Equipment-initiated Format- ted Download, PPARM Count	Number of PPARMs sent	UINT	R/W	Not retained.
S7F27	Verification Result, ACKC7A Table	ACKC7A	ВУТЕ	R/W	Not retained.
	Verification Result, SEQNUM Table	SEQNUM	UINT	R/W	Not retained.
	Verification Result, ERRW7 Table	ERRW7	STRING	R/W	Not retained.
S10F2	_GEM_EquipTerminal MsgRslt.RsltCode	ACKC10	A-2 System-defined Variables on page A-		age A-211
S10F3	Displayed TEXT of sin- gle-block terminal mes- sages – Displayed TEXT	TEXT	STRING	R/W	Not retained.
	_GEM_HostTerminalMsg SB_TID	TID	A-2 System-defined Variable	es on p	age A-211
S10F5	Displayed TEXT of multi-block terminal mes- sages – Displayed TEXT Count	Received TEXT count	UINT	R/W	Not retained.
	Displayed TEXT of multi-block terminal mes- sages – Displayed TEXT Table	TEXT	STRING array	R/W	Not retained.
	_GEM_HostTerminalMsg MB_TID	TID	A-2 System-defined Variable	es on p	age A-211

Applicable streams and functions	Link variable	Applicable item	Data type	RW *1	Retain*2
SxFy	User-defined message	Link variable		R/W	Not
	send/receive parameter val-	assigned to			retained.
	ues	user-defined			
		message item			
	_GEM_HostUserMsgNo	Received mes-	A-2 System-defined Variabl	es on p	age A-211
		sage number			
		for host-initi-			
		ated			
		user-defined			
		message			
SxFy+1	User-defined message	Link variable		R/W	Not
	send/receive parameter val-	assigned to			retained.
	ues	user-defined			
		message item			
	_GEM_EquipUserMsgNo	Received mes-	A-2 System-defined Variabl	es on p	age A-211
		sage number			
		for equip-			
		ment-initiated			
		user-defined			
		message			

^{*1.} Gives the R/W attribute of the variable. R: Read only, RW: Read/write.

^{*2.} Gives the Retain attribute of the variable. Either "Retained" or "Not retained" is given.

^{*3.} S2F2 PPGNT is included.



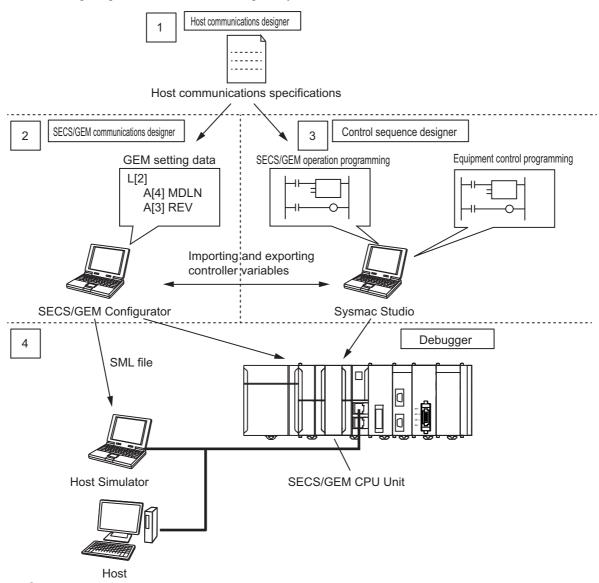
GEM Service Design Procedure

To use the SECS/GEM CPU Unit, you must design the system to use the GEM Services. This section describes the procedure to design a system to use the GEM Services.

3-1	Overv	riew of GEM Service Design Procedure	3-2
3-2	Using	the SECS/GEM Configurator to Create the GEM Setting Data	3-4
3-3	_	the Sysmac Studio to Create the SECS/GEM Operation	3-6
	3-3-1	Starting the Sysmac Studio and Creating a Project	
	3-3-2	FTP Settings	3-7
	3-3-3	Creating the SECS/GEM Operation Programming	3-7
3-4	Debug	gging:	3-9

Overview of GEM Service Design Procedure

The following diagram shows how to design a system to use the GEM Services.



- Creating the Host Communications Specifications
 - The host communications designer creates the host communications specifications.
- Creating the GEM Setting Data

Based on the host communications specifications, the SECS/GEM communications designer uses the SECS/GEM Configurator to create the GEM setting data.

- Creating the SECS/GEM Operation Programming Based on the host communications specifications, the control sequence designer uses the Sysmac Studio to create the SECS/GEM operation programming.
- Debugging

The debugger uses the host or a Host Simulator to debug the GEM setting data and SECS/GEM operation programming.

SECS/GEM Operation Programming

The SECS/GEM operation programming is the programming in the user program to perform SECS message communications with the host jointly with the GEM Services. Some SECS messages are processed automatically by the GEM Services and therefore do not require the user program and some SECS messages must be processed jointly by the GEM Services and the user program. Refer to 2-3 Overview of GEM Service Operation on page 2-7 for details on SECS messages that must be processed jointly by the GEM Services and the user program.

Equipment Control Programming

Equipment control programming is the programming to control the equipment in the user program. The control sequence designer designs the equipment control programming. The procedures and methods for control programming, task design, and wiring are the same as for an NJ-series Standard CPU Unit. Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for detailed operating procedures for an NJ-series Standard CPU Unit.

This section provides details on above steps 2 (creating the GEM setting data), 3 (creating the SECS/GEM operation programming), and 4 (debugging).

Using the SECS/GEM Configurator to 3-2 **Create the GEM Setting Data**

You use the SECS/GEM Configurator to create the GEM setting data and transfer it to the Controller. Use the following procedure to create the GEM setting data. The meaning of each setting and reference pages are also given.

Step No.	Setting	Description	Reference
1	Folder Setting	You set the computer folder in which to save the project data.	Folder Settings on page 8-26
2	Project Creation	You create a new project. You set the project name.	Project Creation on page 8-8
3	Importing Controller Variables	You use the Sysmac Studio to import previously defined global variables if you need to use them as controller variables.	Controller Variable on page 8-27
4	HSMS Commu- nications Set- tings	You set the conditions for HSMS communications.	8-8-1 HSMS Condition on page 8-43
5	Item Definitions	You set the item definitions.	8-9-1 Item on page 8-45
6	Variable Data Definitions	You set the definitions for equipment constants, status variables, and discrete variables.	8-9-2 Equipment Constant (EC) on page 8-47 8-9-3 Status Variable (SV) on page 8-50 8-9-4 Discrete Variable (DV) on page 8-53
7	State Model Settings	You make settings for the communications state model and control state model.	8-10-1 Communications State Model on page 8-58 8-10-2 Control State Model on page 8-59
8	GEM Capability Settings	You make settings for the GEM capabilities.	8-11 GEM Capability Settings on page 8-60
9	Message Settings	You make settings for GEM messages and user-defined messages.	8-12-1 GEM Standard Messages on page 8-95 8-12-2 User-defined Messages on page 8-96
10	GEM Service Log Settings	You set the numbers of records saved in the GEM Service logs.	8-7-1 GEM Service Log on page 8-42
11	Building	You check the set data for errors and create the GEM setting data.	Build on page 8-19
12	Controller Con- nection Settings	You set the conditions for connections between the host and Controller.	Connection Settings on page 8-21
13	Transferring the GEM Setting Data	You transfer the GEM setting data to the Controller.	Transfer to Controller on page 8-22



Precautions for Correct Use

Transfer Settings

You must make FTP settings on the Controller to transfer the GEM setting data from the SECS/GEM Configurator to the Controller. Set the FTP settings on the Controller to enable using the FTP server.

Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for the procedure to set the Controller FTP settings from the Sysmac Studio.

Setting Sequence

The conditions for the GEM capability settings that are related to the items depend on the formats, data sizes, and other item attributes set in the item definitions on the SECS/GEM Configurator. In addition, the link variable data types depend on the item attributes and GEM capability settings. Therefore, make the settings in the following order. If you use any other order, link variables may not be assigned correctly and errors may occur when you build the project.

1. Item definitions \rightarrow 2. Variable data definitions \rightarrow 3. GEM capability settings

Using the Sysmac Studio to Create 3-3 the SECS/GEM Operation Programming

You use the Sysmac Studio to create the SECS/GEM programming. Use the following procedure to create the programming.

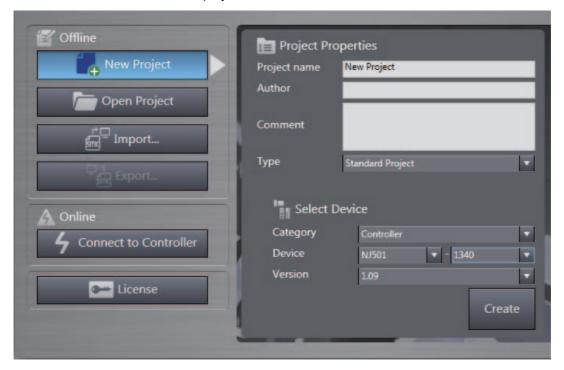
- Start the Sysmac Studio and create a project.
- Make the FTP settings.
- Create the SECS/GEM operation programming.

Details for each step in the procedure are provided below.

3-3-1 Starting the Sysmac Studio and Creating a Project

To start the Sysmac Studio, use the Windows Start Menu or double-click the Sysmac Studio shortcut icon on your desktop.

Enter the project name in the Project Window. Set the device to NJ501-1340 in the Select Device Area. Click the Create Button. A new project is created.



3-3-2 FTP Settings

FTP is used to transfer the GEM setting data from the SECS/GEM Configurator to the SECS/GEM CPU Unit. You must therefore make the FTP settings on the Sysmac Studio.

Use the following procedure to make the FTP settings.

- 1 Double-click Built-in EtherNet/IP Port Settings under Configurations and Setup Controller Setup in the Multiview Explorer and select *Edit*.
- **2** Make the FTP settings on the Built-in EtherNet/IP Port Setting Tab Page.



Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for details on the FTP settings on the Sysmac Studio.

3-3-3 Creating the SECS/GEM Operation Programming

The basic programming operations performed on the Sysmac Studio are the same as for an NJ-series Standard CPU Unit.

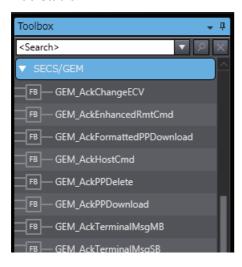
This section describes the processing procedures for SECS/GEM operation programming. Write the user program so that it performs the following processing.

Step No.	Processing	Meaning	Reference
1	Starting the GEM Ser-		4-1 Starting the GEM Ser-
	vices		vices on page 4-2
2	Ending the GEM Ser-	Executing a shutdown.	4-2 Ending the GEM Ser-
	vices		vices on page 4-3
3	Operation processing of	The operation conditions are set for the	5-1-1 Starting and Paus-
	the host connection	GEM Services and the host connection	ing the Host Connection
	function	function is operated.	Function on page 5-3
4	GEM capability process-	Processing is performed for the GEM capa-	5-5 GEM Capabilities on
	ing	bilities.*1	page 5-26

^{*1.} When you create the SECS/GEM operation programming and the link variables are already registered on the SECS/GEM Configurator, export the link variables from the SECS/GEM Configurator and import them to the Sysmac Studio.

You use the GEM instructions to create the SECS/GEM programming. For details, refer to the sample programs given in *A-1 GEM Instructions* on page A-3.

The GEM instructions are displayed in the SECS/GEM instruction category in the Toolbox on the Sysmac Studio.



Restrictions When Defining Link Variables for User-defined 3-3-4 **Variables**

The following restrictions apply when you define link variables for user-defined variables.

- · You cannot use the prohibited characters in the variable names. Refer to the NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) for details on the prohibited characters.
- · You cannot use the multi-byte characters in the variable names.
- You cannot use _ (an underline) as the first character in a variable name.
- The maximum size of a variable name is 127 bytes excluding the NULL character.
- You cannot use the following data types: LINT, ULINT, TIME, DATE, TIME OF DAY, DATE AND -TIME, structures, unions, and enumerations.
- Refer to 2-3-3 Link Variables on page 2-14 for the specified link variable attributes.

3-4 Debugging

You connect to the host or a Host Simulator to debug the GEM setting data and SECS/GEM operation programming.

The following debugging is performed when designing and commissioning the system.

Stage	Connection	Description
During design work	Host Simulator	You check to see if the GEM Services respond to test messages
		correctly according to host communications specifications.
When commission-	Host	You check the event logs,*1 GEM Service logs,*2 and status given
ing the system		in system-defined variables*3 to see if they are correct.

^{*1.} Refer to Section 9 Troubleshooting for details.

^{*3.} Refer to A-2 System-defined Variables on page A-211 for details.



Precautions for Correct Use

You can use the simulations on the Sysmac Studio to check the operation of the SECS/GEM operation programming. However, the GEM Services will not operate during simulation execution. Therefore, the following precautions apply.

- The system-defined variables that are related to GEM will not change from the default initial values for the data types.
- The user-defined variables that are related to GEM will not change from the initial values set in the variable table.
- If a GEM instruction is executed, only an input variable check is made without any consideration of the GEM Service status of the settings made on the SECS/GEM Configurator. If no problems are found, the instruction will end normally.



Additional Information

Use the following procedure to use the Host Simulator.

Meaning	Reference
Output an SML file from the SECS/GEM Configurator.	Create SML File on page 8-18
Read the SML file from the Host Simulator.	
Check the operation of the SECS messages on the Host Simulator	
	Output an SML file from the SECS/GEM Configurator. Read the SML file from the Host Simulator.

Ask where you purchased the Host Simulator for details on the Host Simulator.

^{*2.} Refer to Section 6 GEM Service Logs for details.



Functions Related to All GEM Services

This section describes functions that are related to all GEM Services, such as starting and stopping the GEM Services and the GEM Service status.

4-1	Starting the GEM Services		4-2
	4-1-1	Procedure to Change the GEM Service Status to Run	4-2
	4-1-2	Conditions That Prevent the GEM Service Status from Entering Run $\ \ldots \ \ldots$	4-2
4-2	Ending	g the GEM Services	4-3
	4-2-1	Executing a Shutdown	4-3
	4-2-2	Operation When Shutdown Processing Is Completed	4-3
4-3	GEM S	Service Status	4-4
	4-3-1	GEM Service Status	4-4
	4-3-2	Changes in the GEM Service Status	4-5
	4-3-3	Checking the GEM Service Status	4-6
	4-3-4	Relation between GEM Service Status and GEM Instructions	4-7

Starting the GEM Services

To start the GEM Services, you must change the GEM Service status to Run. Refer to 4-3 GEM Service Status on page 4-4 for the GEM Service status and the procedure to check the current GEM Service status.

4-1-1 Procedure to Change the GEM Service Status to Run

Use the following procedure to change the GEM Service status to Run.

Turn ON the power supply to the Controller.

The GEM Service status is Idle.

Change the operating mode of the CPU Unit to RUN mode. The GEM Service status changes to Initializing and then to Run.

When the GEM Services start, the following event is registered.

Event code	Event name	Level
95420000 hex	GEM Service Started	Information

4-1-2 **Conditions That Prevent the GEM Service Status from Entering** Run

The causes, corrections, and registered events when the GEM Service status does not change to Run are given in the following table.

Cause	Correction	Registered event
The GEM setting data is corrupted.*1	9-2 Errors Related to SECS/GEM	Invalid GEM Setting Data
	on page 9-3	(14E00000 hex)
The link variables used by the GEM Ser-	9-2 Errors Related to SECS/GEM	Illegal Variable Allocation
vices are not registered as global vari-	on page 9-3	(35400000 hex)
ables for the user program. Or, the		
registered attributes*2 are not the same.*1		
The GEM Service status is Stop.	Release Stop from the	No event is registered.
	SECS/GEM Configurator.	
A major fault has occurred.	Use the Troubleshooter to identify	The registered event depends on
	the cause and remove the cause.	the cause of the error.

^{*1.} The GEM Service status changes to Error.

^{*2.} The following five attributes are included: variable name, data type, constant, number of array dimensions, and number of array elements.

4-2 Ending the GEM Services

If you turn OFF the power supply to the CPU Unit while the GEM Services are in operation, the GEM setting data, GEM Service logs, or spool data may be corrupted. To prevent corruption, you must always end the GEM Services before you turn OFF the power supply to the CPU Unit.

You can use the following two methods to end the GEM Services.

- · Execute a shutdown.
- Change the operating mode of the CPU Unit to PROGRAM mode.

4-2-1 Executing a Shutdown

You can use the following two ways to execute a shutdown.

- · Execute the Shutdown GEM Service (GEM_Shutdown) instruction.
- Execute a shutdown from the SECS/GEM Configurator.

Executing the Shutdown GEM Service (GEM_Shutdown) Instruction

Use the following procedure to use the GEM_Shutdown instruction to execute a shutdown.

- **1** Execute the GEM_Shutdown instruction.
- 2 Confirm that the value of the _GEM_ServiceStatus.Shutdown system-defined variable changes to TRUE and then turn OFF the power supply to the CPU Unit.

Executing a Shutdown from the SECS/GEM Configurator

Select **GEM Service Operation – Shutdown** from Controller Menu of the SECS/GEM Configurator. Refer to **GEM Service Operation** on page 8-25 for details.



Precautions for Correct Use

- When you execute a shutdown, the GEM Service status changes to Shutdown. To change the GEM Service status from Shutdown back to Run, you must cycle the power supply to the CPU Unit.
- We recommend that you use a UPS (uninterruptible power supply) to prevent loosing file due
 to power interruptions. The capacity of the NJ-series NJ-P□3001 Power Supply Unit is not
 sufficient to maintain the power supply to the CPU Unit from when the power supply is interrupted until the GEM Services are shut down.

4-2-2 Operation When Shutdown Processing Is Completed

The following event is registered when shutdown processing is completed after you execute a shutdown.

Event code	Event name	Level
95430000 hex	Shutdown Completed	Information

GEM Service Status

There are different operating status for the GEM Services. The functions that you can use depend on the operating status. Therefore, to use the GEM Services you must be aware of the current operating status.

4-3-1 **GEM Service Status**

The following table describes the GEM Service status. The table gives the definition of each status and the system-defined variables that can be used.

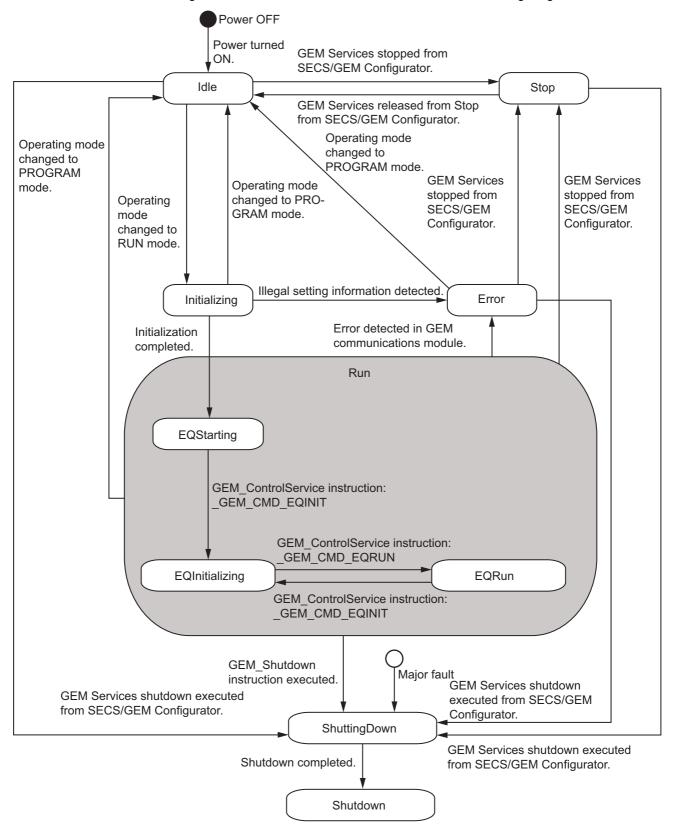
Operating status		Definition	System-defined variables
Idle		The GEM Services are not started.	*1
		CPU Unit is in PROGRAM mode.	
Ini	tializing	The GEM Services are reading the GEM setting data and checking	*1
		the data.	
Rι	in ^{*2}	The GEM Services are operating.	
	EQStarting	The GEM Services are started but not yet initialized.	Can be used.
	EQInitializing	Initialization of the host connection function, such as homing, is in	Can be used.
		progress.	
	EQRun	Host communications are possible.	Can be used.
Stop		The GEM Services are stopped, but not due to an error.	*1
		This status is used to download the GEM setting data from the	
		SECS/GEM Configurator.	
Error		The GEM Services are stopped due to an error.	*1
ShuttingDown		Processing to shut down the GEM Services is in progress.	*1
Shutdown		The GEM Services are shut down.	*1
		You can turn OFF the power supply to the Controller in this status.	

^{*1.} You can use only the _GEM_ServiceStatus system-defined variable. The values of all other GEM system-defined variables are undefined.

^{*2.} Refer to 5-1-1 Starting and Pausing the Host Connection Function on page 5-3 for details on Run.

4-3-2 Changes in the GEM Service Status

You can change the GEM Service status with SECS/GEM Configurator operations or with instruction execution. The changes in the GEM Service status are shown in the following diagram.



Checking the GEM Service Status 4-3-3

There are the following two ways to confirm the current GEM Service status.

- _GEM_ServiceStatus system-defined variable
- · GEM Service operations from the SECS/GEM Configurator

Checking with GEM ServiceStatus

The GEM ServiceStatus system-defined variable is a structure with ten members that give the operating status. The members with a value of TRUE indicate the current GEM Service status. The members of _GEM_ServiceStatus are given in the following table.

_GEM_ServiceStatus member	Name
Idle	Idle
Initializing	Initializing
Run ^{*1}	Run
EQStarting	EQStarting
EQInitializing	EQInitializing
EQRun	EQRun
Stop	Stop
Error	Error
ShuttingDown	ShuttingDown
Shutdown	Shutdown

^{*1.} The value of _GEM_ServiceStatus.Run will be TRUE for any of the following status: EQStarting, EQInitializing, or EQRun.

Confirming with the SECS/GEM Configurator

Use the GEM Service Operation Menu in the menu bar on the SECS/GEM Configurator. For details on the GEM Service Operation Menu, refer to GEM Service Operation on page 8-25.

4-3-4 Relation between GEM Service Status and GEM Instructions

The GEM instructions that you can use depend on the GEM Service status. The following table shows the GEM instructions and the GEM Service status in which you can use them.

	GEM Service Status								
		Run Shut-							
GEM instruction	ldle	Initial- izing	EQStart ing	EQIni- tializ- ing	EQRun	Stop	Error	ting- Down	Shut- down
GEM_Control			Usable	Usable	Usable				
Service			*1	*2	*1				
GEM_Shutdown			Usable	Usable	Usable	Usable	Usable		
GEM_GetComm				Usable	Usable				
Log									
GEM_SetHSMS				Usable	Usable				
Param									
GEM_Change					Usable				
CommState									
GEM_Change					Usable				
ControlState									
GEM_InitEvent				Usable					
GEM Report					Usable				
Event .									
GEM_Report					Usable				
Alarm									
GEM_AckHost					Usable				
Cmd									
GEM_Ack					Usable				
EnhancedRmt									
Cmd									
GEM_Change				Usable	Usable				
ECV									
GEM_Ack					Usable				
ChangeECV									
GEM_AckPP					Usable				
Delete									
GEM_Resp					Usable				
FormattedPP									
Upload									
GEM_RespPP					Usable				
Upload									
GEM_Upload					Usable				
FormattedPP									
GEM_UploadPP					Usable				
GEM_Ack					Usable				
FormattedPP									
Download									
GEM_AckPP					Usable				
Download					11. 11				
GEM_Request					Usable				
FormattedPP									
Download CEM Paguates					l lee'-l-				
GEM_RequestPP					Usable				
Download									

	GEM Service Status								
				Run				Shut-	
GEM instruction	Idle	Initial- izing	EQStart ing	EQIni- tializ- ing	EQRun	Stop	Error	ting- Down	Shut- down
GEM_SendPP					Usable				
Verify									
GEM_Send					Usable				
TerminalMsg									
GEM_Ack					Usable				
TerminalMsgSB									
GEM_Ack					Usable				
TerminalMsgMB									
GEM_Request					Usable				
ChangeTime									
GEM_SendEquip					Usable				
UserMsg									
GEM_RespHos-					Usable				
tUserMsg									

^{*1.} Usage is possible if _GEM_CMD_EQINIT is specified for the Cmd input variable.

^{*2.} Usage is possible if _GEM_CMD_EQRUN is specified for the Cmd input variable.

Host Connection Function

The host connection function is located between the host and the user program. This software handles SECS messages with the host and exchanges data with the user program. This section provides detailed information on the host connection function.

5-1	Basic	Processing of the Host Connection Function	. 5-3
	5-1-1	Starting and Pausing the Host Connection Function	5-3
	5-1-2	Interlocks	
	5-1-3	Transaction Processing	5-6
	5-1-4	Checking the Number of Buffered SECS Messages	. 5-12
5-2	HSMS	Communications	5-14
	5-2-1	Setting HSMS Conditions	. 5-14
	5-2-2	HSMS Communications Connection States	
	5-2-3	Checking the HSMS Communications State	
5-3	Item D	Definitions	5-17
5-4	Variab	ole Data Definitions	5-21
	5-4-1	Types of Variable Data	
	5-4-2	Link Variables for Variable Data	
	5-4-3	List Specifications for Variable Data	
	5-4-4	Standard Variable Data	
5-5	GEM (Capabilities	5-26
	5-5-1	Communications State Model	
	5-5-2	Control State Model	. 5-31
	5-5-3	Equipment Processing States	. 5-37
	5-5-4	Event Notification	. 5-40
	5-5-5	Error Messages	. 5-43
	5-5-6	Documentation	. 5-44
	5-5-7	Dynamic Event Report Configuration	. 5-45
	5-5-8	Variable Data Collection	. 5-48
	5-5-9	Trace Data Collection	. 5-49
	5-5-10	Status Data Collection	. 5-51
	5-5-11	Alarm Management	. 5-53
	5-5-12	Host Commands	
	5-5-13	Enhanced Remote Commands	
	5-5-14	Equipment Constants	. 5-62
	5-5-15	Process Program Management	. 5-66

	5-5-16	Material Movement	.5-87
	5-5-17	Equipment Terminal Service	.5-88
	5-5-18	Clock	.5-91
	5-5-19	Limit Monitoring	. 5-93
	5-5-20	Spooling	.5-96
5-6	Messa	ge Settings!	5-102
	5-6-1	GEM Standard Messages	5-102
	5-6-2	User-defined Messages	5-104

5-1 Basic Processing of the Host Connection Function

The host connection function must be started separately from the GEM Services. You can also temporarily stop the host connection function.

The basic processing performed by the host connection function includes the following.

- Interlocks
- · Transaction processing
- · Checking the number of buffered SECS messages

5-1-1 Starting and Pausing the Host Connection Function

You can use the following methods to start and temporarily stop the host connection function.

Starting the Host Connection Function

The host connection function can be used when the GEM Service status is EQRun. The procedure to start the host connection function is given below.

1 Specify EQInitializing and execute the GEM Service Control (GEM_ControlService) instruction. The GEM Service status changes to EQInitializing.

Non-retained status variables, non-retained discrete variables, and non-retained system-defined variables are set to their default settings.

2 Perform initial settings for the following items as required.

Item	Reference
HSMS conditions	5-2 HSMS Communications on page 5-14
Equipment constants	5-4 Variable Data Definitions on page 5-21
Status variables	5-4 Variable Data Definitions on page 5-21
Communications state model	5-5-1 Communications State Model on page
	5-27
Control state model	5-5-2 Control State Model on page 5-31
Interlock variables	5-1-2 Interlocks on page 5-5
Initialize event reports that are dynamically set by the	GEM_InitEvent on page A-38
host.	
Initialize the GEM capabilities.	5-5 GEM Capabilities on page 5-26

3 Specify EQRun and execute the GEM_ControlService instruction.

The GEM Service state will change to EQRun.



Precautions for Correct Use

The contents of the GEM setting data that is uploaded with the SECS/GEM Configurator is the same as the contents of the GEM setting data that was previously downloaded with the SECS/GEM Configurator. Even if the settings in the downloaded GEM setting data were changed by the user program or host, the changes will not be reflected in the uploaded GEM setting data.

Pausing the Host Connection Function

When the GEM Service status changes from EQRun to EQInitializing, the host connection function is temporarily stopped. The status is as follows while the host connection function is temporarily stopped:

- · Communications with the host stop.
- · Non-retained status variables and non-retained discrete variables are initialized.

To temporarily stop the host connection function, specify EQInitializing and execute the GEM Service Control (GEM_ControlService) instruction.

To restart the host connection function, execute steps 2 and 3 in the procedure to start the host connection function.

5-1-2 Interlocks

Interlocks prevent the equipment from executing processing requested by the host. An interlock is enabled by changing the value of the interlock variable for the relevant processing to TRUE in the user program. It is disabled when the value is changed to FALSE.

When an interlock is in effect, the host connection function returns a secondary message saying that processing is not possible for the primary message from the host.

The interlock variables and the processing that is performed when an interlock is in effect are given in the following table.

Interlock variable	Processing
_GEM_Interlock_ControlState	Going online is denied even if Request ON-LINE (S1,F17) is received
	from the host.
_GEM_Interlock_ECV	Changing an equipment constant is denied even if New Equipment
	Constant Send (S2,F15) is received from the host.
_GEM_Interlock_HostCmd	The host command is denied even if Host Command Send (S2,F41) is
	received from the host.
_GEM_Interlock_EnhancedRmtCmd	The enhanced host command is denied even if Enhanced Remote
	Command (S2,F49) is received from the host.
_GEM_Interlock_PP	Processing is denied even if the following SECS messages are
	received from the host.
	Process Program Request (S7,F5)
	Formatted Process Program Request (S7,F25)
	Process Program Load Inquire (S7,F1)
	Process Program Send (S7,F3)
	Formatted Process Program Send (S7,F23)
	Delete Process Program Send (S7,F17)
_GEM_Interlock_Time	Changing the equipment clock is denied even if Date and Time Set
	Request (S2,F31) is received from the host.



Precautions for Correct Use

The requested processing may be performed for processing requests received from the host immediately after the value of the interlock variable changes to TRUE. Set interlock variables as soon as possible.

5-1-3 **Transaction Processing**

The series of processing that is performed by the SECS/GEM CPU Unit for a SECS message is called transaction processing. Some transactions are processed jointly by the host connection function and the user program, and others are processed only by the host connection function. For the transactions that are processed jointly by the host connection function and user program, you can use the following variables in the user program to check the transaction processing state, processing result, and processing result factor. The values of these variables are updated by the host connection function.

Variable type	Meaning	Data type	Meanings of values
Transaction processing flag	Transaction process-	BOOL	TRUE: Transaction processing is in progress.
	ing state		FALSE: Transaction processing is not in prog-
			ress.
Transaction processing	Transaction process-	Structure	Refer to the following table.
result variable	ing result and result		
	factor		

The members of the transaction processing result variable are given in the following table.

Mem- ber	Meaning	Data type	Meanings of values	Description
Rslt	Processing	BOOL	TRUE: Successful	
	result		FALSE: Failed	
Rslt	Processing	WORD	16#0000: Successful	
Code	result		16#0100: Transmis-	The communications state was DISABLED or
	factor		sion error	NOT COMMUNICATING when the primary message was received.
				The control state was OFF-LINE when the primary message was received.
				The spool status was SPOOL ACTIVE when the primary message was received.
			16#0200: Reception	A T3 timeout occurred while reception of the sec-
			error	ondary message is awaited. *1
				The communications state changed to DISABLED while reception of the secondary message is awaited.
				The control status changed to OFF-LINE while the secondary message is awaited.
				The received secondary message exceeded the
				maximum size of a SECS message. *2
				The message structure of the received secondary
				message was not correct. *3
			16#0300 or higher:	This depends on the transaction result processing
			Specific errors	variable. Refer to A-2 System-defined Variables on
				page A-211 for details.

^{*1.} The host connection function sends Transaction Timer Timeout (S9,F9).

^{*2.} The host connection function sends Data Too Long (S9,F11).

^{*3.} The host connection function sends Illegal Data (S9,F7).

Transaction processing is different when the host sends the primary message in comparison with when the equipment sends the primary message.

When Host Sends the Primary Message

Transaction processing is as described below when the host sends the primary message.

- **1** The host sends the primary message.
- The host connection function determines if the received primary message is normal.
 The normal/error results and factors, and the host connection function processing for each, are given in the following table.

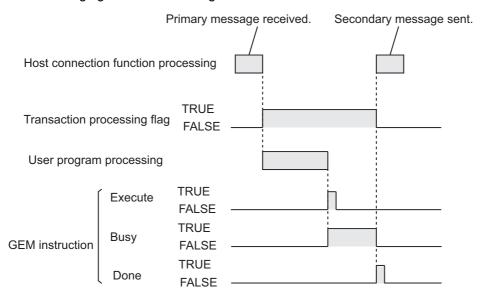
Result	Factor	Host connection function processing
Normal		Changes the transaction processing flag to TRUE.
Error*1	The message structure of the primary message from the host is nonstandard.	Sends Unrecognized Function Type (S9,F5) to the host.
	The communications state was DISABLED when the primary message was received from the host.	The primary message is discarded.
	The control state was OFF-LINE when the primary message was received from the host.	Sends Abort Transaction (S7,F0) to the host.
	The stream number in the primary message from the host is not supported by the GEM Services.	Sends Unrecognized Stream Type (S9,F3) to the host.
	The function number in the primary message from the host is not supported by the GEM Services.	Sends Unrecognized Function Type (S9,F5) to the host.
	The W bit setting in the primary message from the host is OFF.	Sends Unrecognized Function Type (S9,F5) to the host.
	The primary message from the host was disabled on the SECS/GEM Configurator. *2	Sends Unrecognized Function Type (S9,F5) to the host.
	The message structure or format of the primary message from the host is different from the structure or format set in the SECS/GEM Configurator.	Sends Illegal Data (S9,F7) to the host.
	SECS message-specific factors	Refer to information on individual GEM capabilities.

^{*1.} The same error determination is executed for all primary messages from the host.

- **3** The host connection function changes the value of the transaction processing flag for the received primary message.
- **4** The user program detects that the value of the transaction processing flag is TRUE.
- **5** The user program processes the primary message and executes a GEM instruction.
- **6** The host connection function changes the value of the transaction processing flag to FALSE.
- **7** The host connection function returns a secondary message.

^{*2.} Settings to enable and disable primary messages are checked for GEM standard messages and user-defined messages.

The following figure shows a timing chart.





Precautions for Correct Use

If the next primary message is received after the equipment receives a primary message but before it returns the secondary message, the user program detects reception of the second primary message only after the secondary message is returned for the first primary message.

The transaction processing flags that are used when the host sends the primary message are given in the following table. Both the SECS messages that change the values of the transaction processing flags to TRUE and the GEM instructions that change the values of the transaction processing flags to FALSE are given.

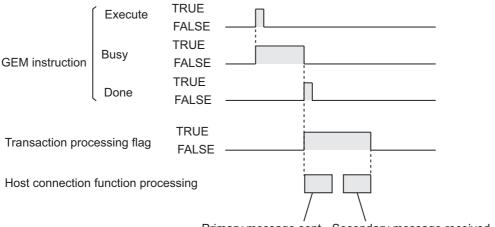
Transaction P	rocessing Flag	SECS message	GEM instruction	
Variable	Name	3EC3 message	GEW IIISU UCUOII	
_GEM_BusyHost	Host-initiated Equipment	New Equipment Constant	GEM_AckChangeECV	
ChangeECV	Constant Change	Send (S2,F15)		
_GEM_BusyHostCmd	Host Command	Host Command Send	GEM_AckHostCmd	
		(S2,F41)		
_GEM_BusyEnhanced	Enhanced Remote	Enhanced Remote Com-	GEM_AckEnhanced	
RmtCmd	Command	mand (S2,F49)	RmdCmd	
_GEM_BusyHostPP	Host-initiated Process	Delete Process Program	GEM_AckPPDelete	
Delete	Program Deletion	Send (S7,F17)		
_GEM_BusyHost	Host-initiated Formatted	Formatted Process Pro-	GEM_Resp	
FormattedPPUpload	Process Program Upload	gram Request (S7,F25)	FormattedPPUpload	
_GEM_BusyHostPP	Host-initiated Process	Process Program Request	GEM_RespPPUpload	
Upload	Program Upload	(S7,F5)		
_GEM_BusyHost	Host-initiated Formatted	Formatted Process Pro-	GEM_Ack	
FormattedPP	Process Program	gram Send (S7,F23)	FormattedPP	
Download	Download		Download	
_GEM_BusyHost	Host-initiated Process	Process Program Send	GEM_AckPP	
PPDownload	Program Download	(S7,F3)	Download	
_GEM_BusyHost	Host-initiated Single-block	Terminal Display, Single	GEM_AckTerminalMsg	
TerminalMsgSB	Terminal Message	(S10,F3)	SB	
_GEM_BusyHost	Host-initiated Multi-block	Terminal Display,	GEM_AckTerminalMsg	
TerminalMsgMB	Terminal Message	Multi-block (S10F5)	MB	
_GEM_BusyHostUser	Host-initiated	Host-initiated	GEM_SendHostUser	
Msg	User-defined Message	User-defined Message	Msg	
		(Sx,Fy)		

When Equipment Sends the Primary Message

Transaction processing is as described below when the equipment sends the primary message.

- 1 A GEM instruction is executed in the user program.
- When execution of the GEM instruction is completed, the GEM Service changes the value of the transaction processing flag for the GEM instruction to TRUE.
- The host connection function sends the primary message.
- The host returns the secondary message.
- The host connection function receives the secondary message.
- The host connection function changes the value of the transaction processing flag to FALSE.
- The user program detects that the value of the transaction processing flag is FALSE.
- The user program uses the transaction processing result variable to check the results of transaction processing.

The following figure shows a timing chart.



Primary message sent. Secondary message received.

The value of the transaction processing flag changes to FALSE regardless of whether transaction processing ends normally or end in an error.

The transaction processing flags and the transaction processing result variables that are used when the equipment sends the primary message are given in the following table. Both the GEM instructions that change the values of the transaction processing flags to TRUE and the SECS messages that change the values of the transaction processing flags to FALSE are given.

Transaction p	Transaction processing flag Transaction processing result variable		GEM instruction	SECS message	
Variable	Name	Variable	Name		
_GEM_Busy EquipChange Time	Equipment- initiated Time Change	_GEM_Equip ChangeTime Rslt	Equipment- initiated Time Change Results	GEM_Request ChangeTime	Date and Time Data (S2,F18)
_GEM_Busy Equip FormattedPP Upload	Equipment- initiated Formatted Process Program Upload	_GEM_Equip FormattedPP UploadRslt	Equipment- initiated Formatted Process Program Upload Results	GEM_Upload FormattedPP	Formatted Process Program Acknowl- edge (S7,F24)
_GEM_Busy EquipPP Upload	Equipment- initiated Process Program Upload	_GEM_Equip PPUploadRsIt	Equipment- Initiated Process Program Upload Results	GEM_UploadPP	Process Program Acknowledge (S7,F4)
_GEM_Busy Equip FormattedPP Download	Equipment- initiated Formatted Process Program Download	_GEM_Equip FormattedPP DownloadRslt	Equipment- initiated Formatted Process Program Download Results	GEM_Request FormattedPP Download	Formatted Process Program Data (S7,F26)
_GEM_Busy EquipPP Download	Equipment- initiated Process Program Download	_GEM_Equip PPDownload Rslt	Equipment- initiated Process Program Download Results	GEM_Request PPDownload	Process Program Data (S7,F6)
_GEM_Busy Equip TerminalMsg	Equipment- initiated Terminal Message	_GEM_Equip TerminalMsg Rslt	Equipment- initiated Terminal Message Results	GEM_Send TerminalMsg	Terminal Request Acknowledge (S10,F2)
_GEM_Busy EquipUser Msg	Equipment- initiated User-defined Message	_GEM_Equip UserMsgRsIt	Send Equipment- initiated User-defined Message Results	GEM_Send EquipUserMsg	Equipment- initiated User-defined Message (Sx,Fy+1)

Checking the Number of Buffered SECS Messages 5-1-4

Processing of GEM Services is performed in the system services of the SECS/GEM CPU Unit. The execution priority of the system services is lower than the execution priority of the primary periodic task and priority-16 periodic task. Other than processing for the GEM Services, the system services also provide the USB port service, built-in EtherNet/IP port service, and other services. Therefore, transmission delays will occur if a lot of SECS messages are sent and received. SECS messages for which there are delays are buffered until they are sent.

Refer to the NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) for details on system services and the execution priority of processes.

System-defined Variables for Number of Buffered SECS Messages

You can check the number of buffered SECS messages with the following system-defined variables.

Variable	Meaning	Data type	Range of values
_GEM_EquipMsgBuf	Equipment-initiated Message Bufferings	USINT	0 to 32
_GEM_HostMsgBuf	Host-initiated Message Bufferings	USINT	0 to 16

Operation When Number of Buffered Messages Exceeds Allowed

Operation when the number of buffered equipment-initiated messages exceeds the allowed value is described in the following table.

Item	Operation
Event log	The Send Transaction Queue Overrun (66000000 hex) observation is
	recorded in the event log.
Instruction execution	The instruction ends in an error with error code 16#381B (Insufficient
	Transaction Resource).
Sending SECS messages to the host	The messages are not sent.
Receiving SECS messages from the	The messages are received normally.
host	

Operation when the number of buffered host-initiated messages exceeds the allowed value is described in the following table.

Item	Operation	
Event log	The Receive Transaction Queue Overrun (66010000 hex) observation	
	is recorded in the event log.	
Instruction execution	The instruction is executed normally.	
Receiving SECS messages from the	After the message is received, Abort Transaction (Sx,F0) is sent in	
host	reply.*1	
User program notification	The user program is not notified that the allowable number of buffered	
	transactions was exceeded.	

^{*1.} The stream number is the same as the stream number of the SECS message received from the host.

How to Reduce the Number of Buffered SECS Messages

The effective ways to reduce the number of buffered SECS messages are as follows:

- Reduce the frequency of communications with the host.
- · Reduce the task execution time ratio.

Refer to A-4 Designing Tasks to Use the GEM Services on page A-231 for details on how to adjust the task execution time ratio.

HSMS Communications **5-2**

HSMS communications conforms to SEMI E37.10702 (High-speed SECS Message Service Single Selected-Session Mode) (HSMS-SS or HSMS-SSS).

5-2-1 **Setting HSMS Conditions**

There are the following two modes for establishing a TCP/IP connection between the host and equipment.

- Passive Mode: The host sends a connection request.
- Active Mode: The equipment sends a connection request.

The HSMS condition settings are different for Passive Mode and Active Mode.

You can use either the SECS/GEM Configurator or the Set HSMS Communications Parameters (GEM_SetHSMSParam) instruction to set the HSMS conditions.

Setting with the SECS/GEM Configurator

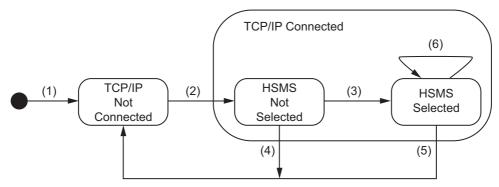
You can set the HSMS conditions with the SECS/GEM Configurator. Refer to 8-8-1 HSMS Condition on page 8-43 for details on the settings.

Executing the GEM SetHSMSParam Instruction

You can execute the GEM_SetHSMSParam instruction to set the HSMS conditions. The settings in the instruction are applied when the GEM Service status changes to EQRun. Refer to A-1 GEM Instructions on page A-3 for information on the instruction.

5-2-2 HSMS Communications Connection States

The HSMS communications connection states operate according to the following HSMS state machine.



The state transition triggers and equipment operation in Passive Mode are described in the following table. The numbers in the table correspond to the numbers in the figure.

None
T7 timeout timer is started.
T7 timeout is canceled and Select.rep
with a Selected Status of 0 is sent.
The TCP/IP connection is closed.
The TCP/IP connection is closed.
The data transaction is canceled
while the TCP/IP connection is not
ended.
For a primary message, Transaction
Timer Timeout (S9,F9) is sent.

The state transition triggers and equipment operation in Active Mode are described in the following table.

No.	Current state	Trigger	New state	Operation
(1)		Initialization	TCP/IP NOT CONNECTED	None
(2)	TCP/IP NOT CONNECTED	A connection is determined.	HSMS NOT SELECTED	TCP/IP ConnectSelect.req is sent.T6 timeout timer is started.
(3)	HSMS NOT SELECTED	Select.rep with a Selected Status of 0 is received.	HSMS SELECTED	T6 timeout is canceled.
(4)	HSMS NOT SELECTED	HSMS selection failed. The GEM Service status changed to a status other than EQRun.	TCP/IP NOT CONNECTED	The TCP/IP connection is closed.T5 timeout timer is started.
(5)	HSMS SELECTED	TCP/IP communications end. The GEM Service status changed to a status other than EQRun.	TCP/IP NOT CONNECTED	The TCP/IP connection is closed.
(6)	HSMS SELECTED	T3 timeout occurs.	HSMS SELECTED	 The data transaction is canceled while the TCP/IP connection is not ended. For a primary message, Transaction Timer Timeout (S9,F9) is sent.

To check the connection status in HSMS SELECTED state, the GEM Service periodically sends a link test request control message (Linktest.req).

If the GEM Service status is not EQRun, the HSMS communications state is always TCP/IP NOT CONNECTED.

5-2-3 **Checking the HSMS Communications State**

Use the following system-defined variables to check the HSMS communications state. Refer to A-2 System-defined Variables on page A-211 for details on system-defined variables.

Variable	Name	Function
_GEM_HSMSState	HSMS Communications	Gives the HSMS communications
	State	connection state.
_GEM_HSMSError	HSMS Communications	Indicates errors detected by the
	Error	HSMS.
_GEM_HSMSParam	HSMS Communications	Gives the active HSMS
	Parameters	communications settings.

5-3 Item Definitions

An item is a data element in a SECS message. You can check item definitions with **Data Definition** - **Item Definition** on the Tools Menu of the SECS/GEM Configurator. You can change the format or data size of some of the items on the SECS/GEM Configurator.

The names, meanings, formats, and data sizes of the items are given in the following table along with whether the values can be changed. The data size is given in the *Data size* column only when it is not implicit from the format. Refer to *A-3 Correspondence between Formats and Data Types* on page A-230 for the format codes and meanings, and the corresponding data types handled by the NJ-series CPU Units.

Item name	Meaning	Value changes	Format	Data size [bytes]
ABS	Any binary string	Not allowed.	В	1,024 max.
ACKC5	Acknowledge code	Not allowed.	В	1
ACKC6	Acknowledge code	Not allowed.	В	1
ACKC7	Acknowledge code	Not allowed.	В	1
ACKC7A	Acknowledge code	Not allowed.	U1	1
ACKC10	Acknowledge code	Not allowed.	В	1
ALCD	Alarm code	Not allowed.	В	1
ALED	Alarm enable/disable code	Not allowed.	В	1
ALID	Alarm identification	Allowed.	U1, U2, or U4 ^{*1}	
ALTX	Alarm text	Allowed.	Α	120 max.
CCODE	Command code	Allowed.	A, I2, I4, U2, or U4	4 max. when the format is A
CEED	Collection event or trace enable/disable code	Not allowed.	BOOLEAN	
CEID	Collection event ID	Allowed.	U1, U2, or U4 ^{*1}	
CEPACK	Command Enhanced Parameter Acknowledge	Not allowed.	U1*2	
CEPVAL	Command Enhanced Parameter Value	Not allowed.	B, BOOLEAN, A, I1, I2, I4, F8, U1, U2, or U4*1*2*3*4*5	
COMMACK	Establish Communications Acknowledge Code	Not allowed.	В	1
CPACK	Command Parameter Acknowledge Code	Not allowed.	В	1
CPNAME	Command Parameter Name	Allowed.	A	60 max.
CPVAL	Command Parameter Value	Not allowed.	B, BOOLEAN, A, I1, I2, I4, U1, U2, or U4*1*3*4*5	
DATAID	Data ID	Allowed.	U1, U2, or U4 ^{*1}	
DATALENGTH	Total bytes to be sent	Allowed.	U1, U2, or U4 ^{*1}	
DRACK	Define Report Acknowledge Code	Not allowed.	В	1
DSPER	Data sample period	Not allowed.	Α	6,8
EAC	Equipment acknowledge code	Not allowed.	В	1
ECDEF	Equipment constant default value	Not allowed.	Same as format for target ECV.	
ECID	Equipment constant ID	Not allowed.	Same as format of VID.	

Item name Meaning		Value	Format	Data size [bytes]
ECMAX	Equipment constant maxi-	changes Not allowed.	Same as format for	
LOWIN DX	mum value	Not allowed.	target ECV.	
ECMIN	Equipment constant mini-	Not allowed.	Same as format for	
	mum value		target ECV.	
ECNAME	Equipment constant name	Allowed.		60
ECV	CV Equipment constant value		B, BOOLEAN, A, I1,	
			12, 14, F4, F8, U1, U2,	
			or U4 ^{*1*3*4*6}	
EDID	Expected data identification	Not allowed.	Same as format of	
			PPID.	
ERACK	Enable/Disable Event Report	Not allowed.	В	1
	Acknowledge Code			
ERRW7	Text string describing error	Allowed.	Α	80
FONID	found in process program	Niet ellerred	114	
FCNID GRANT	Function Identification Grant code	Not allowed.	U1	1
		Not allowed.	В	1
HCACK	Host Command Parameter Acknowledge Code	inot allowed.	В	
LENGTH	Length of the service pro-	Allowed.	114 110 114*1	
LLINOTTI	gram or process program in	Allowed.	U1, U2, or U4 ^{*1}	
	bytes			
LIMITACK	Acknowledgement code for	Not allowed.	В	1
	variable limit attribute set			
LIMITID	The identifier of a specific	Not allowed.	В	1
	limit in the set of limits for a			
	variable to which the corre-			
	sponding limit attributes refer	Not allowed.		
LIMITMAX			Same as format for	
	for the limit values of a spe-		monitoring target SV.	
LIBAITRAINI	cific variable	Not allowed.	Same as format for	
LIMITMIN	The minimum allowed value for the limit values of a spe-			
	cific variable		monitoring target 3v.	
LOWERDB	A variable limit attribute			
201121133			monitoring target SV.	
	boundary of the deadband of		3 3 3	
	a limit			
LRACK	Link Report Acknowledge	Not allowed.	В	1
	code			
LVACK	Variable limit definition	Not allowed.	В	1
	acknowledge code			
MDLN	Equipment Model Type	Allowed.		20
MEXP	Message expected in the	Not allowed.	Α	6
	from Sxx,Fyy where x is			
MHEAD	stream and y is function		D	10
MHEAD	SECS message block header associated with mes-	Not allowed.	В	10
	sage block in error			
OBJSPEC			80	
internal format and that is				
	used to point to a specific			
	object instance			
OFLACK	Acknowledge code for	Not allowed.	В	1
	OFF-LINE request			

		Malara		
Item name	Meaning	Value changes	Format	Data size [bytes]
ONLACK	Acknowledge code for ON-LINE request	Not allowed.	В	1
PPARM	Process Parameters	Not allowed.	BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4*1*4*7	
PPBODY	Process program body	Not allowed.	B, A, I1, I2, I4, U1, U2, or U4*1*4*7	
PPGNT	Process program grant status	Not allowed.	В	1
PPID	Process program ID	Allowed.	Α	120
RCMD	Remote command code or string	Allowed.	А	20
REPGSZ	Reporting group size	Allowed.	U1, U2, or U4 ^{*1}	
RPTID	Report ID	Allowed.	U1, U2, or U4 ^{*1}	
RSDA	Request Spool Data Acknowledge	Not allowed.	B	1
RSDC	Request Spool Data Code	Not allowed.	U1	
RSPACK	Reset Spooling Acknowl-	Not allowed.	В	1
SEQNUM	The value which indicates the position in the list of processing commands	Not allowed.	U2	
SHEAD	Stored header related to the transaction timer	Not allowed.	В	10
SMPLN	Sample Number	Allowed.	U1, U2, or U4 ^{*1}	
SOFTREV	Software revision code	Allowed.	A	20
STIME	Sample time	Not allowed.	Α	12 or 16
STRACK	Spool Stream Acknowledge	Not allowed.	В	1
STRID	Stream Identification	Not allowed.	U1	
SV	Status variable value	Not allowed.	L, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4*1*3*4*6	
SVID	Status variable ID	Not allowed.	Same as format of VID.	
SVNAME	Status Variable Name	Allowed.	Α	60
TEXT	A single line of characters	Allowed.	A*1*3	240
TIAACK	Equipment acknowledge- ment code	Not allowed.	В	1
TIACK	Time Acknowledge Code	Not allowed.	В	1
TID	Terminal number	Not allowed.	В	1
TIME	Time of day	Not allowed.	Α	12 or 16
TOTSMP	Total samples to be made	Allowed.	U1, U2, or U4 ^{*1}	
TRID	Trace request ID	Allowed.	U1, U2, or U4 ^{*1}	
UNITS	Unit Identifier	Allowed.	Α	20
UPPERDB	A variable limit attribute which defines the upper boundary of the deadband of a limit	Not allowed.	L, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4	
V	Variable data	Not allowed.	L, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4*1*3*4*6	
VID	Variable ID	Allowed.	U1, U2, or U4 ^{*1}	
	Variable 1D		1 , , -	I.

Item name	Meaning	Value changes	Format	Data size [bytes]
VLAACK	Variable Limit Attribute Acknowledge Code	Not allowed.	В	1

- *1. The U8 format specified in the SECS/GEM standard is not supported.
- *2. The list format specified in the SECS/GEM standard is not supported.
- *3. The JIS-8 format specified in the SECS/GEM standard is not supported.
- *4. The I8 format specified in the SECS/GEM standard is not supported.
- *5. With remote control, you can specify a different format for each variable.
- *6. With the data definitions, you can specify a different format for each variable.
- *7. With process program management, you can specify a different format for each variable.

5-4 Variable Data Definitions

Variable data indicates the settings for the host connection function and the operating status. You can check the contents of variable data with *Data Definition* on the Tools Menu of the SECS/GEM Configurator.

5-4-1 Types of Variable Data

The following table lists the three types of variable data.

Variable data	Meaning	Maximum number registered
Equipment constants (EC)	These variables are changed by the host.	512 ^{*1}
Status variables (SV)	These variables always hold valid information. They cannot be changed from the host.	*1
Discrete variables (DV)	These variables are valid only when specific events occur.	*1

^{*1.} You can register a total of 1,024 equipment constants (EC), status variables (SV), and discrete variables (DV).

There are also two types of variable data depending on who defines the variables: standard variables and user-defined variables.

Definition	Meaning
Standard variables	These variables are defined by the host connection function as standard features.
User-defined variables	You define the formats and data sizes on the SECS/GEM Configurator.

5-4-2 Link Variables for Variable Data

Link variables for standard variable data are registered as system-defined variables. You use the SECS/GEM Configurator to assign link variables of the correct data type for the format to user-defined variable data.

The specifications for link variable attributes and initialization are described in the following table.

Variable data		Link variable		
Type Definition	Definition	Attributes		Initialization
туре	Deminion	Retain	Constant	iiiitalizatioii
Equipment	Standard	Yes	Yes	The variables are initialized when the GEM Services
constants	variables			are started after the variables are transferred from
	User-defined			the SECS/GEM Configurator.
	variables			To initialize the variables while the host connection
				function is operating, execute the Change Equip-
				ment Constant (GEM_ChangeECV) instruction
				while the GEM Service status is EQInitializing.
Status vari-	Standard	No	*1	The system-defined status variables that have a Con-
ables	variables			stant attribute are initialized by the GEM Services. You
	User-defined		No	must initialize the other variables in the user program
	variables			at startup.
Discrete vari-	Standard	No	No	You must initialize these variables in the user program
ables	variables			as required.
	User-defined			
	variables			

^{*1.} This depends on the variable data.

5-4-3 **List Specifications for Variable Data**

You can define lists in the format for a user-defined status variable or discrete variable. There are two types of lists: lists of fixed length data and lists of length-variable data. Also, you can nest lists. You can nest lists within lists. You can create a total of up to three nesting levels for lists of fixed length data and lists of length-variable data. You cannot nest a list of length-variable data inside a list of length-variable

The specifications of list structures are given in the following table.

Item	Specification
Maximum number of list structures that can be defined	64
Maximum number of items registered in one list structure	64
Maximum size of variable data in a list structure [Kbytes]	2

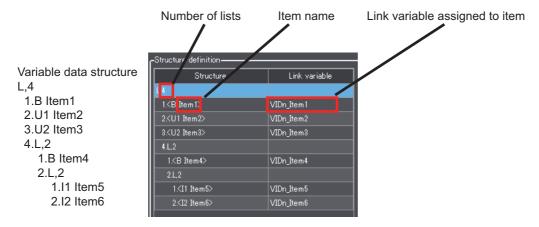
Lists of Fixed Length Data

For a list of fixed length data, you set the items for each list. Number of lists indicates the number of items in the level that is directly below a list structure level. For example, if the structure of a level that is a list of fixed length data is <L,4>, there are four items in the level that is immediately below it, so the number of lists is given as 4. You can set a different format for each item in a list. The specifications for a list of fixed length data are given in the following table.

Item	Specification
Number of lists	0 to 64

In a list of fixed length data, a link variable is assigned to store the value separately for each item in the list.

The following example shows a variable data structure on the SECS/GEM Configurator for a list of fixed length data with three nesting levels and a link variable assigned for each item.



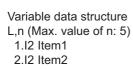
Lists of Length-variable Data

For the list of length-variable data, you set items to be changeable. All items in the list have the same format. The specifications for a list of length-variable data are given in the following table.

Item	Specification
Number of lists	1 to 64

For a list of length-variable data, a link variable to store the number of items and a shared array link variable to store the item values are assigned. The number of array elements must be equal to the maximum number of items.

The following example shows an example on the SECS/GEM Configurator for variable data items in a list of length-variable data and link variable assignments. The variable *VIDm_List1* stores the number of items in the list of length-variable data, and the variable *VIDm_Item1* stores the values of the items. The data type of *VIDm_Item1* is *ARRAY[0..4] OF INT*.







5-4-4 **Standard Variable Data**

The names, meanings, formats, and data sizes of the standard variable data are given in the following tables along with whether the values can be changed.

The data size is given in the Data size column only when it is not implicit from the format.

Refer to A-3 Correspondence between Formats and Data Types on page A-230 for the format codes and meanings, and the corresponding data types handled by the NJ-series CPU Units.

Equipment Constant (EC) Definitions

The names, meanings, and formats of the standard variable data are given in the following table along with whether the values can be changed from the SECS/GEM Configurator.

Equipment constant name	Meaning	Value changes	Format
EnableSpooling	Enable/Disable spooling	Not allowed.	BOOLEAN
EstablishCommunicationsTimeout	The interval between attempts to send S1F13 when establishing communications	Not allowed.	U2
MaxSpoolTransmit	The maximum number of messages to be sent from the spool	Not allowed.	U4
OverWriteSpool	Indicates whether to overwrite data or to stop spooling whenever the spool area limits are exceeded.	Not allowed.	BOOLEAN
TimeFormat	Time format	Allowed.	U1, U2, U4

Status Variable (SV) Definitions

The names, meanings, formats, and data sizes of the standard status variable data are given in the following table along with whether the values can be changed from the SECS/GEM Configurator.

Status variable name	Meaning	Value changes	Format	Data size [bytes]
AlarmsEnabled	The list of alarms (ALIDs) enabled for reporting	Not allowed.	Same as format of ALID.	
AlarmsSet	The list of alarms (ALIDs) currently occur	Not allowed.	Same as format of ALID.	
CLOCK	Present clock time	Not allowed.	Α	12 or 16 ^{*1}
ControlState	The current control state of the equipment	Not allowed.	U1	
EventsEnabled	The list of events (CEIDs) enabled for reporting	Not allowed.	Same as format of CEID.	
PPExecName	The PPID(s) of the currently selected Process Program(s).	Not allowed.	Same as format of PPID.	
PPFormat	The type(s) of supported process programs	Not allowed.	U1	
ProcessState	The current processing state of the equipment	Not allowed.	U1	
PreviousProcessState	The previous processing state of the equipment	Not allowed.	U1	
SpoolCountActual	A count of the messages actually contained in the spool area	Allowed.	U1, U2, or U4	

Status variable name	Meaning	Value changes	Format	Data size [bytes]
SpoolCountTotal	The total number of messages that can be saved in the spool area	Allowed.	U1, U2, or U4 ^{*2}	
SpoolFullTime	The timestamp from the time the spool last became full	Not allowed.	A	12 or 16 ^{*1}
SpoolStartTime	The timestamp from the time spooling last became active	Not allowed.	A	12 or 16 ^{*1}

^{*1.} The data length is determined by the value of the *TimeFormat* equipment constant.

Discrete Variable (DV) Definitions

The names, meanings, formats, and data sizes of the standard discrete variable data are given in the following table along with whether the values can be changed from the SECS/GEM Configurator.

Discrete variable name	Meaning	Value changes	Format
AlarmID	The current alarm identification	Not allowed.	Same as format of ALID.
EventLimit	A list of LIMITIDs whose limits are reached or crossed	Not allowed.	Same as format of LIMITID.
LimitVariable	The VID for the variable whose value exceeded limit monitoring zones	Not allowed.	Same as format of VID.
OperatorCommand	A command issued by the operator	Allowed.	U1, U2, or U4
PPChangeName	The PPID which was affected by a creation, editing, or deletion of a Process Program by an operator	Not allowed.	Same as format of PPID.
PPChangeStatus	The action taken on the Process Program	Not allowed.	U1
TransitionType	The direction of the zone transition which has occurred	Not allowed.	В

^{*2.} The total number of messages that can be saved in the spool area depends on the format. If the format is U1, 255 messages can be saved. If the format is U2 or U4, 1,000 messages can be saved.

GEM Capabilities 5-5

The GEM capabilities achieve functions specified in the SECS/GEM standards. Except for the automatic processing that is performed by the host connection function, you must use GEM instructions to intentionally perform processing to achieve GEM capabilities. Some GEM capabilities require that you set items on the SECS/GEM Configurator.

The following functions are implemented in the SECS/GEM CPU Unit to achieve GEM capabilities.

- · Communications State Model
- · Control State Model
- · Equipment Processing States
- · Event Notification
- · Error Messages
- Documentation
- · Dynamic Event Report Configuration
- · Variable Data Collection
- · Trace Data Collection
- · Status Data Collection
- · Alarm Management
- · Host Commands
- · Enhanced Remote Commands
- · Equipment Constants
- · Process Program Management
- · Material Movement
- · Equipment Terminal Services
- Clock
- · Limit Monitoring
- · Spooling

5-5-1 Communications State Model

The communications state model is based on the Host-Initiated S1,F13/F14 Scenario fundamental GEM requirement and on the Establish Communications additional GEM capability.

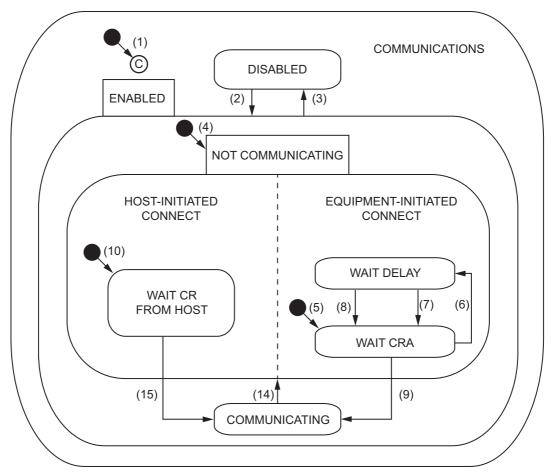
The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-10-1 Communications State Model on page 8-58
Creating the user program on the Sysmac Studio	Required.	This section

Communications State Model

The GEM Service communications states operate according to the following communications state model. The host connection function manages state transitions in the communications state model. You do not need to manage state transitions for the communications state model.

State transitions in the communications state model occur when the GEM Service status is EQRun. If the GEM Service status is not EQRun, the communications model state is always DISABLED.



The triggers, resulting equipment operation, and comments for the above transitions are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Operation	Comment
(1)	(Entry to COMMUNI- CATIONS)	The GEM Service state changes to EQRun.	Default*1	None	
(2)	DISABLED	The Change Communications State (GEM_ChangeCommState) instruction is executed and the communications state changes to ENABLED.	ENABLED	None	SECS-II communications are enabled.
(3)	ENABLED	The Change Communications State (GEM_ChangeCommState) instruction is executed and the communications state changes to DISABLED. The GEM Service state changes to a state other than EQRun.	DISABLED	None	SECS-II communications are prohibited.
(4)	(Entry to ENABLED)	Any entry to ENABLED state.	NOT COMMUNIC ATING	None	
(5)	(Entry to EQUIPMEN T-INITIATED CONNECT)	Any entry to NOT COMMUNICATING	WAIT CRA	Initialize communications. Set CommDelay timer to expired state. Send Establish Communications Request (S1,F13).	Begin an attempt to establish communications.
(6)	WAIT CRA	Connection transaction failure.	WAIT DELAY	Initialize CommDelay timer. Dequeue all SECS messages that were queued to send.	If appropriate, place dequeued messages in spool buffer in the order they were generated. Wait for timer to expire.
(7)	WAIT DELAY	CommDelay timer expired.	WAIT CRA	Send Establish Communications Request (S1,F13) and wait for Establish Communications Request Acknowledge (S1,F14).	Establish Communications Request (S1,F13) may be received from host.
(8)	WAIT DELAY	A SECS message other than Establish Communications Request (S1,F13) was received.	WAIT CRA	Discard the SECS message. No reply. Set CommDelay timer to expired state. Send Establish Communications Request (S1,F13).	

No.	Current state	Trigger	New state	Operation	Comment
(9)	WAIT CRA	Establish Communications Request Acknowledge (S1,F14) was received with COMMACK = 0.	COMMUNI- CATING	None	Communications are established.
(10)		Any entry to NOT COMMUNICATING	WAIT CR FROM HOST	None	Wait for Establish Communications Request (S1,F13) from host.
(14)	COMMUNI- CATING	Communications failure	NOT COMMUNIC ATING	Dequeue all SECS messages that were queued to send.	Place dequeued SECS messages in spool buffer as appro- priate.
(15)	WAIT CR FROM HOST	Establish Communications Request (S1,F13) was received.	COMMUNI- CATING	Send Establish Communications Request Acknowledge (S1,F14) with COMMACK = 0.	Communications are established.

^{*1.} The default is controlled by the setting made with *Model Settings - Communications State Model - Default Communications state* from the List Menu of the SECS/GEM Configurator.

Communications State Model Scenarios

There are the following two Communications State Model scenarios.

- · Host Attempts to Establish Communications
- · Equipment Attempts to Establish Communications and Host Acknowledges

• Host Attempts to Establish Communications

The following procedure is used for the Host Attempts to Establish Communications scenario.

- **1** The host sends Establish Communications Request (S1,F13).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function process		
Result	Factor	Processing	Value of ACKC5	Notification
Normal		Send Establish Communi-	0	None
Error	The communications state model state is not ENABLED.	cations Request Acknowledge (S1,F14) to the host.	1	
	Common criteria*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

Equipment Attempts to Establish Communications and Host Acknowledges

The following procedure is used for the Equipment Attempts to Establish Communications and Host Acknowledges scenario.

- To change the communications state to ENABLED, the Change Communications State (GEM_ChangeCommState) instruction is executed in the user program.
 - To change the communications state to ENABLED, the value of the *TransitionEvent* input variable to the GEM_ChangeCommState instruction is set to _GEM_COMM_ENABLED.
- 2 The host connection function sends Establish Communications Reguest (S1,F13).
- The host sends Establish Communications Request Acknowledge (S1,F14).

Initial Settings for the Communications State Model

Initial settings are necessary for the communications state model. Initial settings can be made from the SECS/GEM Configurator or from the user program.

Initial Settings with the SECS/GEM Configurator

Refer to 8-10-1 Communications State Model on page 8-58 for the procedures to make the initial settings for the communications state model on the SECS/GEM Configurator.

Initial Settings from the User Program

You can make the initial settings for the communications state model from the user program. The setting methods and update timing for each setting item are given in the following table.

Item	Setting method	Update tim- ing
Establish Communi-	Use the Change Equipment Constant (GEM_ChangeECV) instruc-	When the
cations Timeout	tion to set the value of the Establish Communications Timeout	GEM Service
	(_GEM_EstablishCommunicationsTimeout) system-defined variable.	status
Default Communica-	Set the value of the Default Communications State	changes to
tions State	(_GEM_DefaultCommunicationState) system-defined variable.	EQRun
Equipment Model	Set the value of the Equipment Model Type	
Туре	(_GEM_EquipInfo.MDLN) system-defined variable.	
Software Revision	Set the value of the Software Revision Code	
Code	(_GEM_EquipInfo.SOFTREV) system-defined variable.	

Checking the State of the Communications State Model

Use the following system-defined variable to check the state of the communications state model. Refer to A-2 System-defined Variables on page A-211 for details on system-defined variables.

System-defined variable	Name		
_GEM_CommunicationsState	Communications State		

5-5-2 Control State Model

The control state model is based on the State Models, On-line Identification, and Control (Operator-Initiated) fundamental GEM requirements. It is also based on the Control (Host-initiated) additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-10-2 Control State Model on page
		8-59
Creating the user program on the Sysmac Studio	Required.	This section

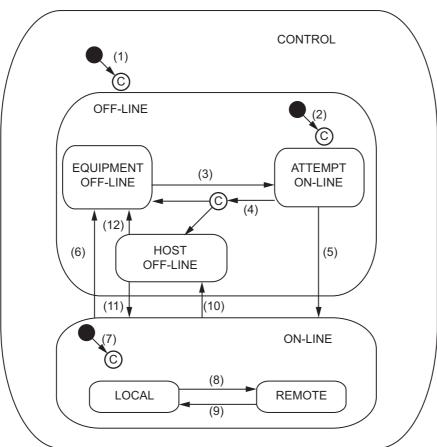
Control State Model

The GEM Service control states operate according to the following control state model. The host connection function manages state transitions in the control state model. You do not need to manage state transitions for the control state model.

State transitions in the control state model occur when the GEM Service status is EQRun. If the GEM Service status is not EQRun, the control model state is always EQUIPMENT OFF-LINE.

When the control state changes, the host connection function issues a collection event.

The current control state is given in the Control State (_GEM_ControlState) system-defined variable.



The triggers, resulting equipment operation, and comments for the above transitions are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Opera- tion	Comment
(1)	(Undefined)	The GEM Service status changed to EQRun.	CONTROL*1	None	
(2)	(Undefined)	Entry into OFF-LINE state. *2	OFF-LINE*1	None	
(3)	EQUIPMENT OFF-LINE	Equipment changed to ON-LINE. The Change Control State (GEM_ChangeControlState) instruction was executed with ON-LINE/LOCAL or ON-LINE/REMOTE specified for the transition request.	ATTEMPT ON-LINE	None	
(4)	ATTEMPT ON-LINE	 Abort Transaction (S1,F0) was received. Communications timeout occurs. Communications fail. 	EQUIPMENT OFF-LINE or HOST OFF-LINE*3	None	
(5)	ATTEMPT ON-LINE	On-Line Data (S1,F2) was received from the host.	ON-LINE*4	None	
(6)	ON-LINE	Equipment changed to OFF-LINE. The Change Control State (GEM_ChangeControl- State) instruction was executed with OFF-LINE specified for the transition request.	EQUIPMENT OFF-LINE	None	An Equipment OFF-LINE collection event occurs.
(7)	(Undefined)	Entry into ON-LINE state. *5	ON-LINE*6	None	A Control State LOCAL or Control State REMOTE collection event occurs.
(8)	LOCAL	The operator set the front panel switch to REMOTE. The Change Control State (GEM_ChangeControlState) instruction was executed with ON-LINE/REMOTE specified for the transition request.	REMOTE	None	A Control State REMOTE collection event occurs.
(9)	REMOTE	The operator set the front panel switch to LOCAL. The Change Control State (GEM_ChangeControlState) instruction was executed with ON-LINE/LOCAL specified for the transition request.	LOCAL	None	A Control State LOCAL collection event occurs.
(10)	ON-LINE	Request OFF-LINE (S1,F15) was received from the host.	HOST OFF-LINE	None	An Equipment OFF-LINE collection event occurs.
(11)	HOST OFF-LINE	Request ON-LINE (S1,F17) is received from the host.	ON-LINE*6	None	If an interlock is set, ON-LINE Acknowledge (S1,F18) is sent with ONLACK (deny). In that case, the state does not change.

No.	Current state	Trigger	New state	Opera- tion	Comment
(12)	HOST OFF-LINE		EQUIP-	None	An Equipment
		OFF-LINE. The Change Control	MENT		OFF-LINE collection
		State (GEM_ChangeControl-	OFF-LINE		event occurs.
		State) instruction was executed			
		with OFF-LINE specified for the			
		transition request.			

- *1. The substate is controlled by the setting made with *Model Settings Control State Model Default Control state* from the List Menu of the SECS/GEM Configurator.
- *2. When the setting made with *Model Settings Control State Model Default Control state* from the List Menu of the SECS/GEM Configurator is one of the following: Equipment OFF-LINE, Attempt ON-LINE, or HOST OFF-LINE.
- *3. The state after the transition is controlled by the setting made with *Model Settings Control State Model Failed Online state* from the List Menu of the SECS/GEM Configurator.
- *4. The substate is controlled by the specification in the Change Control State (GEM_ChangeControlState) instruction. The state when operation starts is controlled by the setting made with *Model Settings Control State Model Default Online substate* from the List Menu of the SECS/GEM Configurator.
- *5. When the setting made with *Model Settings Control State Model Default Control state* from the List Menu of the SECS/GEM Configurator is ON-LINE.
- *6. The substate is controlled by the setting made with *Model Settings Control state Model Default Online substate* from the List Menu of the SECS/GEM Configurator.

Control State Model Scenarios

There are the following four Control State Model scenarios.

- · On-line Identification
- Control (Operator-initiated)
- Control (Host-initiated) Request ON-LINE
- · Control (Host-initiated) Request OFF-LINE

On-line Identification

The following procedure is used for the On-Line Identification scenario.

- The host sends Are You There Request (S1,F1).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notification
Normal	The control state is ON-LINE.	Sends On-Line Data (S1,F2) to the host.	None
Error	Common criteria ^{*1}	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns On-Line Data (S1,F2).

Control (Operator-initiated)

The following procedure is used for the Control (Operator-initiated) scenario.

- To change the equipment control state, execute the GEM Service Control (GEM_ControlService) instruction in the user program.
- 2 The host connection function changes the control state. For an online request, the host connection function sends Are You There Request (S1,F1). In response, the host sends On-Line Data (S1,F2).

Control (Host-initiated) - Request ON-LINE

The following procedure is used for the Control (Host-initiated) - Request ON-LINE scenario.

- The host sends Request ON-LINE (S1,F17).
- 2 The host connection function determines if the received primary message is normal. The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function	Notifi-	
Result	Factor	Processing	Value of ONLACK	cation
Normal		Sends ON-LINE Acknowl-	0	None
Error	The control state is HOST OFF-LINE.	edge (S1,F18) to the host.	1	
	The value of the _GEM_Interlock_ControlState interlock variable is TRUE.			
	The control state is already ON-LINE.		2	
	Common criteria ^{*1}	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns ON-LINE Acknowledge (S1,F18).

• Control (Host-initiated) - Request OFF-LINE

The following procedure is used for the Control (Host-initiated) - Request OFF-LINE scenario.

The host sends Request OFF-LINE (S1,F15).

2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function pro	Notifica-		
Result	Factor	Processing	Value of OFLACK	tion	
Normal		Sends OFF-LINE Acknowledge	0	None	
		(S1,F16) to the host.			
Error	Common criteria*1	Common processing			

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns OFF-LINE Acknowledge (S1,F16).

_GEM_Interlock_ControlState Interlock Variable

The _GEM_Interlock_ControlState interlock variable is related to the control state model.

The relationship between the control state model scenarios and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message
On-line Identification	None
Control (Operator-initiated)	Request ON-LINE (S1,F17)
Control (Host-initiated)	None

Initial Settings for the Control State Model

Initial settings are necessary for the control state model. Initial settings can be made from the SECS/GEM Configurator or from the user program.

Initial Settings with the SECS/GEM Configurator

Refer to 8-10-2 Control State Model on page 8-59 for the procedures to make the initial settings for the control state model on the SECS/GEM Configurator.

Initial Settings from the User Program

You can make the initial settings for the control state model from the user program. The setting method for each setting item is given in the following table.

Item	Setting method		
Default Control State	Set the value of the Default Control State (_GEM_ControlStateParam.Default-		
	Control) system-defined variable.		
Default ON-LINE Substate	Set the value of the Default Online Substate		
	(_GEM_ControlStateParam.DefaultOnlineSubState) system-defined variable.		
ON-LINE Failure State	Set the value of the ON-LINE Failure State		
	(_GEM_ControlStateParam.ChangeOnlineFailed) system-defined variable.		

Checking the State of the Control State Model

Use the following system-defined variable to check the state of the control state model. Refer to A-2 System-defined Variables on page A-211 for details on system-defined variables.

System-defined variable	Name
_GEM_ControlState	Control State

5-5-3 Equipment Processing States

The equipment processing states are based on the Equipment Processing States fundamental GEM requirement.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	5-5-4 Event Notification on page
Creating the user program on the Sysmac Studio	Required.	5-40

Equipment Processing States

The equipment-specified processing states are managed in the user program.

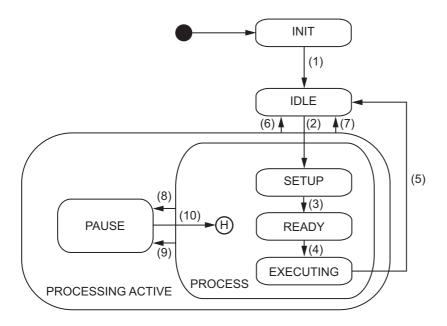
When the processing state changes, the equipment must report a collection event to the host. To do so, the CEID of each collection event is specified and the Report Event (GEM_ReportEvent) instruction is executed in the user program.

The status variables and link variables that are related to collection events are described in the following table. You must set the link variables before you execute the GEM_ReportEvent instruction.

Collection event	Status variable	Link variable	Meaning
Processing Started	PreviousProcessState	_GEM_PreviousProcess	The equipment processing state
Processing Completed		State	before the most recent change in the equipment processing
Processing			state
Stopped Processing State Change			
	ProcessState	_GEM_ProcessState	The current equipment processing state

Equipment Processing State Model

The equipment processing state model is determined by the user according to the equipment process and style. A typical equipment processing state model is shown in the following figure.



The triggers, resulting equipment operation, and comments for the above transitions are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Operation	Comment
(1)	INIT	Initialization is completed.	IDLE	None	A Processing State Change
					collection event is issued.
(2)	IDLE	Setup command	SETUP	None	A Processing State Change
					collection event is issued.
(3)	SETUP	Setup is completed.	READY	Depends	A Processing State Change
				on the	collection event is issued.
				equipment.	
(4)	READY	Start command	EXECUTING	Depends	Processing State Change
				on the	and Processing Started col-
				equipment.	lection events are issued.
(5)	EXECUTING	Task is completed.	IDLE	None	Processing State Change
					and Processing Completed
					collection events are issued.
(6)	PROCESSING	Stop command	IDLE	None	A Processing State Change
	ACTIVE				collection event is issued.
(7)	PROCESSING	Abort command	IDLE	Depends	A Processing State Change
	ACTIVE			on the	collection event is issued.
				equipment.	
(8)	PROCESS	Pause state	PAUSE	Depends	A Processing State Change
				on the	collection event is issued.
				equipment.	
(9)	PROCESS	Pause command	PAUSE	Depends	Processing State Change
				on the	and Processing Stopped col-
				equipment.	lection events are issued.
(10)	PAUSE	Resume command	Previous	Depends	A Processing State Change
			PROCESS	on the	collection event is issued.
			substate	equipment.	

5-5-4 **Event Notification**

Event notification is based on the Event Notification fundamental GEM requirement.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-11-1 Event Notification on page
		8-61
Creating the user program on the Sysmac Studio	Required.	This section

Event Notification

When an equipment collection event is issued, a collection event can be issued based on the Event Notification fundamental GEM requirement.

For each collection event, the linked report and the report members (equipment constants, status variables, and discrete variables) are set in advance in the event definitions of the SECS/GEM Configurator. If a user-defined variable is used as a report member variable, it is set in the data definitions of the SECS/GEM Configurator.

Collection events include events that are issued with the Report Event (GEM ReportEvent) instruction and events that are issued automatically by the host connection function.

The specifications of event notification are given in the following table.

Item	Specification
Maximum number of registered events	256 ^{*1}
Maximum number of reports linked to events	32
Maximum number of registered reports	128
Maximum number of variables that you can link to reports*2	64

^{*1.} Excluding collection events registered for alarms.

Multi-block Data Send Inquire (S6,F5) and Multi-block Grant (S6,F6) are not supported.

^{*2.} These variables include equipment constants, status variables, and discrete variables.

Standard Collection Events

The following collection events are registered as standard features on the SECS/GEM Configurator. The collection event ECIDs, report variable data, and issuing method are given.

Туре	Collection event	ECID	Report variable data	Issuing method
Control-related	Equipment OFF-LINE	1	ControlState, CLOCK	Automatic
events	Control State LOCAL	2	ControlState, CLOCK	Automatic
	Control State REMOTE	3	ControlState, CLOCK	Automatic
	Operator Command Issued	4	OperatorCommand	Instruction
Process-	Processing Started	5	CLOCK, PreviousProcessState	Instruction
ing-related events	Processing Completed	6	CLOCK, PreviousProcessState	Instruction
	Processing Stopped	7	CLOCK, PreviousProcessState	Instruction
	Processing State Change	8	CLOCK, ProcessState,	Instruction
			PreviousProcessState	
Equipment constants	Operator Equipment Constant Change*1	9		Instruction
Alarm	Alarm _n Detected	*2	CLOCK, AlarmID, AlarmSet	Automatic
management events	Alarm Cleared	*2	CLOCK, AlarmID, AlarmSet	Automatic
Limits monitoring events	Limit Zone Transition	*3	CLOCK, LimitVariable, EventLimit, TransitionType	Automatic
Process program	Process Program Change	10	PPChangeName, PPChangeStatus	Instruction
management events	Process Program Selected	11	PPExecName	Instruction
Material	Material Received	12	CLOCK	Instruction
movement events	Material Removed	13	CLOCK	Instruction
Spooling-related	Spooling Activated	14	SpoolStartTime	Automatic
events	Spooling Deactivated	15	SpoolCountTotal	Automatic
	Spool Transmit Failure	16	CLOCK, SpoolCountActual, Spool-CountTotal	Automatic
Equipment terminal service events	Message Recognition	17	CLOCK	Instruction

^{*1.} Refer to 8-11-1 Event Notification on page 8-61 for the setting procedure for the Operator Equipment Constant Change report variable data.

^{*2.} An alarm management collection event is created for each ALID when an alarm is registered.

^{*3.} A limit monitoring collection event is created for each status variable when you specify limit monitoring in the status variable definitions.

Event Notification Scenarios

There are the following two Event Notification scenarios.

- Collection Event Occurs on Equipment
- · Host Responds Event Report

Collection Event Occurs on Equipment

The following procedure is used for the Collection Event Occurs on Equipment scenario.

- The host connection function sends Event Report Send (S6,F11). To send Event Report Send (S6,F11), execute the Report Event (GEM_ReportEvent) instruction in the user program.
- The host sends Event Report Acknowledge (S6,F12).



Precautions for Correct Use

The Event Report Send (S6,F11) SECS message is not sent if the maximum message length of 256 Kbytes is exceeded. Also, a Too Long SECS Message event (event code 66020000 hex) is registered. The GEM ReportEvent instruction, however, ends normally.

Host Responds Event Report

The following procedure is used for the Host Responds Event Report scenario.

- The host sends Event Report Request (S6,F15).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notification
Normal		Sends Event Report Data (S6,F16) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns Event Report Data (S6,F16).



Precautions for Correct Use

Only the header of the Event Report Data (S6,F16) SECS message is sent if the maximum message length of 256 Kbytes is exceeded. Also, a Too Long SECS Message event (event code 66020000 hex) is registered.

To prevent exceeding the maximum message length, make sure that the total size of all reports linked to an event is 254 Kbytes or less when you set up event notification on the SECS/GEM Configurator.

5-5-5 Error Messages

Error messages are based on the Error Messages fundamental GEM requirement.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Not required.	
Creating the user program on the Sysmac Studio	Not required.	

Error Messages

The equipment reports information on the causes of errors found in SECS messages and communications with the host based on the Error Messages fundamental GEM requirement.

Errors in SECS messages and communications are detected by the host connection function and it sends an S9 message for the relevant error type to the host. Therefore, it is not necessary to create any user programming.

The contents of the S9 messages are given in the following table.

Stream and function numbers	Function name
S9,F1	Unrecognized Device ID
S9,F3	Unrecognized Stream Type
S9,F5	Unrecognized Function Type
S9,F7	Illegal Data
S9,F9	Transaction Timer Timeout
S9,F11	Data Too Long
S9,F13	Conversation Timeout

The following restrictions exist for errors related to Process Program Load Inquire (S7,F1).

- The value of EDID in Conversation Timeout (S9,F13) is the value of PPID from Process Program Load Inquire (S7,F1) for which an error was detected.
- Monitoring for conversation timeouts is performed until Process Program Load Inquire (S7,F1) or Formatted Process Program Send (S7,F23) is received.
- If the next Process Program Load Inquire (S7,F1) is received while monitoring for conversation timeouts for a previous Process Program Load Inquire (S7,F1), conversation timeout monitoring is canceled for the previous Process Program Load Inquire (S7,F1) and started for the next one.

Checking for Error Messages

To check for error messages, you can use the S9 Errors (_*GEM_S9Error*) system-defined variable or the SECS message log.

Checking with the _GEM_S9Error System-defined Variable

You can check for the number of each S9 message with _GEM_S9Error. Refer to A-2 System-defined Variables on page A-211 for details on _GEM_S9Error.

Checking with the SECS Message Log

You can check S9 messages in the SECS message log. Refer to 6-2-2 Displaying the Contents of the GEM Service Logs on page 6-4 for details on the SEC message log.

5-5-6 **Documentation**

Documentation is based on the Documentation fundamental GEM requirement.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Not required.	
Creating the user program on the Sysmac Studio	Not required.	

Documentation

You can create lists of the following information required for the Documentation fundamental GEM requirement.

- Items
- Messages
- · Collection events
- · Reports
- Alarms
- · Equipment constants, status variables, and discrete variables

Refer to 8-4-5 Documentation on page 8-30 for details on documentation.

5-5-7 Dynamic Event Report Configuration

The dynamic event report configuration is based on the Dynamic Event Report Configuration additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Not required.	
Creating the user program on the Sysmac Studio	Not required.	

Dynamic Event Report Configuration

The host can dynamically correct or change the equipment event report configuration based on the Dynamic Event Report Configuration additional GEM capability.

The host connection function manages the dynamic event report configuration. You do not need to manage the dynamic event report configuration.

Dynamic Event Report Configuration Scenario

There is the following one Dynamic Event Report Configuration scenario.

· Collection Event Reporting Set-up

The Collection Event Reporting Set-up can be divided into the following four types based on the SEC messages sent by the host.

- · Collection Event Reporting Set-up Define Report (S2,F33)
- Collection Event Reporting Set-up Link Event Report (S2,F35)
- · Collection Event Reporting Set-up Enable/Disable Event Report (S2,F37)
- · Collection Event Reporting Set-up Multi-Block Inquire (S2,F39)



Precautions for Correct Use

When you change the settings for reports linked with Define Report (S2,F33) or Link Event Report (S2,F35), make sure that the total size of all linked reports is 245 Kbytes or less to prevent exceeding the maximum message length.

Collection Event Reporting Set-up - Define Report (S2,F33)

The following procedure is used for the Collection Event Reporting Set-up - Define Report (S2,F33) scenario.

1 The host sends Define Report (S2,F33).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection funct	Notifica-	
Result	Factor	Processing	Value of DLACK	tion
Normal		Sends Define Report	0	None
Error	More than 64 VIDs are linked.	Acknowledge (S2,F34)	1]
	The same RPTID is used twice.	to the host.	3	
	The VID is not registered.		4	
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns Define Report Acknowledge (S2,F34).

Collection Event Reporting Set-up - Link Event Report (S2,F35)

The following procedure is used for the Collection Event Reporting Set-up - Link Event Report (S2,F35) scenario.

1 The host sends Link Event Report (S2,F35).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

	Factor	Host connection fund	Notifica-	
Result		Processing	Value of LRACK	tion
Normal		Sends Link Event	0	None
Error	More than 32 RPTIDs are linked.	Report Acknowledge	1	
	A report was set for an event CEID that	(S2,F36) to the host.	3	
	was already linked to a report. *1			
	The CEID is not registered.		4	
	The RPTID is not registered.		5	
	Common criteria*2	Common processing		

^{*1.} An error does not occur if the link event is deleted.

The host connection function returns Link Event Report Acknowledge (S2,F36).

^{*2.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

Collection Event Reporting Set-up - Enable/Disable Event Report (S2,F37)

The following procedure is used for the Collection Event Reporting Set-up - Enable/Disable Event Report (S2,F37) scenario.

- The host sends Enable/Disable Event Report (S2,F37).
- 2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function processing		Notifica-
Result	Factor	Processing	Value of ERACK	tion
Normal		Sends Enable/Disable Event Report	0	None
Error	The CEID is not registered.	Acknowledge (S2,F38) to the host.	1	
	Common criteria*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns Enable/Disable Event Report Acknowledge (S2,F38).

Collection Event Reporting Set-up - Multi-Block Inquire (S2,F39)

The following procedure is used for the Collection Event Reporting Set-up - Multi-Block Inquire (S2,F39) scenario.

- **1** The host sends Multi-Block Inquire (S2,F39).
- 2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function processing		Notifica-
Result	Factor	Processing	Value of GRANT	tion
Normal		Sends Multi-Block Grant (S2,F40) to the host.	0	None
Error	The message		2]
	length exceeded			
	256 Kbytes.			
	Common criteria*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

The host connection function returns Multi-Block Grant (S2,F40) according to the value of DATALENGTH.

Dynamic Event Report Configuration Initialization

If the GEM Service status is EQInitializing and the Initialize Event (GEM_InitEvent) instruction is executed, the dynamic event report configuration is initialized.

5-5-8 **Variable Data Collection**

Variable data collection is based on the Variable Data Collection additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Not required.	
Creating the user program on the Sysmac Studio	Not required.	

Variable Data Collection

The host can ask for the values of equipment constants, status variables, and discrete variables based on the Variable Data Collection additional GEM capability.

The host connection function manages variable data collection. Therefore, it is not necessary to create any user programming.

Variable Data Collection Scenario

The following procedure is used for variable data collection.

The host sends Individual Report Request (S6,F19).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifica- tion
Normal		Sends Individual Report Data (S6,F20) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns Individual Report Data (S6,F20).

5-5-9 Trace Data Collection

Trace data collection is based on the Trace Data Collection additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-9-3 Status Variable (SV) on page 8-50
Creating the user program on the Sysmac Studio	Not required.	

Trace Data Collection

The host can periodically sample the status variables based on the Trace Data Collection additional GEM capability. The host connection function manages trace data collection. You do not need to perform management for trace data collection.

The specifications of trace data collection are given in the following table.

Item	Specification
Maximum number of executable simultaneous traces	5
Maximum number of status variables for one trace	100
Maximum REPGSZ (reporting group size)	100
Data sample period, DSPER [s] ^{*1}	1 to 65535

^{*1.} The minimum unit is seconds. If you set the data sample period, DSPER, in milliseconds, all digits below seconds are truncated.

Trace Data Collection Scenario

The following procedure is used for trace data collection.

1 The host sends Trace Initialize Send (S2,F23).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing		Notifi-
Result	racioi	Processing	Value of TIAACK	cation
Normal		Sends Trace Ini-	0	None
Error	More than 100 status variables were specified.	tialize Acknowl-	1	
	Five traces are already being executed simultane-	edge (S2,F24)	2	
	ously.	to the host.		
	The value of DSPER was not between 1 and 65,535		3	
	S.			
	An undefined status variable or a status variable that		4	
	is not set for tracing was specified.			
	The value of REPGSZ was 0 or exceeded 100.		5	
	The value of REPGSZ was larger than TOTSMP.			
	Stopping was specified for a TRID that does not exist.		63	
	Common criteria*1	Common		
		processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

- The host connection function returns Trace Initialize Acknowledge (S2,F24).
- For each trace of the REPGSZ number, the host connection function returns Trace Data Send (S6,F1) with the trace data collection results attached.

Tracing ends when the number of traces reaches TOTSMP.

The host sends Trace Data Acknowledge (S6,F2).



Precautions for Correct Use

The Trace Data Send (S6,F1) SECS message is not sent if the maximum message length of 256 Kbytes is exceeded. Also, a Too Long SECS Message event (event code 66020000 hex) is registered. However, Trace Initialize Acknowledge (S2,F24) is sent normally.

To prevent exceeding the maximum message length, make sure that the total size of the status variables specified for tracing with Trace Initialize Send (S2,F23) times REPGSZ does not exceed 225 Kbytes.

5-5-10 Status Data Collection

Status data collection is based on the Status Data Collection additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-9-3 Status Variable (SV) on page 8-50
Creating the user program on the Sysmac Studio	Not required.	

Status Data Collection

The host can ask for the specified status information based on the Status Data Collection additional GEM capability.

The host connection function manages status data collection. You do not need to perform management for status data collection.

Status Data Collection Scenarios

There are the following two Status Data Collection scenarios.

- · Request Equipment Status Report
- · Request Equipment Status Variable Namelist

Request Equipment Status Report

The following procedure is used for the Request Equipment Status Report scenario.

- **1** The host sends Selected Equipment Status Request (S1,F3).
- 2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Sends Selected Equipment Status Data (S1,F4) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns Selected Equipment Status Data (S1,F4).



Precautions for Correct Use

Only the header of the Selected Equipment Status Data (S1,F4) SECS message is sent if the maximum message length of 256 Kbytes is exceeded. Also, a Too Long SECS Message event (event code 66020000 hex) is registered.

To prevent exceeding the maximum message length, make sure that the total size of the status variables specified for reading with Selected Equipment Status Request (S1,F3) does not exceed 250 Kbytes.

Request Equipment Status Variable Namelist

The following procedure is used for the Request Equipment Status Variable Namelist scenario.

1 The host sends Status Variable Namelist Request (S1,F11).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifica- tion
Normal		Sends Status Variable Namelist Reply (S1,F12) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns Status Variable Namelist Reply (S1,F12).

5-5-11 Alarm Management

Alarm management is based on the Alarm Management additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-11-2 Alarm Management on page 8-69
Creating the user program on the Sysmac Studio	Required.	This section

Alarm Management

The equipment can notify the host of the alarm status that occurs on the equipment based on the Alarm Management additional GEM capability.

When alarms occur on the equipment and when they are cleared are managed in the user program. The user program executes the Report Alarm (GEM_ReportAlarm) instruction when an alarm occurs or is cleared.

The main specification of alarm management is given in the following table.

Item	Specification
Maximum number of registered alarms	1024

Alarm Management Scenarios

There are the following three Alarm Management scenarios.

- · Send Alarm Report
- Enable/Disable Alarms
- · Send Alarm Information

Send Alarm Report

The following procedure is used for the Send Alarm Report scenario.

- 1 You execute the Report Alarm (GEM_ReportAlarm) instruction when an alarm that was defined on the SECS/GEM Configurator occurs or is cleared.
- **2** The host connection function sends Alarm Report Send (S5,F1).
- **3** The host sends Alarm Report Acknowledge (S5,F2).

The host connection function will not send Alarm Report Send (S5,F1) when an alarm for which the ALID is disabled occurs or is cleared. Event Report Send (S6,F11) is sent only for collection events that are sent automatically.

Enable/Disable Alarms

The following procedure is used for the Enable/Disable Alarms scenario.

- The host sends Enable/Disable Alarm Send (S5,F3).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function prod	Notifica-	
Result	Factor	Processing	Value of ACKC5	tion
Normal		 Sends Enable/Disable Alarm Acknowledge (S5,F4) to the host. The alarm enable/disable setting of 	0	None
Error	The ALID is not registered. Common criteria*1	the specified ALID is changed. Sends Enable/Disable Alarm Acknowledge (S5,F4) to the host. Common processing	63	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns Enable/Disable Alarm Acknowledge (S5,F4).

The default value of the AlarmsEnabled status variable is set on the SECS/GEM Configurator.

Send Alarm Information

The following procedure is used for the Send Alarm Information scenario.

- The host sends List Alarms Request (S5,F5).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notification
Normal		Sends List Alarm Data (S5,F6) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns List Alarm Data (\$5,F6).

Alarm Management State Transitions

The alarm management states operate according to the following state transition diagram. The host connection function issues the state transition SECS messages.



The above state transition triggers and equipment operation are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Operation
(1)	ALARM _n CLEAR	Alarm _n is detected on the equipment. The Report Alarm (GEM_ReportAlarm) instruction is executed to report the occurrence of the alarm to the host.	ALARM _n SET	Update AlarmSet and ALCD _n values. Issue Alarm Report Send (S5,F1) if it is enabled. If a collection event is set to be issued when the alarm occurs, issue Event Report Send (S6,F11).
(2)	ALARM _n SET	Alarm _n is no longer detected on the equipment. The Report Alarm (GEM_ReportAlarm) instruction is executed to report the clearing of the alarm to the host.	ALARM _n CLEAR	Update AlarmSet and ALCD _n values. Issue Alarm Report Send (S5,F1) if it is enabled. If a collection event is set to be issued when the alarm is cleared, issue Event Report Send (S6,F11).

5-5-12 Host Commands

Host commands are based on the Remote Control additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	8-11-3 Host Command on page 8-72
Creating the user program on the Sysmac Studio	Required.	This section

Host Commands

The host can control overall equipment operation in stages (remote/local) based on the Remote Control additional GEM capability.

The commands to use are set under Remote Control - Host Command on the List Menu of the SECS/GEM Configurator.

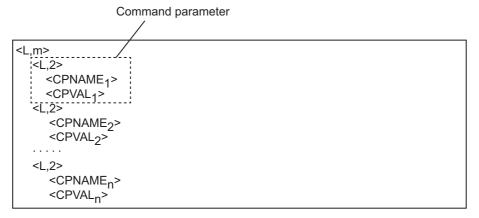
The main specifications of the host commands are given in the following table.

Item	Specification
Maximum number of registered host commands	32
Maximum number of CPNAMEs registered in one host command	32

Host Command Structure

A host command consists of command parameters.

A command parameter consists of CPNAME, which gives a command parameter name, and CPVAL, which gives a command parameter value.



Relationship between Message Structure and Link Variables

The relationship between the message structure and link variables for Host Command Send (S2,F41) and Host Command Acknowledge (S2,F42) is described below using the START host command as an example.

The START host command has the following three command parameters.

CPNAME	CPVAL	
CFINAIVIE	Format	Data size [bytes]
PPID	A*1	80 ^{*1}
LOTID	A	16
MID	Α	16

^{*1.} Set the same format and data size as the PPID that was defined in the item definitions.

Host Command Send (S2,F41) Message Structure and Link Variables

This section describes the relationship between the message structure and link variables for Host Command Send (S2,F41).

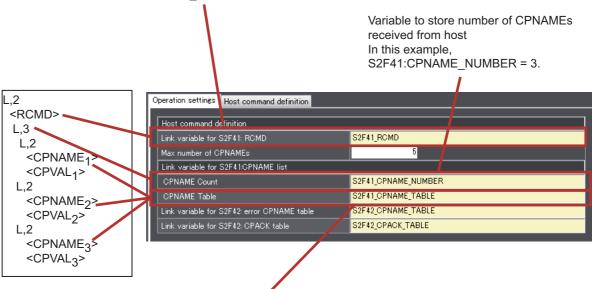
Link variables are assigned to the items of Host Command Send (S2,F41). You use the SECS/GEM Configurator to assign the link variables.

First, select **GEM Capability Settings - Remote Control - Host Command**, and assign link variables to *Link variable for S2F41: RCMD* and *Link variable for S2F41:CPNAME list* on the Operation settings Tab Page. The meanings of the link variables are described in the following figure.

Variable to store RCMD received from host The data type is STRING[21].

STRING[21] has the same format and data size as the *RCMD* that was defined in the item definitions. In this example,

S2F41_RCMD = 'START'.

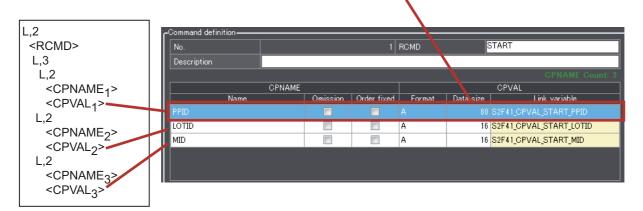


Array to store the CPNAMEs received from host The data type is ARRAY[0..4] OF STRING[21]. STRING[21] has the same format and data size as the *CPNAME* that was defined in the item definitions. In this example,

S2F41_CPNAME_TABLE[0] = 'PPID', S2F41_CPNAME_TABLE[1] = 'LOTID', and S2F41_CPNAME_TABLE[2] = 'MID'. Next, you assign the link variables to the CPVALs on the Host command definition Tab Page. The meanings of the link variables are described in the following figure.

Variable to store RCMD received from host The data type is STRING[80].

STRING[80] has the same format and data size as the PPID that was defined in the item definitions.



Host Command Acknowledge (S2,F42) Message Structure and Link Variables

This section describes the relationship between the message structure and link variables for Host Command Acknowledge (S2,F42).

Link variables are assigned to the items of Host Command Acknowledge (S2,F42). You use the SECS/GEM Configurator to assign the link variables.

You select GEM Capability Settings - Remote Control - Host Command, and assign link variables to Link variable for S2F42: error CPNAME table and Link variable for S2F42: CPACK table on the Operation settings Tab Page. The meanings of the link variables are described in the following figure.

In this example, the results of verifying the host command in the user program show that LOTID and MID are not correct.

In the following figure, the values of HCACK and the number of command parameter errors CPErrorNum are specified as input variables to the Acknowledge Host Command (GEM_AckHostCmd) instruction. In this example, the value of CPErrorNum is 2.

Array to store CPNAMEs determined to be in error

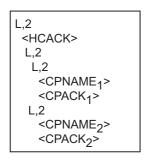
The data type is ARRAY[0..4] OF STRING[21].

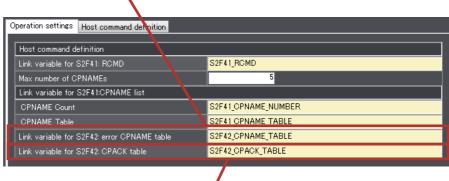
STRING[21] has the same format and data size as the CPNAME that was defined in the item definitions.

In this example,

S2F42 CPNAME TABLE[0] = 'LOTID' and

S2F42_CPNAME_TABLE[1] = 'MID'.





Array to store CPACKs determined to be in error The data type is ARRAY[0..4] OF BYTE. In this example,

S2F42 CPACK TABLE[0] = 16#03 and S2F42_CPACK_TABLE[1] = 16#03.

GEM_Interlock_HostCmd Interlock Variable

The _GEM_Interlock_HostCmd interlock variable is related to host commands.

The relationship between the Host Commands scenario and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message
Host Command	Host Command Send (S2,F41)

Host Command Scenario

The following procedure is used for the Host Commands scenario.

1 The host sends Host Command Send (S2,F41).

2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

	Factor	Host connection function p	Notifi-	
Result		Processing	Value of HCACK	cation
Normal		Changes the value of _GEM_BusyHostCmd (Host Command Transaction Processing Flag) to TRUE.		Yes
Error	The RCMD is not registered. The value of the _GEM_Interlock_HostCmd interlock variable is TRUE. An incorrect parameter was received. Details are given below.	Sends Host Command Acknowledge (S2,F42) to the host.	3	None
	The Host Command GEM capability is disabled. Common criteria*1*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The following table gives detailed factors for "An incorrect parameter was received" in the above table and the values of CPACK returned to the host.

Detailed error factor	Value of CPACK
The CPNAME is not registered.	1
A CPNAME that was not omitted was not received.	
CPNAMEs with a fixed reception order were not in the set order.	1
The same CPNAME is used twice.	63
The format of CPVAL is different from the setting.	3

3 Perform processing in the user program for RCMD, CPNAME, and CPVAL.

The host connection function returns Host Command Acknowledge (S2,F42).

To return Host Command Acknowledge (S2,F42), execute the Acknowledge Host Command (GEM_AckHostCmd) instruction in the user program.

5-5-13 Enhanced Remote Commands

Enhanced remote commands are based on the Remote Control additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	8-11-4 Enhanced Remote Command
		on page 8-76
Creating the user program on the Sysmac Studio	Required.	This section

Enhanced Remote Command

The host can control overall equipment operation in stages (remote/local) based on the Remote Control additional GEM capability.

The main specifications of the enhanced host commands are given in the following table.

Item	Specification
Maximum number of registered enhanced remote commands	32
Maximum number of CPNAMEs registered in one enhanced remote command	32

You cannot use a list data structure for CEPVAL in the primary message. Therefore, the data structure must use CPNAME and CPVAL in pairs as shown below.

```
L,4
1.<DATAID>
2.<OBJSPEC>
3.<RCMD>
4.L,m
   1.L,2
     1.<CPNAME<sub>1</sub>>
     2.<CEPVAL<sub>1</sub>>
  2.L,2
     1.<CPNAME<sub>2</sub>>
     2.<CEPVAL<sub>2</sub>>
  m.L,2
     1.<CPNAME<sub>m</sub>>
     2.<CEPVAL<sub>m</sub>>
```

GEM Interlock EnhancedRmtCmd Interlock Variable

The GEM Interlock EnhancedRmtCmd interlock variable is related to enhanced remote commands.

The relationship between the Enhanced Remote Command scenario and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message
Enhanced Remote Command	Enhanced Remote Command (S2,F49)

Enhanced Remote Command Scenario

The following procedure is used for the Enhanced Remote Command scenario.

1 The host sends Enhanced Remote Command (S2,F49).

2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

	Factor	Host connection function pro	Notifi-	
Result		Processing	Value of HCACK	cation
Normal		Changes the value of _GEM_BusyEnhanced- RmtCmd (Enhanced Remote Command Transaction Pro- cessing Flag) to TRUE.		Yes
Error	The RCMD is not registered. The value of the _GEM_Inter-lock_EnhancedRmtCmd interlock variable is TRUE.	Sends Enhanced Remote Command Acknowledge (S2,F50) to the host.	1 2	None
	An incorrect parameter was received. Details are given below. The Enhanced Remote Command GEM capability is disabled.		60	
	Common criteria*1*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

The following table gives detailed factors for "An incorrect parameter was received" in the above table and the values of CEPACK returned to the host.

Detailed error factor	Value of CEPACK
The CPNAME is not registered.	1
A CPNAME that was not omitted was not received.	
CPNAMEs with a fixed reception order were not in the set order.	1
The same CPNAME is used twice.	63
The format of CEPVAL is different from the setting.	3

3 Perform processing in the user program for RCMD, CPNAME, and CEPVAL.

The host connection function returns Enhanced Remote Command Acknowledge (S2,F50).

To return Enhanced Remote Command Acknowledge (S2,F50), execute the Acknowledge Enhanced Remote Command (GEM_AckEnhancedRmtCmd) instruction in the user program.

5-5-14 Equipment Constants

The equipment constants are based on the Equipment Constants additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	8-9-2 Equipment Constant (EC) on page 8-47 8-11-5 Equipment Constants on page 8-80
Creating the user program on the Sysmac Studio	Required.	This section

Equipment Constants

The host can read the specified equipment constants in the equipment and change the values of specified equipment constants in the equipment based on the Equipment Constants additional GEM capability.

The main specification of equipment constants is given in the following table.

Item	Specification
Maximum number of equipment constants for which	100
changes can be requested by the host at the same time	



Precautions for Correct Use

The host connection function checks the upper and lower limits of the values of equipment constants. However, if the format of the equipment constant is not a number, the upper/lower limit check is not performed. The following values are used for the upper and lower limits for equipment constants.

Upper/lower limit	Value used for check
Upper limit	ECMAX set on the SECS/GEM Configurator
Lower limit	ECMIN set on the SECS/GEM Configurator

The value of retained variables is lost if the power supply to the Controller is turned OFF when a battery is not mounted or the battery voltage is low. Therefore, the values of equipment constants are lost. The next time the power supply to the Controller is turned ON, the values of equipment constants will be the ECDEF values set on the SECS/GEM Configurator.

Equipment Constant Scenarios

There are the following three Equipment Constant scenarios.

- · Operator Changes Equipment Constant
- · Host Sends Equipment Constants
- Host Equipment Constant Namelist Request

Operator Changes Equipment Constant

The following procedure is used for the Operator Changes Equipment Constant scenario.

- **1** The user executes the Change Equipment Constant (GEM_ChangeECV) instruction.
- The user executes the Report Event (GEM_ReportEvent) instruction to report an Operator Equipment Constant Change collection event.

Refer to 8-11-1 Event Notification on page 8-61 for the setting procedure for the Operator Equipment Constant Change collection event.



Precautions for Correct Use

Changing Equipment Constants

Link variables for equipment constants have a Constant attribute, so their values cannot be changed with value assignments. Use the Change Equipment Constant (GEM_ChangeECV) instruction to change the values of equipment constants. The values of the link variables of the relevant equipment constants change when execution of the GEM_ChangeECV instruction is completed normally.

Changing Multiple Equipment Constants

Use the following steps to change more than one equipment constant.

- (1)Execute the GEM ChangeECV instruction for each of the equipment constants to change.
- (2) Specify an array containing all of the ECIDs to change and execute the GEM_ReportEvent instruction once.

Host Sends Equipment Constants

The following procedure is used for the Host Sends Equipment Constants scenario.

- The host sends New Equipment Constant Send (S2,F15). To return Host Command Acknowledge (S2,F42), execute the Acknowledge Host Command (GEM AckHostCmd) instruction in the user program.
- The host connection function determines if the received primary message is normal. The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function pro-	Notifi-	
Result	Factor	Processing	Value of EAC	cation
Normal		Changes the value of _GEM_BusyHostChangeECV (Change Equipment Constant Transaction Processing Flag) to TRUE.		Yes
Error	The ECID is not registered. The value of the _GEM_Interlock_ECV interlock variable is TRUE.	Sends New Equipment Constant Acknowledge (S2,F16) to the host.	2	None
	The value of ECV is out of range.		3	
	The Equipment Constants GEM capability is disabled.		60	
	The number of ECs for which changes are requested exceeds the maximum value that is set.		63	
	Common criteria ^{*1}	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns New Equipment Constant Acknowledge (S2,F16). To return New Equipment Constant Acknowledge (S2,F16), execute the Acknowledge Equipment Constant Change (GEM AckChangeECV) instruction in the user program.

• Host Equipment Constant Namelist Request

The following procedure is used for the Host Equipment Constant Namelist Request scenario.

- The host sends Equipment Constant Namelist Request (S2,F29).
- **2** The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Sends Equipment Constant Namelist (S2,F30) to the host.	None
Error	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns Equipment Constant Namelist (S2,F30).

GEM Interlock ECV Interlock Variable

The _GEM_Interlock_ECV interlock variable is related to equipment constants.

The relationship between the Equipment Constant scenarios and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message	
Operator Changes Equipment Constant	None	
Host Sends Equipment Constants	New Equipment Constant Send (S2,F15)	
Host Equipment Constant Namelist Request	None	

5-5-15 Process Program Management

Process program management is based on the Process Program Management additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	8-11-6 Process Program Management
		on page 8-81
Creating the user program on the Sysmac Studio	Required.	This section

Process Program Management

The process programs can be managed between the host and equipment based on the Process Program Management additional GEM capability.

However, E42 recipes, E139 recipes, and large process programs are not supported.

The main specifications of process programs are given in the following table.

Item	Specification
Maximum size of process program [Kbytes]*1*2	1 to 257
Maximum number of saved process programs	40

^{*1.} This is the size without a header for Process Program Send (S7,F3) and Formatted Process Program Send (S7,F23).

The scenarios that are supported for process program management and the applicable process program types are given in the following table.

Scenario	Unformatted pro-	Formatted pro-
- Contains	cess programs	cess programs
Creation, Editing, or Deletion of Process Program by Operator	Applicable	Applicable
Process Program Deletion by Host	Applicable	Applicable
Process Program Directory Request	Applicable	Applicable
Equipment-initiated Process Program Upload	Applicable	
Host-initiated Process Program Upload	Applicable	
Equipment-initiated Process Program Download	Applicable	
Host-initiated Process Program Download	Applicable	
Equipment-initiated Formatted Process Program Upload		Applicable
Host-initiated Formatted Process Program Upload		Applicable
Equipment-initiated Formatted Process Program Download		Applicable
Host-initiated Formatted Process Program Download		Applicable

^{*2.} The maximum size of a process program is set on the SECS/GEM Configurator as Permissible message LENGTH.

Types of Process Programs

There are the following types of process programs.

- · Unformatted process programs
- · Formatted process programs

Hereafter, unless otherwise specified, "process program" refers to an unformatted process program.

Process Program Specifications

A process program consists of one PPBODY item that is not structured. The message structure for a process program is given below.

<PPBODY>

The maximum size and data size setting range for a process program depends on the format, as shown in the following table.

Format	Maximum size [bytes]	Data size setting range
В	65,535	1 to 65,535
Α	1,985	1 to 1,985
I1	65,535	1 to 65,535
12	131,070	1 to 65,535
14	262,140	1 to 65,535
U1	65,535	1 to 65,535
U2	131,070	1 to 65,535
U4	262,140	1 to 65,535

Formatted Process Program Specifications

A formatted process program is expressed with commands. A command consists of the command code CCODE and the parameter PPARM that corresponds to the CCODE.

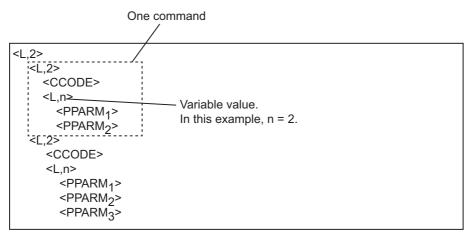
The formats of the CCODEs and PPARMs are defined on the SECS/GEM Configurator.

The main specifications of formatted process programs are given in the following table.

Item	Specification
Maximum number of registered CCODEs	50
Maximum number of PPARMs registered for one CCODE	20

- · A PPARM is defined as a list of length-variable data.
- All of the PPARMs for a CCODE have the same format.
- The commands can be in any order in the message structure.

An example of a message structure for a formatted process program is given below.



PPID Management Table

A PPID Management Table is required on the equipment to manage process programs and formatted process programs. The PPIDs of process programs and formatted process programs are registered in the PPID Management Table. Only the user program can update the PPID Management Table. The host connection function can only access the PPID Management Table. It cannot update it.

The processing and corresponding scenarios for the PPID Management Table when a process program or formatted process program is created, edited, or deleted are given in the following table.

Item	Step No.	Processing	Scenario
Creation	2	Save the process program or format- ted process program. Add the PPID to the PPID Manage- ment Table.	 Creation in the Creation, Editing, or Deletion of Process Program by Operator scenario Equipment-initiated Process Program Down-load scenario*1
			* Host-initiated Process Program Download sce- nario*1
			 Equipment-initiated Formatted Process Pro- gram Download scenario*1
			 Host-initiated Formatted Process Program Download scenario*1
Editing	1	Delete the PPID of the process program to edit from the PPID Manage-	Editing in the Creation, Editing, or Deletion of Process Program by Operator scenario
		ment Table. *2	Equipment-initiated Process Program Down-
	2	Edit the process program or formatted	load scenario ^{*3}
	3	process program. Add the PPID of the process program	Host-initiated Process Program Download sce-
	3	that was edited to the PPID Manage-	nario ^{*3}
		ment Table. *2	Equipment-initiated Formatted Process Pro-
			gram Download scenario*3
			Host-initiated Formatted Process Program
			Download scenario*3
Deletion	1	Delete the PPID of the process program to delete from the PPID Management Table.	Deletion in the Creation, Editing, or Deletion of Process Program by Operator senario
	2	Delete the process program or formatted process program.	

^{*1.} This scenario is used when a process program or formatted process program that is not in the equipment is downloaded.

- *2. This processing is not necessary if the PPID of the process program to edit is included in EPPD.
- *3. This scenario is used when a process program or formatted process program that is already in the equipment is edited.



Precautions for Correct Use

- If you use a link variable for the PPID Management Table, set the variable attributes as follows: Retain attribute and no Constant attribute.
- It is assumed that a PPID is not registered for any element that is NULL in the link variable for the PPID Management Table.

Retaining Process Programs and Formatted Process Programs for **Power Interruptions**

It is necessary to retain process programs and formatted process programs in memory when the power supply to the CPU Unit is turned OFF.

There are the following two ways to retain the process programs and formatted process programs.

Storage in a User-defined Variable with a Retain Attribute

You can store a process program or formatted process program in a user-defined variable with a Retain attribute. If you use this method, the process programs and formatted process programs will be backed up along with the other backup data.

Storage in Files on SD Memory Cards

You can use the FileWriteVar instruction or another SD Memory Card instruction to save process programs and formatted process programs as files on SD Memory Cards. If you use this method, you can manage the process programs and formatted process programs as files on a computer and edit them on the computer.

Link Variables for Uploading and Downloading

Link variables are used between the user program and host connection function when process programs and formatted process programs are uploaded/downloaded between the host and equipment. The processing is divided into the following eight types.

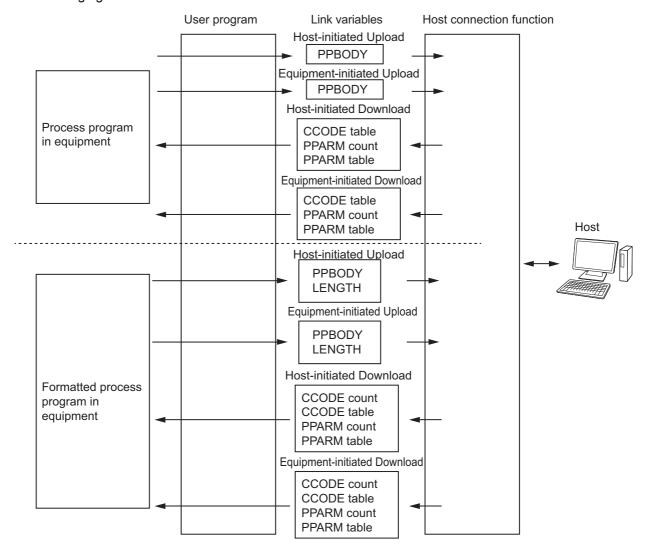
The link variables that are used for each process are specified in the following table.

Process programs/formatted process programs	Processing	Link variables
Process programs	Host-initiated upload	PPBODY*1
	Equipment-initiated upload	PPBODY*1
	Host-initiated download	PPBODY and LENGTH
	Equipment-initiated down-load	PPBODY and LENGTH
Formatted process programs	Host-initiated upload	CCODE table, PPARM count, and PPARM table*2
	Equipment-initiated upload	CCODE table, PPARM count, and PPARM table
	Host-initiated download	CCODE count, CCODE table, PPARM count, and PPARM table
	Equipment-initiated down-load	CCODE count, CCODE table, PPARM count, and PPARM table

^{*1.} LENGTH is specified in an input variable to the GEM instruction.

^{*2.} The CCODE count is specified in an input variable to the GEM instruction.

The relationship between the user program, host connection function, and link variables is shown in the following figure.



The difference in processing for an upload and a download is described in the following table.

Upload/download	Processing
Upload	The user program updates the link variable and the host connection
	function accesses the link variable.
Download	The host connection function updates the link variable and the user program accesses the link variable.

Relationship between Message Structure and Link Variables

This section describes the relationship between the message structure for process programs and formatted process programs and the link variables. Refer to 8-11-6 Process Program Management on page 8-81 for details on setting process programs on the SECS/GEM Configurator.

Message Structure of Process Programs and Link Variables

This section describes the relationship between the message structure for process programs and the link variables, using an equipment-initiated download as an example.

The message structure for a process program is shown in the following figure.

```
<PPID>
<PPBODY>
```

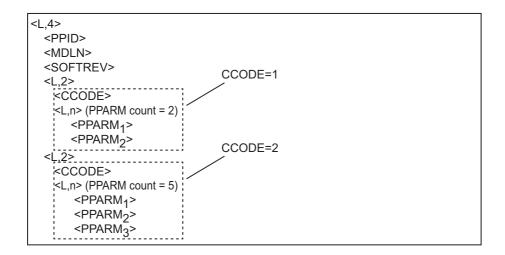
The meanings of the link variables are given in the following figure.



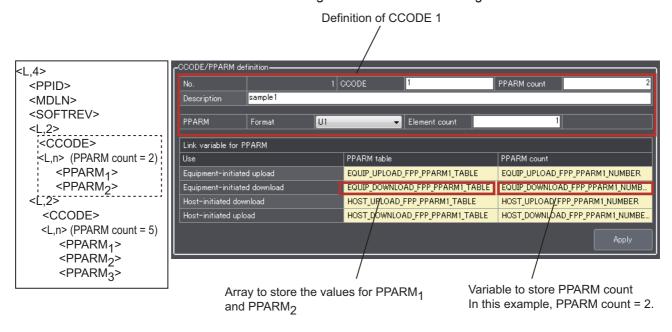
Message Structure of Formatted Process Programs and Link Variables

This section describes the relationship between the message structure for formatted process programs and the link variables, using an equipment-initiated download as an example. An example of a message structure for a formatted process program is given in the following figure.

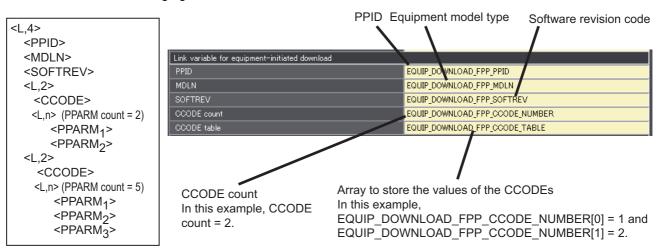
In this example, the formatted process program consists of CCODEs 1 and 2.



First, for each CCODE, link variables are assigned for the PPARM table and PPARM count. The definition of CCODE 1 and the meanings of the link variables are given below.



Next, the link variables for the CCODEs are assigned. The meanings of the link variables are given in the following figure.



_*GEM_Interlock_PP* Interlock Variable

The _GEM_Interlock_PP interlock variable is related to the process programs and formatted process programs.

The relationship between the process program and formatted process program scenarios and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message
Creation, Editing, or Deletion of Process Program by	None
Operator	
Process Program Deletion by Host	Delete Process Program Send (S7,F17)
Process Program Directory Request	None
Equipment-initiated Process Program Upload	None
Host-initiated Process Program Upload	Process Program Request (S7,F5)
Equipment-initiated Process Program Download	None
Host-initiated Process Program Download	Process Program Load Inquire (S7,F1)
	Process Program Send (S7,F3)
Equipment-initiated Formatted Process Program	None
Upload	
Host-initiated Formatted Process Program Upload	Formatted Process Program Request (S7,F25)
Equipment-initiated Formatted Process Program Down-	None
load	
Host-initiated Formatted Process Program Download	Process Program Load Inquire (S7,F1)
	Formatted Process Program Send (S7,F23)

Programming Procedure

Use the following programming procedure on the Sysmac Studio to use process programs and formatted process programs.

1 Setting the Initial Values of Link Variables

Set the initial values of the following link variables. Set the initial values when the GEM Service status is EQInitializing. Refer to *5-1-1 Starting and Pausing the Host Connection Function* on page 5-3 for information on the initial value settings of link variables.

Variable	Link variable name	Setting
PPFormat status	_GEM_PPFormat	Support for process programs/formatted process
variable		programs
		0: Neither is supported.
		1: Only process programs are supported.
		2: Only formatted process programs are sup-
		ported.
		3: Both are supported.
PPID Management	User-set variable name	To record process programs and formatted pro-
Table		cess programs in the equipment, the PPIDs are registered in the PPID Management Table.

2 Creating the User Program According to the Scenarios

Create the user program according to the scenarios. Details on the processing for the process program and formatted process program scenarios are given later. Also, refer to the descriptions of the GEM instructions that are used for scenario processing. Refer to *A-1 GEM Instructions* on page A-3 for information on the GEM instructions.

3 Process Program Selection

When you select a process program in the user program, you must notify the host of the PPID using a collection event. To do so, the CEID of the Process Program Selected collection event is specified and the Report Event (GEM ReportEvent) instruction is executed in the user program.

You also set a discrete link variable for the Process Program Selected collection event.

Discrete variable	Link variable	Description
PPExecName	_GEM_PPExecName	PPID of currently selected process program

Scenario Processing

This section describes the processing for the process program and formatted process program scenarios. There are the following eleven scenarios.

- Creation, Editing, or Deletion of Process Program by Operator
- · Process Program Deletion by Host
- Process Program Directory Request
- Equipment-initiated Process Program Upload
- Host-initiated Process Program Upload
- Equipment-initiated Process Program Download
- · Host-initiated Process Program Download
- Equipment-initiated Formatted Process Program Upload
- Host-initiated Formatted Process Program Upload
- Equipment-initiated Formatted Process Program Download
- Host-initiated Formatted Process Program Download

Creation, Editing, or Deletion of Process Program by Operator

After the operator creates, edits, or deletes a process program and formatted process program, the host is notified with a Process Program Change collection event.

The following procedure is used.

- The equipment changes the process program or formatted process program and the PID Management Table according to the creation, edition or deletion contents of process programs or formatted process programs.
- The host connection function sends the collection event.

To send the collection event, the CEID of the Process Program Change collection event is specified and the GEM ReportEvent instruction is executed in the user program.

At the time, the following values are set in the discrete variable assigned to the Process Program Change collection event.

Discrete variable	Link variable	Description
PPChange	_GEM_PPChangeInfo.P	PPID of the process program or formatted process program
Name	PChangeName	that was created, edited, or deleted by the operator.
PPChange	_GEM_PPChange-	Processing type for process program or formatted process pro-
Status	Info.PPChangeStatus	gram
		1: Created
		2: Edited
		3: Deleted

Process Program Deletion by Host

The following procedure is used for the Host-initiated Process Program Deletion scenario or the Host-initiated Formatted Process Program Deletion scenario.

- Delete Process Program Send (S7,F17) is received from the host.
- **2** The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function processing		Notifi-
Result	Factor	Processing	Value of ACKC7	cation
Normal		Changes the value of _GEM_BusyHostPPDelete (Host-initiated Process Program Deletion Transaction Processing Flag) to TRUE.		Yes
Error	The PPID is not saved in the PPID Management Table.	Sends Delete Process Program Acknowledge (S7,F18)	1	None
	The value of PPID is NULL.	to the host.	4	1
	The value of the _GEM_Interlock_PP interlock variable is TRUE.		5	
	The Process Program Management GEM capability is disabled.		60	
	The same PPID is used twice.		63	
	Common criteria*1*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

The data received for Delete Process Program Send (S7,F17) is stored in *PPID count* and *PPID table* in the link variables for the deletion requested PPID list.

- The user program deletes the PPID of the process program or formatted process program for which there was a deletion request from the PPID Management Table. Also, the process program/formatted process program for which there was a deletion request is deleted.
 - If the PPID count for the deletion request is 0, all of the process programs and formatted process programs are deleted.
- **4** The host connection function returns Delete Process Program Acknowledge (S7,F18). To return Delete Process Program Acknowledge (S7,F18), execute the Acknowledge Process Program Deletion (GEM AckPPDelete) instruction in the user program.

Process Program Directory Request

The following procedure is used for the Process Program Directory Request scenario. The host connection function handles all of the processing for the process program directory request. No processing is required in the user program.

- 1 Current EPPD Request (S7,F19) is received from the host.
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Sends Current EPPD Data (S7,F20) to the host.	None
Error	Common criteria*1*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function returns Current EPPD Data (S7,F20).

Equipment-initiated Process Program Upload

The following procedure is used for the Equipment-initiated Process Program Upload scenario.

- The host connection function sends Process Program Load Inquire (S7,F1). To send Process Program Load Inquire (S7,F1), execute the Upload Process Program (GEM UploadPP) instruction in the user program.
- Process Program Load Grant (S7,F2) is received from the host.
- The host connection function determines if the received secondary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Sends Process Program Request (S7,F5) to the host.	None
Error	The value of PPGNT is not 0.	 Changes the value of _GEM_BusyEquipPPUpload (Equipment-initiated Process Program Upload Transaction Processing Flag) to FALSE. Stores the error information in _GEM_EquipPPUploadRslt (Equipment-initiated Process Program Upload Result). 	Yes

- If the message is normal, the host connection function sends Process Program Reguest (S7,F5).
- Process Program Data (S7,F6) is received from the host.

The value of GEM BusyEquipPPUpload (Equipment-initiated Process Program Upload Transaction Processing Flag) changes to FALSE.

The transaction processing result is stored in _GEM_EquipPPUploadRsltI as the equipment-initiated process program upload result.

If the process program data can be received, the data received with Process Program Data (S7,F6) is stored in the PPBODY link variable for equipment-initiated upload.

Host-initiated Process Program Upload

The following procedure is used for the Host-initiated Process Program Upload scenario.

- **1** Process Program Request (S7,F5) is received from the host.
- **2** The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Changes the value of _GEM_BusyHostPPUpload (Host-initiated Process Program Upload Transaction Processing Flag) to TRUE.	Yes
Error	The value of PPID is NULL. The value of the _GEM_Interlock_PP interlock variable is TRUE. Process programs in the Process Program Management GEM capability are disabled.	Sends L,0 to the host with Process Program Data (S7,F6).	None
	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The data received with Process Program Request (S7,F5) is stored in the *PPID of upload request* link variable for host-initiated upload.

3 The host connection function returns Process Program Data (S7,F6).

To return Process Program Data (S7,F6), execute the Respond to Process Program Upload (GEM_RespPPUpload) instruction in the user program. When you execute the instruction, store the send data for Process Program Data (S7,F6) in the PPBODY link variable for host-initiated upload.

Equipment-initiated Process Program Download

The following procedure is used for the Equipment-initiated Process Program Download scenario.

- The host connection function sends Process Program Request (S7,F5).
 To send Process Program Request (S7,F5), execute the Request Process Program Download (GEM_RequestPPDownload) instruction in the user program.
- **2** Process Program Data (S7,F6) is received from the host.

The value of _GEM_BusyEquipPPDownload (Equipment-initiated Process Program Download Transaction Processing Flag) changes to FALSE.

The transaction processing result is stored in _GEM_EquipPPDownloadRsIt as the equipment-initiated process program download result.

The data received with Process Program Data (S7,F6) is stored in the PPID, LENGTH, and PPBODY link variables for equipment-initiated download.

3 The user program updates the PPID Management Table and process program.

Host-initiated Process Program Download

The following procedure is used for the Host-initiated Process Program Download scenario.

- Process Program Load Inquire (S7,F1) is received from the host.
- The host connection function determines if the received primary message is normal. The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

	Factor	Host connection function p	Notifi-	
Result		Processing	Value of PPGNT	cation
Normal		Sends Process Program Load	0	None
Error	The PPID Management Table is full.	Grant (S7,F2) to the host.	2	
	The value of PPID is NULL.		3	
	The value of the _GEM_Interlock_PP interlock variable is TRUE.		4	
	The value of LENGTH exceeds the permissible message length set on the SECS/GEM Configurator.		5	
	Process programs in the Process		60	

Common processing

- The host connection function returns Process Program Load Grant (S7,F2).
- Process Program Send (S7,F3) is received from the host.

Program Management GEM capabil-

ity are disabled.

Common criteria*1

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The host connection function determines if the process program can be accepted.

The accept/reject results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

	Factor	Host connection function processing		Notifi-
Result		Processing	Value of ACKC7	cation
Can be accepted		Changes the value of _GEM_BusyHostPPDownload (Host-initiated Process Program Download Transaction Processing Flag) to TRUE.		Yes
Cannot be	The PPID Management Table is full.	Sends Process Program	3	None
accepted	The value of PPID is NULL.	Acknowledge (S7,F4) to the	4	
	The value of the _GEM_Inter- lock_PP interlock variable is TRUE.	host.	5	
	Process programs in the Process Program Management GEM capabil- ity are disabled.		60	
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The data received with Process Program Send (S7,F3) is stored in the PPID, LENGTH, and PPBODY link variables for host-initiated download.

- **6** The user program updates the PPID Management Table and process program.
- The host connection function returns Process Program Acknowledge (S7,F4).

 To send Process Program Acknowledge (S7,F4), execute the Acknowledge Process Program Download (GEM_AckPPDownload) instruction in the user program.

Equipment-initiated Formatted Process Program Upload

The following procedure is used for the Equipment-initiated Formatted Process Program Upload scenario.

- The host connection function sends Process Program Load Inquire (S7,F1). To send Process Program Load Inquire (S7,F1), execute the Upload Formatted Process Program (GEM UploadFormattedPP) instruction in the user program.
- 2 Process Program Load Grant (S7,F2) is received from the host.
- The host connection function determines if the received secondary message is normal. The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifica- tion
Normal		Sends Process Program Request (S7,F5) to the host.	None
Error	The value of PPGNT is not 0.	 Changes the value of _GEM_BusyEquipFormattedP-PUpload (Equipment-initiated Formatted Process Program Upload Transaction Processing Flag) to FALSE. Stores the error information from the result of the equipment-initiated formatted process program upload in _GEM_EquipFormattedPPUploadRslt. 	Yes

- If the message is normal, the host connection function sends Formatted Process Program Request (S7,F25).
- Formatted Process Program Data (S7,F26) is received from the host.

The value of GEM BusyFormattedEquipPPUpload (Formatted Process Program Upload Transaction Processing Flag) is changed to FALSE.

The transaction processing result is stored in GEM EquipPPUploadRslt as the equipment-initiated formatted process program upload result.

If the formatted process program data can be received, the data received with Formatted Process Program Data (S7,F26) is stored in the CCODE table link variable for equipment-initiated formatted process program upload.

Host-initiated Formatted Process Program Upload

The following procedure is used for the Host-initiated Formatted Process Program Upload scenario.

- **1** Formatted Process Program Request (S7,F25) is received from the host.
- **2** The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifi- cation
Normal		Changes the value of _GEM_BusyHostFormattedPPUpload (Host-initiated Formatted Process Program Upload Transaction Processing Flag) to TRUE.	Yes
Error	The value of PPID is NULL. The value of the _GEM_Inter- lock_PP interlock variable is TRUE. Formatted process programs in the Process Program Management GEM capability are disabled.	Sends L,0 to the host with Formatted Process Program Data (S7,F26).	None
	Common criteria*1	Common processing	

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The data received with Formatted Process Program Request (S7,F25) is stored in the *PPID of upload request* link variable for host-initiated formatted process program upload.

3 The host connection function returns Formatted Process Program Data (S7,F26).

To return Formatted Process Program Data (S7,F26), execute the Respond to Formatted Process Program Upload (GEM RespFormattedPPUpload) instruction in the user program.

When you execute the instruction, store the send data for Formatted Process Program Data (S7,F26) in the *CCODE table* link variable for host-initiated formatted process program upload.

Equipment-initiated Formatted Process Program Download

The following procedure is used for the Equipment-initiated Formatted Process Program Download scenario.

The host connection function sends Formatted Process Program Request (S7,F25). To send Formatted Process Program Request (\$7,F25), execute the Request Formatted Process Program Download (GEM RequestFormattedPPDownload) instruction in the user program.

2 Formatted Process Program Data (S7,F26) is received from the host.

The value of GEM BusyEquipFormattedPPDownload (Formatted Process Program Download Transaction Processing Flag) is changed to FALSE.

The transaction processing result is stored in _GEM_EquipFormattedPPDownloadRsIt as the equipment-initiated formatted process program download result.

The data received with Formatted Process Program Data (S7,F26) is stored in the following link variables for equipment-initiated formatted process program download.

- PPID
- MDLN
- SOFTREV
- CCODE count
- CCODE table
- The user program updates the PPID Management Table and process program.
- The host connection function sends Process Program Verification Send (S7,F27). To send Process Program Verification Send (S7,F27), execute the Send Process Program Verification Result (GEM SendPPVerify) instruction in the user program.

When you execute the instruction, store the send data for Process Program Verification Send (S7,F27) in the ACKC7A table, SEQNUM table, and ERRW7 table link variables for verification check results.

Process Program Verification Acknowledge (S7,F28) is received from the host.

Host-initiated Formatted Process Program Download

The following procedure is used for the Host-initiated Formatted Process Program Download scenario.

1 Process Program Load Inquire (S7,F1) is received from the host.

2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function p	rocessing	Notifi-
Result	Factor	Processing	Value of PPGNT	cation
Normal		Sends Process Program Load	0	None
Error	The PPID Management Table is full.	Grant (S7,F2) to the host.	2	
	The value of PPID is NULL.		3	
	The value of the _GEM_Inter-		4	
	lock_PP interlock variable is TRUE.		_	
	The value of LENGTH exceeds the		5	
	permissible message length set on the SECS/GEM Configurator.			
	Formatted process programs in the		60	
	Process Program Management			
	GEM capability are disabled.			
	Common criteria*1	Common processing		

^{*1.} Refer to *When Host Sends the Primary Message* on page 5-7 for the common criteria and applicable processing.

- **3** If the message is normal, the host returns Process Program Load Grant (S7,F2).
- Formatted Process Program Send (S7,F23) is received from the host.
- The host connection function determines if the formatted process program can be accepted. If possible, the data received with Formatted Process Program Send (S7,F23) is stored in the following link variables for host-initiated formatted process program download.
 - PPID
 - MDLN
 - SOFTREV
 - CCODE count
 - CCODE table

The accept/reject results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function	processing	Notifi-
Result	Factor	Processing	Value of ACKC7	cation
Can be accepted		Changes the value of _GEM_BusyHostFormatte dPPDownload (Host-initiated Formatted Process Program Download Transaction Processing Flag) to TRUE.		Yes
Cannot be accepted	 The CCODE is not registered. The format of PPARM does not agree with the definition. The value of PPARM is 0. The number of PPARMs is larger than the maximum value of PPARM. The PPID Management Table is full. The value of PPID is NULL. The value of the _GEM_Interlock_PP interlock variable is TRUE. Formatted process programs in the Process Program Management 	Sends Formatted Process Program Acknowledge (S7,F24) to the host.	3 4 5	None
	GEM capability are disabled. Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

- The user program updates the PPID Management Table and process program.
- The host connection function returns Formatted Process Program Acknowledge (S7,F24). To return Formatted Process Program Acknowledge (S7,F24), execute the Acknowledge Formatted Process Program Download (GEM AckFormattedPPDownload) instruction in the user program.
- The host connection function sends Process Program Verification Send (S7,F27).

To send Process Program Verification Send (S7,F27), execute the Send Process Program Verification Result (GEM_SendPPVerify) instruction in the user program.

When you execute the instruction, store the send data for Process Program Verification Send (S7,F27) in the ACKC7A table, SEQNUM table, and ERRW7 table link variables for verification check results.

Process Program Verification Acknowledge (S7,F28) is received from the host.

5-5-16 Material Movement

Material movement is based on the Material Movement additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	5-5-4 Event Notification on page 5-40
Creating the user program on the Sysmac Studio	Required.	

Material Movement

Collective events can be issued for material movement and the user program can manage receiving and removing materials based on the Material Movement additional GEM capability.

Receiving and removing materials from the equipment port are detected and Material Removed and Material Received collection events are issued to notify the host.

To issue a collection event, the CEID of the Material Removed or Material Received collection event is specified and the GEM_ReportEvent instruction is executed in the user program.

5-5-17 Equipment Terminal Service

The equipment terminal service is based on the Equipment Terminal Service additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	Required.	8-11-7 Equipment Terminal Service on page 8-90
Creating the user program on the Sysmac Studio	Required.	This section

Equipment Terminal Service

The host can collect information that is displayed on equipment displays based on the Equipment Terminal Service additional GEM capability. The equipment can also send information to the host. You can set TID to 0 to specify the main terminal and to 1 to specify an additional terminal as the equipment terminal. An additional terminal does not need to be used.

The main specifications of the equipment terminal service are given in the following table.

Item	Specification
Maximum size of terminal message [bytes]*1	240

^{*1.} The terminal message size is set as the data size of TEXT in the item definitions.

Equipment Terminal Service Scenarios

There are the following two Equipment Terminal Service scenarios.

- · Host Sends Information to Equipment Display Device
- · Operator Sends Information to Host

Host Sends Information to Equipment Display Device, Single Block

The following procedure is used for the Host Sends Information to Equipment Display Device, Single Block scenario.

- **1** The host sends Terminal Display, Single (S10,F3).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function proc	essing	Notifi-
Result	Factor	Processing	Value of ACKC10	cation
Normal		Changes the value of		Yes
		_GEM_BusyHostTerminalMsgSB		
		(Host-initiated Single-block Terminal		
		Message Transaction Processing		
		Flag) to TRUE.		
Error	The value of TID is incorrect.	Sends Terminal Display, Single	2	None
		Acknowledge (S10,F4) to the host.		
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

- The host connection function returns Terminal Display, Single Acknowledge (S10,F4).

 To send Terminal Display, Single Acknowledge (S10,F4), execute the Acknowledge Single-block Equipment Terminal Message (GEM_AckTerminalMsgSB) instruction in the user program.
- **4** The user displays the information on the specified terminal.

If a Message Recognition collection event is issued when the operator checks the terminal message, the Report Event (GEM_ReportEvent) instruction is executed in the user program.

Host Sends Information to Equipment Display Device, Multi-block

The following procedure is used for the Host Sends Information to Equipment Display Device, Multi-block scenario.

- The host sends Terminal Display, Multi-block (S10,F5).
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function pro	cessing	Notifica-
Result	Factor	Processing	Value of ACKC10	tion
Normal		Changes the value of _GEM_BusyHostTerminalMsgMB (Host-initiated Multi-block Terminal Message Transaction Processing Flag) to TRUE.		Yes
Error	The value of TID is incorrect.	Sends Terminal Display, Multi-block (S10,F5) to the host.	2	None
	The TEXT count exceeds the set number of terminal messages displayed on a terminal.	 Sends Terminal Display, Multi-block (S10,F5) to the host. Sends Multi-block Not Allowed (S10,F7) to the host. 	63	
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

- The host connection function returns Terminal Display, Multi-block Acknowledge (S10,F6). To send Terminal Display, Multi-block Acknowledge (S10,F6), execute the Acknowledge Multi-block Equipment Terminal Message (GEM AckTerminalMsgMB) instruction in the user program.
- The user displays the the information on the specified terminal. If a Message Recognition collection event is issued when the operator checks the terminal message, the Report Event (GEM_ReportEvent) instruction is executed in the user program.

Operator Sends Information to Host

The following procedure is used for the Operator Sends Information to Host scenario.

- The user executes the Send Equipment Terminal Message (GEM_SendTerminalMsg) instruction.
- The host connection function sends Terminal Request (S10,F1).
- The host sends Terminal Request Acknowledge (S10,F2).

5-5-18 Clock

The clock is based on the Clock additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Not required.	
Creating the user program on the Sysmac Studio	Required.	This section

Clock

The equipment can request clock information from the host based on the Clock additional GEM capability. Also, the host can set the clock in the Controller.

Clock Scenarios

There are the following two Clock scenarios.

- · Equipment Requests Time
- · Host Instructs Equipment to Set Time

• Equipment Requests Time

The following procedure is used for the Equipment Requests Time scenario.

- 1 The user executes the Request Time Change (GEM_RequestChangeTime) instruction.
- **2** The host connection function sends Date and Time Request (S2,F17).
- **3** The host sends Date and Time Data (S2,F18).
- **4** The date and time are set in the equipment.
- **5** The equipment-initiated time change result is set in _GEM_EquipChangeTimeRslt.

If TIME in Date and Time Data (S2,F18) is not a 12-byte or 16-byte text string, the date and time in the equipment are not changed.

Host Instructs Equipment to Set Time

The following procedure is used for the Host Instructs Equipment to Set Time scenario. The host connection function performs all of the processing for the Host Instructs Equipment to Set Time scenario. Reception of the primary message is not reported to the user program.

1 The host sends Date and Time Set Request (S2,F31).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function proc	essing	Notifica-
Result	Factor	Processing	Value of TIACK	tion
Normal	*1	• Sends Date and Time Acknowledge (S2,F32) to the host.	0	None
		Sets the date and time in the equipment.		
Error	The value of TIME is not a date and time.	Sends Date and Time Acknowledge (S2,F32) to the host.	1	
	The value of the _GEM_Interlock_Time interlock variable is TRUE.		63	
	Common criteria*2*3	Common processing		

^{*1.} Regardless of the value of the TimeFormat equipment constant, the value of a 12-byte or 16-byte TIME is accepted.

The host connection function returns Date and Time Acknowledge (S2,F32).

GEM Interlock Time Interlock Variable

The _GEM_Interlock_Time interlock variable is related to the clock.

The relationship between the Clock scenarios and the SECS messages that are interlocked is given in the following table.

Scenario	Interlocked SECS message
Equipment Requests Time	None
Host Instructs Equipment to Set Time	Date and Time Set Request (S2,F31)

^{*2.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

^{*3.} If TIME is not a 12-byte or 16-byte text string, Illegal Data (S9,F7) is returned to the host.

5-5-19 Limit Monitoring

Limit monitoring is based on the Limits Monitoring additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Settings on the SECS/GEM Configurator	•	8-9-3 Status Variable (SV) on page 8-50 8-11-8 Limit Monitoring on page 8-92
Creating the user program on the Sysmac Studio	Not required.	

Limit Monitoring

The host can monitor the values of status variables based on the Limits Monitoring additional GEM capability. The host connection function manages state transitions for limit monitoring. You do not need to manage state transitions for limit monitoring.

The main specifications of limit monitoring are given in the following table.

ltem	Specification
Maximum number of status variables for limit monitoring	5
Maximum number of limit settings registered for one status variable	7
Sampling period [s]	1 to 360

You cannot specify the following formats for limit monitoring.

- List (L)
- ASCII (A)
- · Binary (B)
- Numeric formats with more than one element (U1, U2, U4, F4, F8, I1, I2, and I4)

Limit Monitoring Scenarios

There are the following three Limit Monitoring scenarios.

- · Zone Transition Event Occurs in Equipment
- · Host Defines Limit Attribute
- · Host Queries Equipment for Current Limits

Zone Transition Event Occurs in Equipment

When a status variable that is specified for limit monitoring moves between monitoring zones, a Limit Zone Transition collection event is sent to the host.

Host Defines Limit Attribute

The following procedure is used for the Host Defines Limit Attribute scenario.

The host sends Define Variable Limit Attributes (S2,F45).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection fu	Notifica-	
Result	Factor	Processing	Value of VLAACK	tion
Normal		Sends Date and Time	0	None
Error	There is an error in a limit	Set Acknowledge	1	
	attribute.*1	(S2,F32) to the host.		
	More than five status vari-		2	
	ables are specified for limit			
	monitoring at the same time.			
	Common criteria*2	Common processing		

^{*1.} A limit attribute error is reflected in the values of LVACK and LIMITACK. Refer to the following tables for details on determining limit attribute errors.

A limit attribute error is reflected in the values of LVACK and LIMITACK. The meanings of the values of LVACK and LIMITACK are given in the following tables..

Value of LVACK	Meaning		
1	VID is not registered.		
2	VID is not a target for limit monitoring.		
3	The same VID was used twice.		
4	The value of LIMITID, UPPERDB, or LOWERDB is not correct.		
63	The same VID is used more than seven times in the limit settings.		

Value of LIMITACK	Meaning
2	The value of UPPERDB is greater than the value of LIMITMAX.
3	The value of LOWERDB is smaller than the value of LIMITMIN.
4	The value of UPPERDB is smaller than the value of LOWERDB.
7	The same LIMITID is used twice.

The host connection function returns Variable Limit Attribute Acknowledge (S2,F46).

Host Queries Equipment for Current Limits

The following procedure is used for the Host Queries Equipment for Current Limits scenario.

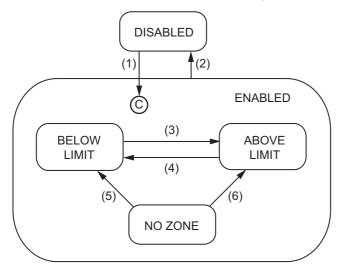
The host sends Variable Limit Attribute Request (S2,F47).

The host connection function returns Variable Limit Attributes Send (S2,F48).

^{*2.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

Limit State Model

The variables for which limits are monitored operate according to the following limit state model.



The triggers, resulting equipment operation, and comments for the above transitions are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Operation	Comment
(1)	DISABLED	Limit attribute defined with Define Variable Limit Attributes (S2,F45)	ENABLED	None	The substate of ENABLED is determined by the value of the monitored variable.
(2)	ENABLED	Limit attribute undefined with Define Variable Limit Attributes (S2,F45)	DISABLED	None	
(3)	BELOW LIMIT	Variable increased to be ≥ UPPERDB (upper boundary of the deadband)	ABOVE LIMIT	None	A Limit Zone Transition collection event is issued.
(4)	ABOVE LIMIT	Variable decreased to be ≤ LOWERDB (lower boundary of the deadband)	BELOW LIMIT	None	A Limit Zone Transition collection event is issued.
(5)	NO ZONE	Variable decreased to be ≤ LOWERDB (lower boundary of the deadband)	BELOW LIMIT	None	
(6)	NO ZONE	Variable increased to be ≥ UPPERDB (upper boundary of the deadband)	ABOVE LIMIT	None	

5-5-20 Spooling

Spooling is based on the Spooling additional GEM capability.

The design items required to achieve this function are given in the following table along with references.

Item	Requirement	Reference
Setting with the SECS/GEM Configurator	Required.	8-11-9 Spooling on page 8-93
Creating the user program on the Sysmac Studio	Not required.	

Spooling

While communications are cut off between the host and equipment, the SECS messages to send from the equipment to the host can be queued based on the Spooling additional GEM capability. Then, when communications recover, the queued SECS messages can be sent from the equipment to the host.

The host connection function manages state transitions for spooling. You do not need to manage state transitions for spooling.

You can spool the SECS messages only for the primary messages in the user-specified streams.

The main specifications of the spooling are given in the following table.

Item	Specification
Maximum number of messages that can be spooled	1000

The spooled SECS messages are saved in the SD Memory Card. The saved SECS messages are discarded in the following cases.

- Request Spooled Data (S6,F23) is received from the host with RSDC set to 1.
- The spooling settings are changed from the SECS/GEM Configurator.
- Restoring backup data is performed for the Controller
- An SD Memory Card was inserted when the GEM Service status is Run.
- The SD Memory Card is initialized with a Sysmac Studio operation.
- An error occurs in the spooled data stored on the SD Memory Card.



Precautions for Correct Use

- When the equipment sends queued primary messages to the host with spooling, the transaction processing is not performed for the secondary message from the host.
- If spooling is enabled for the following SECS messages, transaction processing will end in a send error when the message is spooled. When a send error occurs, the value of the Rslt-Code member of the system-defined variable for the processing result will be 16#0100.
 - Process Program Load Inquire (S7,F1)
 - · Process Program Send (S7,F3)
 - · Process Program Request (S7,F5)
 - · Formatted Process Program Send (S7,F23)
 - Formatted Process Program Request (S7,F25)
 - Process Program Verification Send (S7,F27)
 - Terminal Request (S10,F1)
- If you set spooling for user-defined messages, the user program is not notified when the secondary message is received from the host.
- Immediately after communications are interrupted, e.g., by a disconnected cable, the SECS message sent from the equipment to the host may not be spooled.

Spooling Scenarios

There are the following two Spooling scenarios.

- · Define Set of Messages to Spool
- · Request or Delete Spooled Data

Define Set of Messages to Spool

The following procedure is used for the Define Set of Messages to Spool scenario.

- **1** The host sends Reset Spooling Streams and Functions (S2,F43).
- 2 The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

		Host connection function proc		
Result	Factor	Processing	Value of RSPACK	Notification
Normal		Sends Reset Spooling Acknowledge	0	None
Error	The spooling state is SPOOL ACTIVE.	(S2,F44) to the host.	1	
	The spool data is not saved.		2	
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

3 The host connection function returns Reset Spooling Acknowledge (S2,F44).

Request or Delete Spooled Data

The following procedure is used for the Request or Delete Spooled Data scenario.

1 The host sends Request Spooled Data (S6,F23).

The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection fun	Notification	
Result	i actor	Processing	Value of RSDA	Notification
Normal		Sends Request	0	None
Error	The host sent Request Spooled Data (S6,F23) during	Spooled Data Acknowledgement Send (S6,F24) to the	1	
	spooled data transfer. There is no spooled data.	host.	2	
	The value of RSDC is not correct.		63	
	Common criteria*1	Common processing		

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

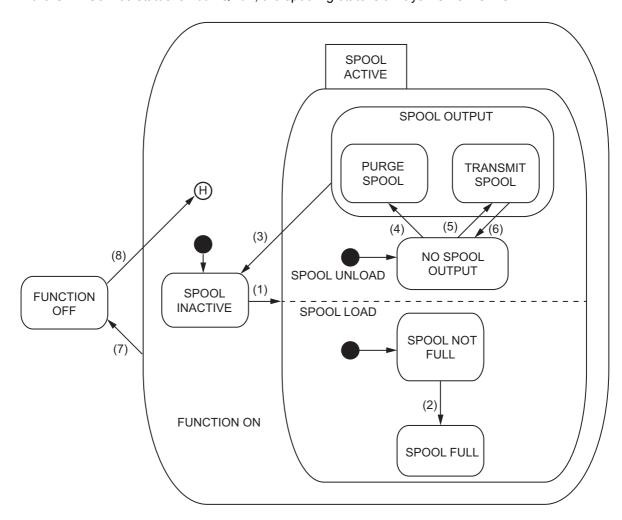
The host connection function performs the following processing according to the value of RSDC if the received primary message is normal.

Value of RSDC	Host connection function processing
0	Sends a spool message to the host.
1	Discards the spooled data.

The host connection function returns Request Spooled Data Acknowledgement Send (S6,F24).

Spooling State Model

State transitions for spooling are performed according to the following spooling state model. If the GEM Service status is not EQRun, the spooling state is always FUNCTION OFF.



The triggers, resulting equipment operation, and comments for the above transitions are described in the following table. The numbers in the table correspond to the numbers in the figure.

No.	Current state	Trigger	New state	Operation	Comment
(1)	SPOOL INACTIVE	The communications state changes from COMMUNICATING to NOT COMMUNICTIONS or from WAIT CRA to WAIT DELAY and EnableSpool is TRUE.	SPOOL ACTIVE	SpoolCountActual and SpoolCountTotal are initialized to zero. Any open transactions with the host are aborted. SpoolStartTime is set to the current time.	A Spooling Activated collection event is issued.
(2)	SPOOL NOT FULL	Message generated does not fit into spool area.	SPOOL FULL	SpoolFullTime is set to the current time.	
(3)	SPOOL OUTPUT	Spool area became empty. The SD Memory Card was removed.	SPOOL INACTIVE	Spooling processing is disabled.	A Spooling Deactivated collection event is issued.
(4)	NO SPOOL OUTPUT	Request Spooled Data (S6,F23) was received with RSDC set to 1.	PURGE SPOOL	None	Purging is started.
(5)	NO SPOOL OUTPUT	Request Spooled Data (S6,F23) was received with RSDC set to 0.	TRANSMIT SPOOL	None	Sending SECS messages from the spool is started.
(6)	TRANSMIT SPOOL	Communications failed or <i>MaxSpoolTransmit</i> was reached.	NO SPOOL OUTPUT	Spool transmission processing is suspended.	If communications fail, a Spool Trans- mit Failure collec- tion event is issued.
(7)	FUNCTION ON	The GEM Service status changed to a status other than EQRun.	FUNCTION OFF	None	The spooling context is saved in non-volatile memory.
(8)	FUNCTION OFF	The GEM Service status changed to EQRun.	FUNCTION ON	The spooling context is restored from non-volatile memory.	If spooling was active before the power supply was turned OFF, the active state is continued. Transition 6 occurs if the state TRANSMIT SPOOL was active when power went down.

Spooling Settings

Some spooling settings are made from the SECS/GEM Configurator and others are made from the user program.

Settings Made from the SECS/GEM Configurator

The number of spooled messages and the messages to spool are set with the SECS/GEM Configurator. Refer to *8-11-9 Spooling* on page 8-93 for details.

Settings Made with the User Program

The Change Equipment Constant (GEM_ChangeECV) instruction is used to set the values of equipment constants related to spooling.

System-defined Variables Related to Spooling

The following system-defined variables are related to spooling. Refer to *A-2 System-defined Variables* on page A-211 for details on system-defined variables.

System-defined variable	Name
_GEM_SpoolParam	Spooling Parameters
_GEM_SpoolCondition	Spool Information
_GEM_SpoolingState	Spooling State

Message Settings 5-6

You can make message settings for the following two types of SECS messages.

- · GEM Standard Messages: These are the SECS messages that are supported as standard features by the GEM Services.
- User-defined Messages: These are SECS messages that are defined by the user.

5-6-1 **GEM Standard Messages**

The following settings are made from the SECS/GEM Configurator for the SECS messages that are supported as standard features by the GEM Services.

Item	Set value	Meaning
Setting to enable/disable pri-	Enabled	Primary messages from the host to the equipment are enabled.
mary messages from the host to	Disabled	Primary messages from the host to the equipment are dis-
the equipment		abled.
W-bit setting for primary mes-	ON	Indicates a primary message that requires a response from the
sages sent from the equipment		host to the equipment.
to the host	OFF	Indicates a primary message that does not require a response
		from the host to the equipment.

Refer to 8-12-1 GEM Standard Messages on page 8-95 for the procedures to make the settings for GEM standard messages on the SECS/GEM Configurator.

Processing Differences Based on the Settings

The processing performed by the equipment when it receives a SECS message from the host depends on the primary message enable/disable setting and the W-bit setting for GEM standard messages.

The processing performed by the equipment also depends on whether the SECS message is processed just by the GEM Services or it is processed jointly by the GEM Services and user program.

Host Sends Primary Message to Equipment

When the host sends a primary message to the equipment, the following reception processing is performed by the equipment according to the setting.

Enable/disable setting	Host connection function processing	User program processing
Enabled	Depends on the SECS message. *1	
Disabled	Sends Unrecognized Function Type (S9,F5) to	Processing is performed only by the host
	the host.	connection function.

^{*1.} Refer to 2-3-1 SECS Messages When Host Sends the Primary Message on page 2-7 for details.



Precautions for Correct Use

If the W bit in a primary message from the host is OFF, the equipment sends Unrecognized Function Type (S9,F5) regardless of the primary message enable/disable setting.

Equipment Sends Primary Message to Host

When the equipment sends a primary message to the host and the host sends a secondary message to the equipment, the following reception processing is performed by the equipment according to the setting.

W-bit setting	Host connection function processing	User program processing
ON	Depends on the SECS message. *1	
OFF	Sends Unrecognized Function Type (S9,F5) to the	Processing is performed only by the
	host.	host connection function.

^{*1.} Refer to 2-3-2 SECS Messages When Equipment Sends the Primary Message on page 2-11 for details.

5-6-2 **User-defined Messages**

In addition to the SECS messages defined in the SECS/GEM standard, the user can define any SECS messages that are compliant with SECS. These are called user-defined messages.

The specifications for user-defined messages are given in the following table.

Item	Specification
Maximum number of registered user-defined messages	128
Maximum number of registered SECS messages with the same function number and stream number	20
Maximum size of SECS message [Kbytes]	256
Maximum number of items registered in one SECS message	160

User-defined messages are defined in pairs. Each pair consists of a primary message and a secondary message. The stream and function numbers for a primary message and secondary message pair are in the form SxFy and SxFy+1. Here, y is an odd number. However, if the W bit for a primary message is set to OFF, a secondary message is not required for it.

Refer to 8-12-2 User-defined Messages on page 8-96 for the procedures to make the settings for user-defined messages on the SECS/GEM Configurator.



Precautions for Correct Use

- · You cannot define a SECS message that has the same stream and function numbers as a SECS standard message.
- It is not necessary to register the Sx,F0 message. If the control state is EQUIPMENT OFF-LINE, the GEM services will return the Sx,F0 message.
- If you define more than one SECS message with the same message structure, the SECS message with the smaller message number takes priority.

Message Structure and Link Variables

The item and list formats that you can use in user-defined messages are given in the following table.

Item	Format
Items	B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, and U4
Lists	Lists of fixed length data and lists of length-variable data

You use the SECS/GEM Configurator to assign a link variable to each message item. The data type of a link variable depends on the item format and message list structure.

List Specifications for User-defined Messages

There are two types of lists: lists of fixed length data and lists of length-variable data. Also, you can nest lists. You can nest lists within lists. You can create a total of up to six nesting levels for lists of fixed length data and lists of length-variable data. You cannot nest a list of length-variable data inside a list of length-variable data.

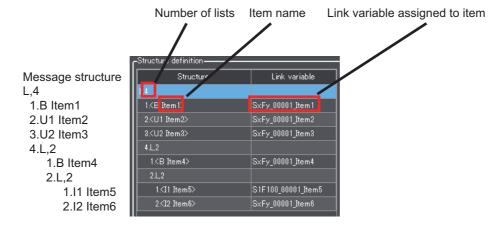
List of Fixed Length Data

For the list of fixed length data, you set the items for each list. You can set a different format for each item in a list. The specifications for a list of fixed length data are given in the following table.

Item	Specification
Number of lists	0 to 128

In a list of fixed length data, a link variable is assigned to store the value separately for each item in the list.

The following example shows a message structure on the SECS/GEM Configurator for a list of fixed length data with three nesting levels and link variables assigned for each item.



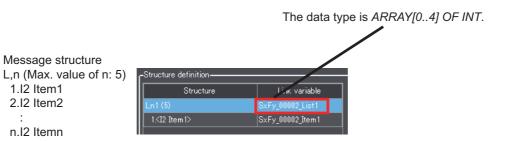
List of Length-variable Data

For the list of length-variable data, you set items to be changeable. All items in the list have the same format. The specifications for a list of length-variable data are given in the following table.

Item	Specification
Number of lists	1 to 128

For a list of length-variable data, a link variable to store the number of items and a shared array link variable to store the item values are assigned. The number of array elements must be equal to the maximum number of items.

The following example shows a message structure on the SECS/GEM Configurator for an item in the list of length-variable data and link variables assignments. The variable $SxFy_00002_List1$ stores the number of items in the list of length-variable data, and the variable $SxFy_00002_ltem1$ stores the values of the items. The data type of $SxFy_00002_ltem1$ is ARRAY[0..4] OF INT.



User-defined Message Processing

Processing of user-defined messages is different depending on whether the host sends the primary message to the equipment or the equipment sends the primary message to the host.

Host Sends Primary Message to Equipment

The following procedure is used when the host sends the primary message to the equipment.

- **1** The host sends the primary message to the equipment.
- The host connection function determines if the received primary message is normal.

The normal/error results and factors, and the host connection function processing for each, are given in the following table. The table also tells if the user program is notified.

Result	Factor	Host connection function processing	Notifica- tion
Normal		Changes the value of _GEM_BusyHostUserMsg (Host-initiated User-defined Message Transaction Processing Flag) to TRUE.	Yes
Error	Common criteria*1	Common processing	None

^{*1.} Refer to When Host Sends the Primary Message on page 5-7 for the common criteria and applicable processing.

The user executes the Respond to Host-initiated User-defined Message (GEM_RespHostUserMsg) instruction in the user program.

The message number that is specified in the GEM_RespHostUseMsg instruction depends on the W-bit setting in the primary message as described in the following table.

Primary message W-bit setting	Message number
ON	Message number defined for SxFy+1 in response to a primary
	message with stream and function numbers of SxFy.
OFF	0

4 The equipment returns the secondary message to the host.

Equipment Sends Primary Message to Host

The following procedure is used when the equipment sends the primary message to the host.

Refer to System-defined Variables on page A-211 for details on the system-defined variables that are given. Refer to GEM_SendEquipUserMsg on page A-175 for details on the GEM_SendEquipUserMsg instruction.

- 1 The user executes the Send Equipment-initiated User-defined Message (GEM SendEquipUserMsg) instruction in the user program.
- The equipment sends the primary message to the host.
- The host sends the secondary message to the equipment.
- The host connection function determines if the received secondary message is normal. If there is an error, it changes the value of _GEM_BusyEquipUserMsg (Equipment-initiated User-defined Message Transaction Processing Flag) to FALSE. It also stores the transaction processing result in GEM EquipUserMsqRslt as the equipment-initiated user-defined message result.

The secondary message error criteria and the host connection function processing for each are given in the following table. The table also tells if the user program is notified of reception of the secondary message.

Error criteria	Host connection function processing	Notifica- tion
A secondary message with normal stream and function numbers was received, but the message structure of the received message is different from the structure set on the SECS/GEM Configurator.	An error is given for the transaction processing result.	Yes*1
A secondary message with stream and function numbers that are not correct was received, and the message structure of the received message is different from the structure set on the SECS/GEM Configurator.	 The secondary message is discarded. Illegal Data (S9,F7) is sent to the host. 	None
The W-bit setting in the primary message is ON but a secondary message was not sent.	 The following processing is performed after a T3 timeout. An error is given for the transaction processing result. Transaction Timer Timeout (S9,F9) is sent to the host. 	Yes*1

^{*1.} You can check to see if a secondary message was received with the value of _GEM_BusyEquipUserMsg.

If the W-bit setting in the primary message is OFF, the value of GEM BusyEquipUserMsg changes to FALSE before the secondary message is received from the host.



GEM Service Logs

The GEM Service logs record the operations that were performed by the GEM Services. You use the Log Viewer in the GEM Setting Tools to view the contents of the logs. This section provides details on the GEM Service logs and the operating procedures for the Log Viewer.

6-1	GEM S	Service Logs	6-2
	6-1-1	Types of GEM Service Logs	6-2
	6-1-2	Saving Destinations for GEM Service Logs	6-2
	6-1-3	Restrictions on GEM Service Logs	6-2
6-2	Applic	ation Procedures for the GEM Service Logs	6-4
	6-2-1	Setting the Numbers of Records Saved in the GEM Service Logs	6-4
	6-2-2	Displaying the Contents of the GEM Service Logs	6-4
6-3	Log Vi	ewer Operations	6-6
	6-3-1	Installation of GEM Setting Tools	6-6
	6-3-2	Starting and Stopping the Log Viewer	6-6
	6-3-3	Configuration of the Main Window	6-7
	6-3-4	Procedure to Display a GEM Service Log	6-8
	6-3-5	Displaying the SECS Message Log	6-12
	6-3-6	Displaying the HSMS Communications Log	6-15
	6-3-7	Displaying the Execution Log	6-17
	6-3-8	Filters	6-18
	6-3-9	Saving the Current Settings	6-18
	6-3-10	Outputting Logs to Files	6-19
	6-3-11	Windows	6-22
	6-3-12	Help	6-22

GEM Service Logs 6-1

The GEM Service logs record the operations that were performed by the GEM Services. This section describes the types of GEM Service logs, where they are saved, and the restrictions that apply to them.

6-1-1 Types of GEM Service Logs

There are the following three types of GEM Service logs. The log contents, application methods, and numbers of saved records for the GEM Service logs are given in the following table. You can set the numbers of records that are saved with Configuration - GEM Service Log on the List Menu of the SECS/GEM Configurator.

Types of GEM Service Logs	Recorded contents	Application methods	Number of saved records*1
SECS message log	SECS messages sent between the host and equip-	Debugging communications between the host and equipment	0-1,000,000
	ment	Evidence that the equipment to which the SECS/GEM CPU Unit is mounted com- plies with GEM capability definitions	
HSMS communi-	Operating status for HSMS	Troubleshooting errors that occur in the	0-100,000
cations log	communications	physical layer	
Execution log	GEM instruction execution	Evidence that the GEM Services are oper-	0-100,000
	and transaction processing	ating	
	values		

^{*1.} You can make the settings in increments of 100 records. Records are not recorded in the logs if you set 0.

6-1-2 **Saving Destinations for GEM Service Logs**

The GEM Service logs are saved on the SD Memory Card. The logs are saved in the following directories.

GEM Service log	Directory name
SECS message log	/packages/GEM/log/secs
HSMS communications log	/packages/GEM/log/hsms
Execution log	/packages/GEM/log/execution

6-1-3 **Restrictions on GEM Service Logs**

The following restrictions apply to the GEM Service logs.

Conditions Under Which Records Cannot Be Logged in GEM Service Logs

Records cannot be logged in the GEM Service logs in the following cases.

- There is no SD Memory Card inserted in the CPU Unit.
- The SD Memory Card does not have enough available space.
- The SECS/GEM Configurator was used to disable saving to the GEM Service logs.
- The SD Memory Card is write protected.
- · Writing to the SD Memory Card is not possible, e.g., the SD Memory Card is faulty.

Conditions Under Which GEM Service Log Files Are Deleted

The GEM Service log files are deleted in the following cases.

- Any of the settings of the numbers of records saved in the GEM Service logs was changed from the SECS/GEM Configurator.
- The SD Memory Card was initialized from the Sysmac Studio.
- The log file contents that was set with the SECS/GEM Configurator does not agree with the actual contents of the SD Memory Card.

Application Procedures for the GEM 6-2 **Service Logs**

The following two processes are used for the GEM Service logs.

- The numbers of records to save in the GEM Service logs are set before the Controller is operated.
- The contents of the GEM Service logs is checked after the Controller is operated.

6-2-1 **Setting the Numbers of Records Saved in the GEM Service Logs**

You set the numbers of records to save in the GEM Service logs with Configuration - GEM Service Log on the List Menu of the SECS/GEM Configurator. Refer to 8-7-1 GEM Service Log on page 8-42 for a detailed setting procedure.

6-2-2 Displaying the Contents of the GEM Service Logs

You can check the contents of the GEM Service logs with any of the following methods: Log Viewer GUI displays, Log Viewer file output, and Get SECS Communications Log (GEM GetCommLog) instruction execution.

Log Viewer GUI Displays

You can view the contents of the GEM Service logs on the Log Viewer GUI. Refer to 6-3-4 Procedure to Display a GEM Service Log on page 6-8 for a detailed GUI procedure.

Log Viewer File Output

You can output the contents of the GEM Service logs to files from the Log Viewer. Refer to 6-3-10 Outputting Logs to Files on page 6-19 for a detailed file output procedure.

Get SECS Communications Log (GEM GetCommLog) Instruction **Execution**

Of the GEM Service logs, you can get the contents of the SECS message log with the Get SECS Communications Log (GEM GetCommLog) instruction. You can get up to 100 records with each execution of this instruction. Use the following procedure.

- Execute the GEM GetCommLog instruction.
 - The most recent records from the SECS message log are stored in the GEM CommLog[100] (SECS Communications Log) system-defined variable. The most recent SECS message log record is stored in _GEM_CommLog[0]. Other records are stored in chronological order in _GEM_CommLog[1] and on. The number of SECS message log records that were read is stored in GEM CommLogCnt.
- Display the contents of _GEM_CommLog, e.g., on an HMI.



Additional Information

To display the SECS message log on an NS/NA-series PT, you must assign the _GEM_CommLog (SECS Communications Log) system-defined variable to a functional object on the CX-Designer. To do that, you must register _GEM_CommLog in the variable table on the CX-Designer.

You can create a variable table for _GEM_CommLog with Microsoft Excel and copy it to the CX-Designer.

Use the following format to create the variable table in a Microsoft Excel spreadsheet. You must use the same number and arrangement of columns and the same variable names and types as in the following format. Do not omit any columns even if they are empty, like the *Address type/address* and *I/O comment* columns that are shown below.

Copy the shaded portion shown below and paste it into the variable table on the CX-Designer.

Host	Variable	Туре	Address type/ address	I/O comment	Tag
HOST3	_GEM_CommLogCnt	UINT			TRUE
HOST3	_GEM_CommLog[0].LogNo	UDINT			TRUE
HOST3	_GEM_CommLog[0].LogDate	DATE_AND_TIME			TRUE
HOST3	_GEM_CommLog[0].SndRcv	USINT			TRUE
HOST3	_GEM_CommLog[0].StreamCode	USINT			TRUE
HOST3	_GEM_CommLog[0].FunctionCode	USINT			TRUE
HOST3	_GEM_CommLog[0].MsgPtn	USINT			TRUE
HOST3	_GEM_CommLog[0].OutType	USINT			TRUE
HOST3	_GEM_CommLog[0].Rslt	USINT			TRUE

Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for information on how to register variables in the variable table on the CX-Designer.

Log Viewer Operations 6-3

This section describes the operating methods of the Log Viewer up to displaying the GEM Service logs.

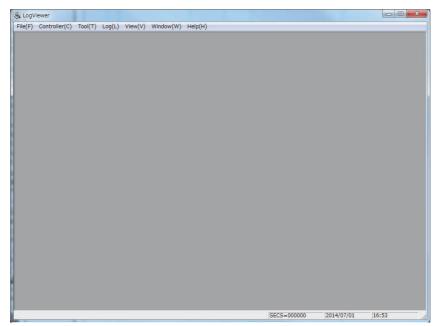
Installation of GEM Setting Tools 6-3-1

Install the GEM Setting Tools on the computer on which to use the Log Viewer. After you install the GEM Setting Tools, you can use the following two tools: Log Viewer and SECS/GEM Configurator.

Refer to 8-1 Installing and Uninstalling the GEM Setting Tools on page 8-3 for details on installing the GEM Setting Tools.

6-3-2 Starting and Stopping the Log Viewer

To start the Log Viewer, use the Windows Start Menu or double-click the Log Viewer shortcut icon on your desktop. When the Log Viewer starts, the Main Window is displayed.

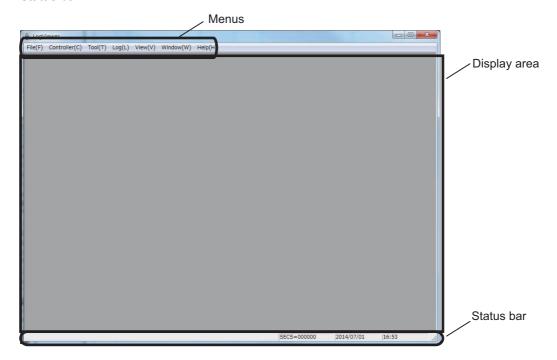


To exit the Log Viewer, select Exit from the File Menu. Or, click the Close Button in the upper right corner of the Main Window.

6-3-3 Configuration of the Main Window

The Main Window consists of the following elements.

- Menus
- · Display area
- · Status bar



Menus

The menus are used to operate the Log Viewer. The menu configuration and functions are described in the following table.

Level 1	Level 2	Function
File	Select Log	Selects the GEM Service log file to display.
	Output Log	Outputs the GEM Service logs to files.
	Exit	Exits the Log Viewer.
Controller	Connection Settings	Used to make settings for connection to the Controller.
	Upload	Uploads the GEM Service logs from the Controller.
Tool	Folder Setting	Used to set the folders in which to save the GEM Service
		logs.
Log	SECS Message log	Displays the SECS message log.
	HSMS communication	Displays the HSMS communications log.
	log	
	Execution log	Displays the execution log.
View	Enable Filter	Enables/disables the filters.
	Filter Settings	Sets the period for displaying log records.
	SECS Log Summary	Displays up to five lines of the contents of each SECS mes-
		sage body.
	Save Current Setting	Saves the current settings of the Log Viewer.
Window	Cascade	Cascades the windows for more than one GEM Service log.
	Tile	Tiles the GEM Service log windows horizontally.
	Arrange Icons	Arranges the minimized windows.
Help	About the Software	Displays version information for the Log Viewer.

Display Area

The GEM Service log is displayed in this area.

Status Bar

The current time and date are displayed.

6-3-4 **Procedure to Display a GEM Service Log**

Use the following procedure to display a GEM Service log.

- Set the saving destination for the GEM Service logs.
- 2 Make the settings for connection to the Controller.
- 3 Upload the GEM Service logs from the Controller.
- Display the GEM Service log.

Operations on the Log Viewer are described according to the above procedure.

Setting the Saving Destination for GEM Service Logs

Set the folder in which to save the uploaded GEM Service logs. Use the following procedure.

1 Select *Folder Setting* from the Tool Menu. The Folder Setting Dialog Box is displayed.



Select the folder in which to save the files and click the **OK** Button.

The error messages that are sometimes displayed for this menu command are described in the following table.

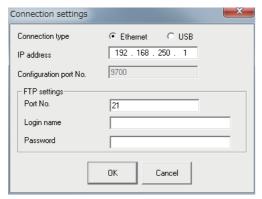
Error message	Cause	Correction
The folder specified as the saving des-	The specified log does not exist on	Set a folder that exists on the com-
tination for log does not exist.	the computer that is running the Log Viewer.	puter or create the specified folder.
The path name includes invalid character(s). The following characters cannot be used: * ? " < >	As given in the error message.	Set a folder name that does not contain the invalid characters.
A path name cannot exceed 128 characters.	As given in the error message.	Specify a folder name including the path with no more than 128 characters.

Controller Connection Settings

Make the settings to connect the Log Viewer to the Controller. Use the following procedure.

1 Select Connection Settings from the Controller Menu.

The Connection Settings Dialog Box is displayed.



2 Enter the items and then click the **OK** Button.

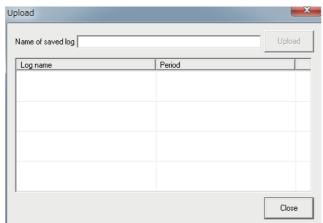
Make the same settings here as those made in the connection settings for the SECS/GEM Configurator. The meaning of each item is given in the following table.

Item	Meaning	
Connection type	The method used to connect to the Controller.	
IP address	The IP address of the Controller.	
Configuration port No.	The port number to use to connect to the Controller.	
FTP settings	The FTP settings for the Controller.	
Port No.	The port number to use for FTP communications with the Controller.	
Login name	The login name to use for FTP communications.	
Password	The password to use for FTP communications.	

Uploading GEM Service Logs

You must upload the GEM Service logs from the Controller. Use the following procedure.

1 Select *Upload* from the Controller Menu. The Upload Dialog Box is displayed.



Enter the save log name and click the **Upload** Button. Uploading the GEM Service logs starts.

3 When the upload is completed, the save log name is displayed in the Upload Dialog Box.

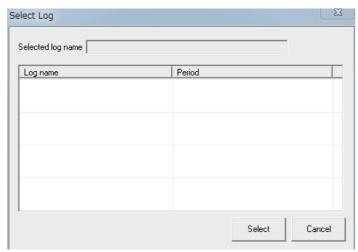
The error messages that are sometimes displayed for this menu command are described in the following table.

Error message	Cause	Correction
The entered name is	As given in the error	Change the save log name.
already used.	message.	
Cannot connect to the	There is a problem in	Check the following.
controller.	connecting to the	Are the connection settings correct?
	Controller.	Has an error occurred in the Controller?
		Is the Ethernet cable or USB cable disconnected?
Cannot access the SD	As given in the error	Make sure that an SD Memory Card is inserted and that an
Memory Card.	message.	error has not occurred for it.
Failed to transfer.	The GEM Service	Check the following.
	logs were not	Are the connection settings correct?
	uploaded normally.	Has an error occurred in the Controller or SD Memory Card?
		Is the Ethernet cable or USB cable disconnected?
Log does not exist.	As given in the error	Nothing has happened that resulted in logging a record on the
	message.	Controller.

Displaying GEM Service Logs

You can display a GEM Service log in the display area. Use the following procedure.

Select Select Log from the File Menu.
The Select Log Dialog Box is displayed.



- 2 Select the GEM Service log to display and click the **Select** Button.
- **3** Execute one of the following menu commands depending on the GEM Service log to display.

GEM Service log	Menu command
SECS message log	Log – SECS Message log
HSMS communications log	Log – HSMS Communication log
Execution log	Log – Execution log

6-3-5 **Displaying the SECS Message Log**

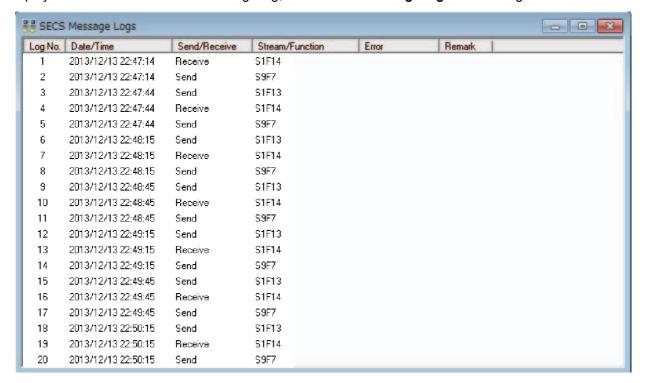
There are the following three ways to display the SECS message log.

SECS message log display method	Description
List view	The information from the SECS message log is displayed with each record on a
	separate line.
Summary view	In addition to the list display of the SECS message log, up to five lines of the con-
	tents of each SECS message body are displayed.
Detail view	In addition to the list display of the SECS message log, detailed SECS message
	information is displayed.

The operating methods for each view and the displayed contents are described next.

List View of SECS Message Log

The information from the SECS message log is displayed with each record on a separate line. To display the list view of the SECS message log, select SECS Message log from the Log Menu.



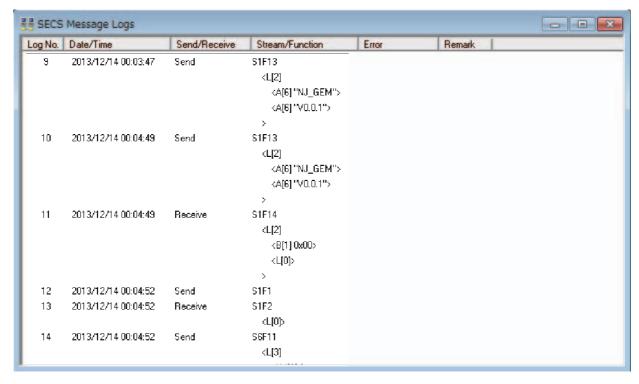
The following items are displayed.

Item	Meaning			
Log No.*1	Number that gives the order of the record in the log.			
J	Serial numbers from 1 to the maximum number of records are used.			
	If the maximum number of records is exceeded, the log returns to log number 1.			
Date/Time	The date and time when the record was recorded.			
Send/Receive	Tells whether the message was sent or received.			
	Send: The SECS message was sent.			
	Receive: The SECS message was received.			
Stream/Function	The stream and function of the SECS message that was sent or received.			
Error	The error if an error occurred when the SECS message was sent or received.			
	T3: T3 timeout			
	T5: T5 timeout			
	T6: T6 timeout			
	NotConnected: A SECS message for which sending failed because communications were not			
	connected.			
Remark	SPOOL is displayed if the SECS message was sent by the spool.			

^{*1.} Even if the records that are displayed are changed by applying a filter, the log numbers are not reassigned so the relationship between the records and log numbers does not change.

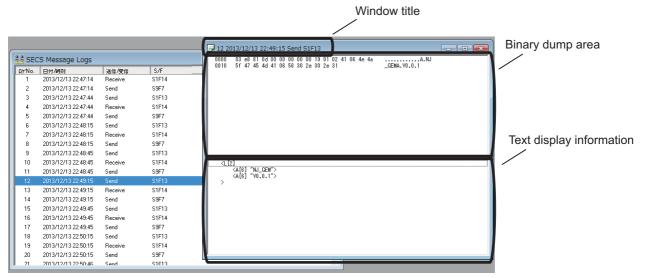
Summary View of SECS Message Log

In addition to the list display of the SECS message log, up to five lines of the contents of each SECS message body are displayed, To display the summary view, select **SECS Log Summary** from the View Menu. A maximum of 10,000 records can be displayed in the summary view. If there are more than 10,000 records in the log, use a filter to reduce the number of displayed records to 10,000 or less.



Detail View of SECS Message Log

In addition to the list display of the SECS message log, detailed SECS message information is displayed. Double-click any line in the list view of the SECS message log. Detailed information on that SECS message will be displayed in a separate window. You can open more than one detail information window at the same time.

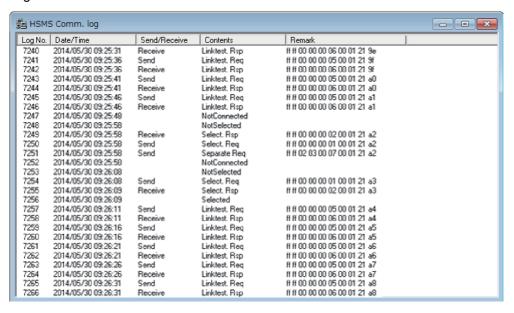


The following items are displayed.

	Item	Meaning
Window title The outline of the SECS message that is displayed in the		The outline of the SECS message that is displayed in the list view.
Bin	ary dump area	A binary dump of the SECS message.
	Byte offsets	The byte position in the SECS message from the first byte in the line is displayed in hexadecimal.
Binary data		The binary data of the SECS message is displayed in 16 bytes per line. Each byte is displayed as two hexadecimal digits.
	ASCII display	The binary data for the line is displayed in ASCII characters. Periods are displayed when the actual characters cannot be displayed.
Tex	t display	The text contents of the SECS message body is displayed with the notation methods
information fo		for the SECS-II message structure.

6-3-6 Displaying the HSMS Communications Log

The information from the HSMS communications log is displayed with each record on a separate line. To display the list view of the HSMS communications log, select **HSMS Communication log** from the Log Menu.



The following items are displayed.

Item	Meaning
Log No.*1	Number that gives the order of the record in the log.
3	Serial numbers from 1 to the maximum number of records are used.
	If the maximum number of records is exceeded, the log returns to log number 1.
Date/Time	The date and time when the record was recorded.
Send/Receive	Gives the send/receive classification of the HSMS procedural message and the connection
	status.
	Blank: HSMS status
	Send: The message was sent.
	Receive: The message was received.
Contents	The HSMS status or the procedural message type. See below for details.
Remark	Displays a binary dump of the HSMS message.

^{*1.} Even if the records that are displayed are changed by applying a filter, the log numbers are not reassigned so the relationship between the records and log numbers does not change.

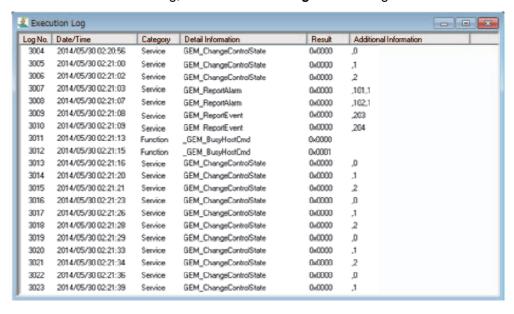
The meanings of the connection status given in the *Contents* column and the meanings of the procedural messages are given in the following tables.

HSMS status	Meaning		
NOT CONNECTED	Preparations for TCP/IP connections have been completed, but no connections have		
	been established. Or, all previously established TCP/IP connections have been ended.		
NOT SELECTED	No HSMS sessions have been established. Or, all previously established HSMS		
	sessions have been ended.		
SELECTED	At least one HSMS session has been established. This is the normal operating status for		
	HSMS. Data messages can be exchanged.		

Procedural message	Meaning			
Select.req	The request message for a selection procedure.			
Select.rsp	The response message for a selection procedure. The connection status changes to SELECTED.			
Linktest.req	The request message for a link test procedure.			
Linktest.rsp	The response message for a link test procedure.			
Separate.req	The request message for a separation procedure. There is no response to a			
	separation procedure request. The connection status changes to NOT SELECTED.			
Reject.req	The request message for a reject procedure. There is no response to a reject proce-			
	dure request.			

6-3-7 Displaying the Execution Log

The information from the execution log is displayed with each record on a separate line. To display the list view of the execution log, select *Execution log* from the Log Menu.



The following items are displayed.

	Item	Meaning		
Log No.*1		Number that gives the order of the record in the log.		
		Serial numbers from 1 to the maximum number of records are		
		used.		
		If the maximum number of records is exceeded, the log returns to		
		log number 1.		
Date/Time		The date and time when the record was recorded.		
Category		The execution log category.		
		Function: Instruction execution		
		Variable: Transaction processing flag or interlock variable		
Detail	When category is Function	Executed instruction		
Information	When category is Variable	The transaction processing flag or interlock variable for the SECS		
		message that was received.		
Result	When category is Function	Result of instruction execution		
		0x0000: Successful		
		Not 0x0000: Failed (The values are the same as the error IDs of		
		the executed instruction.)		
	When category is Variable	0x0000: Transaction processing flag written successfully.		
		0x0001: Interlock		
Additional	When category is Function	The values of the input variables to the instruction.		
Information	When category is Variable	When Variable is a transaction processing flag, the value of the		
		transaction processing flag.		
		When Variable is an interlock variable, nothing is recorded.		

^{*1.} Even if the records that are displayed are changed by applying a filter, the log numbers are not reassigned so the relationship between the records and log numbers does not change.

6-3-8 **Filters**

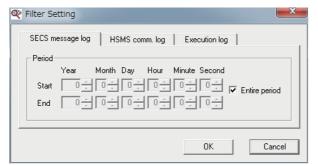
Filters are used when you display the GEM Service logs to prevent unnecessary information from being displayed by restricting the period for which to display records. There are two menu commands related to the filters: Filter Settings and Enable Filter.

Filter Settings

You use the filter settings to set the period for displaying log records. You can set different display periods for the SECS message log, HSMS communications log, and execution log. Use the following procedure.

1 Select Filter Settings from the View Menu.

The Filter Setting Dialog Box is displayed.



- 2 Click the tab for the SECS message log, HSMS communications log, or execution log.
- Set the start date and time and the end date and time of the display period. You can select the Entire period Check Box to specify displaying records for the entire period.
- Click the OK Button.

Enabling the Filters

To enable the filters, select *Enable Filter* from the View Menu.

6-3-9 Saving the Current Settings

You can select **Save Current Setting** from the View Menu to save the current values for the following Log Viewer settings. If you save the current settings, they will be used the next time you start the Log Viewer.

- · The column that was used to sort the lines when each log was displayed
- The column widths when each of the logs was displayed
- · The filter settings
- The summary view settings for the SECS message log

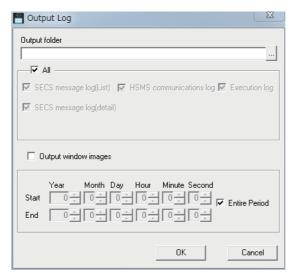
6-3-10 Outputting Logs to Files

You can output the contents of the GEM Service logs to files. You can output the following four files.

- · SECS message log (list)
- · SECS message log (detail)
- · HSMS communications log
- Execution log

Use the following procedure.

Select Output Log from the File Menu.
The Output Log Dialog Box is displayed.



2 Enter the items and then click the OK Button.
The meaning of each item is given in the following table.

Item	Meaning
Output folder	Specify the full path of the folder in which to save the output files.
Logs	Select the logs to output to files.
	You can select any of the following: SECS message log (list), SECS message log
	(detail), HSMS communications log, and execution log. If you select the All Check Box,
	all four of the above logs are output.
Period to output	Specify the period of the log records to output to the files.
	If you select the Output window images Check Box, the information that is displayed in
	the windows will be output. *1
	If you select the Entire period Check Box, all of the records for the entire period are out-
	put.

^{*1.} If the filters are enabled, the records for the periods set for the filters are output. The log line sort conditions in the output files are the same as the line sort conditions for the logs displayed in the windows. Even if a log is displayed, it will not be output unless you select it in the file output settings. The filter conditions and line sort conditions for the SECS message log (detail) are the same as those for the SECS message log (list).

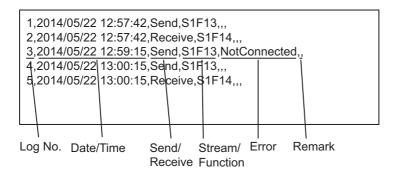
Output File for SECS Message Log (List)

The SECS message log (list) is output to a CSV file called CommLog.csv.

The format of the output file for the SECS message log (list) depends on whether the list view is displayed or the summary is displayed.

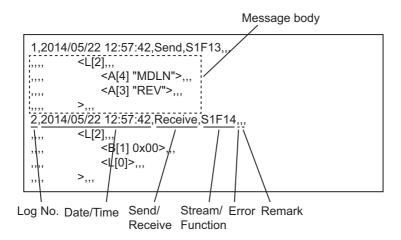
Format of Output File for SECS Message Log (List)

The format of the output file for the SECS message log (list) is shown below. The output contents are the same as the contents that are displayed in the window.



Format of Output File for Summary of SECS Message Log (List)

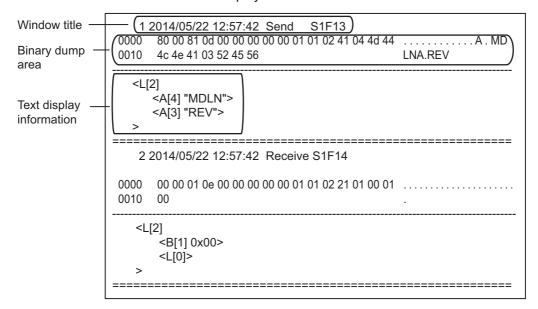
The format of the output file for the summary of the SECS message log (list) is shown below. The output contents are the same as the contents that are displayed in the window.



Output File for SECS Message Log (Detail)

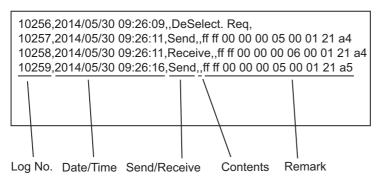
The SECS message log (detail) is output to a text file called CommLogDetail.txt.

The format of the output file for the SECS message log (detail) is shown below. The output contents are the same as the contents that are displayed in the window.



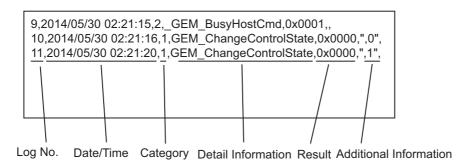
Output File for HSMS Communications Log

The HSMS communications log is output to a CSV file called HsmsLog.csv. The format of the output file for the HSMS communications log is shown below. The output contents are the same as the contents that are displayed in the window.



Output File for Execution Log

The execution log is output to a CSV file called ExeLog.csv. The format of the execution log output file is shown below. The output contents are the same as the contents that are displayed in the window.



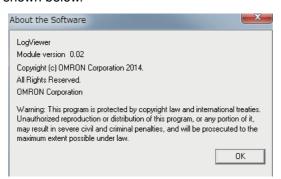
6-3-11 Windows

You can rearrange the windows that display the logs to make them easier to see. You can rearrange the windows in the following three ways.

- Cascade
 - You can cascade the windows. Select *Cascade* from the Windows Menu.
- - You can tile the windows. Select *Tile* from the Windows Menu.
- · Arrange Icons You can arrange the minimized windows. Select Arrange Icons from the Windows Menu.

6-3-12 Help

Select About the Software from the Help Menu to display version information on the Log Viewer as shown below.





Functionality Other Than the GEM Services

The SECS/GEM CPU Unit provides functionality that is not directly related to the SECS/GEM standards. This section describes that functionality.

7-1	SD Me	emory Cards	. 7-2
	7-1-1	Directory Structure of the SD Memory Card	. 7-2
	7-1-2	Restrictions When No SD Memory Card Is Inserted	. 7-2
	7-1-3	Operation When Data Cannot Be Saved in the SD Memory Card	. 7-2
	7-1-4	Operation When the SD Memory Card Is Replaced	. 7-3
7-2	Backu	ıp Functions	. 7-5
	7-2-1	Data That Is Backed Up	. 7-5
	7-2-2	Data That Is Not Backed Up	. 7-5
	7-2-3	Backup Functions for GEM Setting Data	. 7-5
	7-2-4	Compatibility between CPU Unit Models	. 7-6
	7-2-5	Compatibility between Versions of CPU Units	. 7-6
	7-2-6	Restrictions for Backup Function Execution	. 7-7

7-1 **SD Memory Cards**

When you use the GEM Services, insert an SD Memory Card into the CPU Unit. The SD Memory Card is used to store the GEM Service logs and spooled data. Also, the SD Memory Card is temporarily used for data storage during processing when GEM setting data or the project is uploaded or downloaded.

The SECS/GEM CPU Unit supports the same SD Memory Cards as the NJ-series Standard CPU Units.

7-1-1 **Directory Structure of the SD Memory Card**

The directory structure of the SD Memory Card and the usage of each directory are described in the following table.

Directory	Usage
/packages/GEM/log	Stores the GEM Service logs.
/packages/GEM/spool	Stores the spool data.

7-1-2 Restrictions When No SD Memory Card Is Inserted

Restrictions When No SD Memory Card Is Inserted

- The GEM Service logs are not recorded.
- · The spooled data is not saved.
- You cannot transfer the GEM setting data from or to the SECS/GEM Configurator.

Communications with the host are possible even if an SD Memory Card is not inserted into the CPU

7-1-3 Operation When Data Cannot Be Saved in the SD Memory Card

Data cannot be saved in the SD Memory Card in the following cases.

- · There is no SD Memory Card inserted in the CPU Unit.
- The SD Memory Card does not have enough available space.
- · The SD Memory Card is write protected.
- · The SD Memory Card is faulty.

The following events are registered depending on the data that cannot be saved in the SD Memory Card.

Data	Event code	Event name	Level
GEM Service log	14E100000 hex	GEM Service Log Save Failed	Observation
Spooled data	14E300000 hex	Spool Save Failed	Minor fault

7-1-4 Operation When the SD Memory Card Is Replaced

The operation when the SD Memory Card is replaced depends on whether it is replaced after the power supply to the Controller is turned OFF or it is replaced while the equipment is operating.

Replacement After Turning OFF the Power Supply to the Controller

The operation of the GEM Service logs and spooling and the events that are created when the SD Memory Card is replaced after the power supply to the Controller is turned OFF are described in the following table. These depend on the operation that is performed by the user.

User operation	Operation of GEM Service logs	Operation of spool- ing	Event
The user turns ON the power supply without inserting an SD Memory Card. The user inserts an SD Memory Card that cannot be written to and	Records are not saved.	Spool data is not saved.	Invalid SD Memory Card (14E40000 hex)
then turns ON the power supply.*1 The user inserts an SD Memory Card on which no GEM Service logs or spooled data is saved and turns ON the power supply.	Records are saved.	Spool data is saved.	Valid SD Memory Card (95450000 hex)
The user inserts an SD Memory Card that contains GEM Service logs or spooled data and turns ON the power supply.	 If the GEM Service logs that are saved are normal, records are saved at the ends of the existing files. If the GEM Service logs that are saved are not correct, those files are deleted and the records are saved to new files. 	 If the spool data that is saved is normal, spooled data continues to be saved to the same file. If the spool data that is saved is not correct, that file is deleted and the spooled data is saved to a new file. 	

^{*1.} This is an SD Memory Card that is write protected or faulty.

Replacement during Equipment Operation

The operation of the GEM Service logs and spooling and the events that are created when the SD Memory Card is replaced during equipment operation are described in the following table. These depend on the operation that is performed by the user.

User operation	Operation of GEM Service logs	Operation of spool- ing	Event
The user removes the SD Memory Card.	Records are not saved.	Spooled data is not saved.	Invalid SD Memory Card (14E40000 hex)
The user inserts an SD Memory			
Card that cannot be written to.*1			
The user inserts an SD Memory Card on which no GEM Service logs or spooled data is saved.	Records are saved.	Spooled data is saved.	Valid SD Memory Card (95450000 hex)
The user inserts an SD Memory Card that contains GEM Service logs or spooled data.	 If the GEM Service logs that are saved are normal, records are saved at the ends of the existing files. If the GEM Service logs that are saved are not correct, those files are deleted and the records are saved to new files. 	The saved spool data is deleted and the spooled data is saved to a new file.	

^{*1.} This is an SD Memory Card that is write protected or faulty.



Precautions for Correct Use

Perform one of the following operations to prevent errors and data corruption when you remove the SD Memory Card.

- Execute a shutdown and then turn OFF the power supply to the Controller.
- · Change the operating mode of the CPU Unit to PROGRAM mode and press the SD Memory Card power supply switch.

7-2 Backup Functions

You can back up, restore, and compare the data in the CPU Unit. This functionality is useful in the event that the CPU Unit fails. The functions used to back up, restore, and compare data are collectively called the backup functions.

7-2-1 Data That Is Backed Up

The backup functions of the SECS/GEM CPU Unit apply to the following data.

Data	Description
Standard backup data	This backup data is the same as the backup data for an NJ-series Standard CPU Unit.*1
GEM setting data	This setting data is specific to the GEM Services.
Event logs*2	These event logs are the same as the event logs for an NJ-series Standard CPU Unit.*3

- *1. Refer to the NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) for information on the backup data of an NJ-series Standard CPU Unit.
- *2. The event logs are only backed up. You cannot restore or compare them.
- *3. Refer to the NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) for information on the event logs of an NJ-series Standard CPU Unit.

System-defined variables that are specific to the SECS/GEM CPU Unit are backed up only if they have a Retain attribute. They are not backed up if they do not have a Retain attribute. Refer to *A-2 System-defined Variables* on page A-211 for the system-defined variables that are specific to the SECS/GEM CPU Unit and for the attributes of those variables.

7-2-2 Data That Is Not Backed Up

The following data is not backed up. This data is saved in the SD Memory Card, so you can save it on your computer or other device.

- · GEM Service logs
- · Spooled data



Precautions for Correct Use

If you replace the CPU Unit and insert the SD Memory Card that was used in the old CPU Unit into the new CPU Unit, the GEM Service log and spool data files are deleted. Save the data in advance on your computer or other device.

7-2-3 Backup Functions for GEM Setting Data

Of the backup functions that you can use on the SECS/GEM CPU Unit, the following backup functions apply to the GEM setting data.

- · SD Memory Card backups
- · Automatic transfers from SD Memory Cards
- Sysmac Studio Controller backups



Precautions for Correct Use

The Sysmac Studio backup file import/export functions and the Sysmac Studio variable/memory backup functions do not apply to the GEM setting data. If you use these functions to back up and restore data, the GEM setting data from before data restoration will remain.

Compatibility between CPU Unit Models 7-2-4

The following table shows the compatibility of the backup functions when the CPU Unit model where the data was backed up from is different from the CPU Unit model where the data is being restored.

CPU Unit model where data was	CPU Unit model to restore to	
backed up	NJ501-1340	NJ-series CPU Unit other than NJ501-1340
NJ501-1340	Compatible	Not compatible
NJ-series CPU Unit other than NJ501-1340	Not compatible	*1

^{*1.} Refer to the NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501) for information on the compatibility of two NJ-series CPU Units that are not NJ501-1340 CPU Units.

7-2-5 Compatibility between Versions of CPU Units

There are two types of versions for the CPU Unit: the unit version and the GEM Service version.

The following table shows the compatibility of the backup functions when the combination of CPU Unit versions where the data was backed up from are different from the combination of CPU Unit versions where the data is being restored.

Refer to Versions on page 20 for the methods to check the CPU Unit version and the GEM Service version.

	GEM Service version		
Unit version	Backup source ≤ Restore	Backup source > Restore	
	destination	destination	
Backup source ≤ Restore destination	Compatible*1	Not compatible	
Backup source > Restore destination	Not compatible	Not compatible	

^{*1.} If the GEM Service version of the backup source is lower than the version of the restore destination, you must convert the GEM setting data. Use the following procedure to convert the data.

- (1) Restore the data.
- (2) Upload the GEM setting data to the SECS/GEM Configurator.
- (3) Convert the GEM setting data so that it agrees with the version of the GEM Services.
- (4) Download the GEM setting data to the Controller.

7-2-6 Restrictions for Backup Function Execution

The following restrictions apply when you execute backup functions during operation of the GEM Services.

Backup function	CPU Unit operat- ing mode	Restriction
Backup	PROGRAM mode	If you download the GEM setting data during a backup, the expected operation may not be performed.
	RUN mode	If the GEM Service status is Run, the GEM setting data that was changed from the host may not be backed up correctly. Back up the data after changing the GEM Service status to Idle.
Restoring	PROGRAM mode	If you restore data, the spool data file is deleted.
	RUN mode	You cannot restore data in RUN mode.
Comparison	PROGRAM mode	The GEM setting data that was dynamically changed by the host after
	RUN mode	the data was backed up may be detected as unmatched data.



SECS/GEM Configurator

The SECS/GEM Configurator is a different software application from the Sysmac Studio or Log Viewer. You use it to create, edit, and save the GEM setting data. This section describes the functions and operating procedures of the SECS/GEM Configurator.

8-1	Install	ling and Uninstalling the GEM Setting Tools	8-3	
	8-1-1	Installation Precautions	8-3	
	8-1-2	Applicable Operating Systems for the GEM Setting Tools	8-3	
	8-1-3	Installed Application Software	8-3	
	8-1-4	Installation Procedure for the GEM Setting Tools	8-4	
	8-1-5	Uninstallation Procedure for the GEM Setting Tools	8-7	
8-2	Startin	ng and Exiting the SECS/GEM Configurator	8-8	
	8-2-1	Starting the SECS/GEM Configurator		
	8-2-2	Exiting the SECS/GEM Configurator	8-9	
8-3	Config	guration of the SECS/GEM Configurator	8-10	
	8-3-1	Window Configuration		
	8-3-2	Menu Structure	8-11	
	8-3-3	Operating Buttons	8-14	
8-4	4 Menu Bar Functions			
	8-4-1	File	8-15	
	8-4-2	Build	8-19	
	8-4-3	Controller	8-21	
	8-4-4	Tool	8-26	
	8-4-5	Documentation	8-30	
	8-4-6	Window		
	8-4-7	Help	8-35	
8-5	Toolba	ar Configuration	8-36	
8-6	Basic	Operations on the List Menus	8-37	
	8-6-1	List Menu Dialog Boxes	8-37	
	8-6-2	Setting Dialog Boxes	8-38	
	8-6-3	Variable Dialog Boxes	8-40	
8-7	Config	guration	8-42	
	8-7-1	GEM Service Log		
		-		

8-8	HSMS	Settings
	8-8-1	HSMS Condition
8-9	Data D	efinition
	8-9-1	Item8-45
	8-9-2	Equipment Constant (EC)8-47
	8-9-3	Status Variable (SV)
	8-9-4	Discrete Variable (DV)8-53
	8-9-5	List Structure Definitions8-56
8-10	Model	Settings
	8-10-1	Communications State Model
	8-10-2	Control State Model
8-11	GEM C	Capability Settings
	8-11-1	Event Notification
	8-11-2	Alarm Management8-69
	8-11-3	Host Command8-72
	8-11-4	Enhanced Remote Command8-76
	8-11-5	Equipment Constants
	8-11-6	Process Program Management8-81
	8-11-7	Equipment Terminal Service8-90
	8-11-8	Limit Monitoring8-92
	8-11-9	Spooling
8-12	Messa	ge Settings8-95
	8-12-1	GEM Standard Messages8-95
	8-12-2	User-defined Messages
8-13	Confir	m Settings8-101
	8-13-1	Item List8-101
	8-13-2	Message List
	8-13-3	Event List
	8-13-4	Report List8-103
	0 12 5	Alarm List 9 103

8-1 Installing and Uninstalling the GEM Setting Tools

Install the GEM Setting Tools on the computer on which to use the SECS/GEM Configurator. After you install the GEM Setting Tools, you can use the following two tools: Log Viewer and SECS/GEM Configurator.

8-1-1 Installation Precautions

Observe the following precautions when you install the GEM Setting Tools.

- · You must log onto Windows as the administrator or as a user with administrator rights.
- · You must exit all applications that are running on Windows.
- Do not turn OFF the power to the computer or reset the computer while the installation is in progress.

8-1-2 Applicable Operating Systems for the GEM Setting Tools

The GEM Setting Tools will run on the following operating systems.

- · Windows XP with SP3 (excluding 64-bit edition)
- · Windows Vista (excluding 64-bit edition)
- Windows 7 (32-bit or 64-bit edition)

8-1-3 Installed Application Software

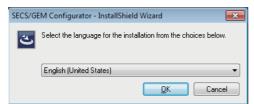
After you install the GEM Setting Tools, you can use the following applications.

- · SECS/GEM Configurator
- · Log Viewer
- · Communications Middleware

8-1-4 Installation Procedure for the GEM Setting Tools

Use the following procedure to install the GEM Setting Tools.

Set the GEM Setting Tools installation disk into the DVD-ROM drive in the computer. The Select Language Dialog Box is displayed.



Select the language to use, and then click the **OK** Button. The following dialog box is displayed.



If the GEM Setting Tools were previously installed, the above dialog box is not displayed. A warning message is displayed, and the installation is canceled.

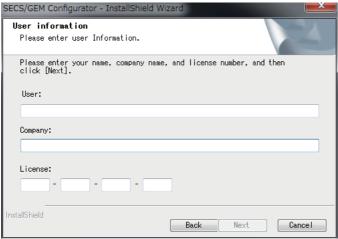
Click the Next Button.

The License Agreement Dialog Box is displayed.

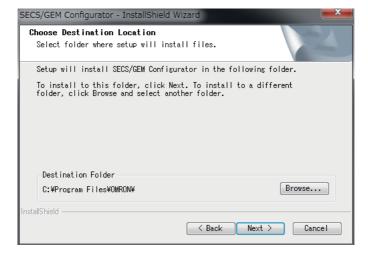


4 If you agree to all of the conditions in the License Agreement, select the *I accept the terms of the license agreement* Option, and then click the **Next** Button.

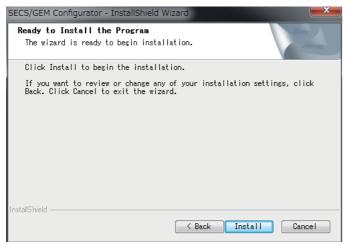
The User Information Dialog Box is displayed.



5 Enter the user name, company name, and license number, and then click the **Next** Button. The Choose Destination Location Dialog Box is displayed.



Specify the installation destination folder, and then click the **Next** Button. The Ready to Install the Program Dialog Box is displayed.

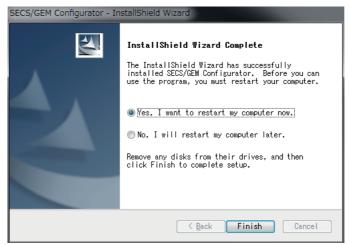


The default installation folder is C:\Program Files\OMRON\.

Click the Install Button.

The software is installed.

When the installation is completed, an Installation Completed Dialog Box is displayed.



Select the Yes, I want to restart my computer now Option, and then click the **Finish** Button. The computer is restarted.

8-1-5 Uninstallation Procedure for the GEM Setting Tools

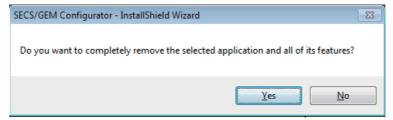
Use the following procedure to uninstall the GEM Setting Tools.

Open the Control Panel from the Windows Start Menu and then select *Programs and Features*.

The Uninstall or Change a Program Dialog Box is displayed.

2 Select the SECS/GEM Configurator and click the **Uninstall** Button.

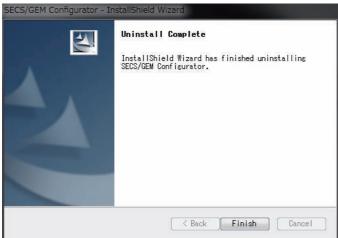
A Delete File Confirmation Dialog Box is displayed.



3 Click the **Yes** Button.

The software is uninstalled.

When the software has been uninstalled, an Uninstallation Completed Dialog Box is displayed.



Click the Finish Button.

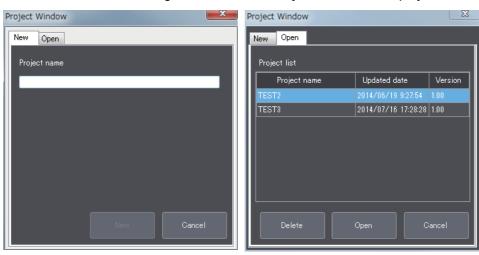
8-2 Starting and Exiting the SECS/GEM Configurator

This section describes how to start and exit the SECS/GEM Configurator.

8-2-1 **Starting the SECS/GEM Configurator**

To start the SECS/GEM Configurator, use the Windows Start Menu or double-click the shortcut icon on your desktop.

When the SECS/GEM Configurator starts, the Project Window is displayed.



Project Creation

Use the following procedure to create a project.

- Click the New Tab in the Project Window.
- Enter the project name.
- Click the New Button.

The Main Window is displayed and the project name that you entered is displayed as the project name.

The project name must not be more than 160 characters long, including the file path that is specified with Folder Settings under the Tool Menu.

The project file is created in the folder that is specified with *Folder Settings* under the Tool Menu.

Error message	Cause	Correction
The entered name is already used.	As given in the error mes-	Change the project name.
	sage.	
You cannot use following characters for a	As given in the error mes-	Set a project name that does not con-
project name:	sage.	tain invalid characters.
\		

Opening an Existing Project

Use the following procedure to open an exiting project.

1 Click the **Open** Tab in the Project Window.

A list of the existing project names is displayed.

You can sort the list in ascending or descending order by clicking the *Project name* or *Updated date* column title.

- **2** Select the name of the project to open.
- **3** Click the **Open** Button.

The Main Window is displayed and the specified project is opened.



Additional Information

There is no command available to change the project name. To change a project name, save the project under a different name and then delete the original project.

8-2-2 Exiting the SECS/GEM Configurator

To exit the SECS/GEM Configurator, select *Exit* from the File Menu. Or, click the **Close** Button in the upper right corner of the Main Window.

Configuration of the SECS/GEM 8-3 **Configurator**

This section describes the window configuration, the menu structure, and the meanings of the operating buttons of the SECS/GEM Configurator.

8-3-1 Window Configuration

The SECS/GEM Configurator window consists of the following elements.

· Title bar

The project name and version of the SECS/GEM Configurator are displayed.

· Menu bar

The menu bar provides the menu commands that you use to connect to the Controller, make file settings, make operation environment settings, and perform other operations.

The toolbar provides icons to create projects, open projects, and save projects. You can access commands on the File Menu to achieve the same things.

Project name display area

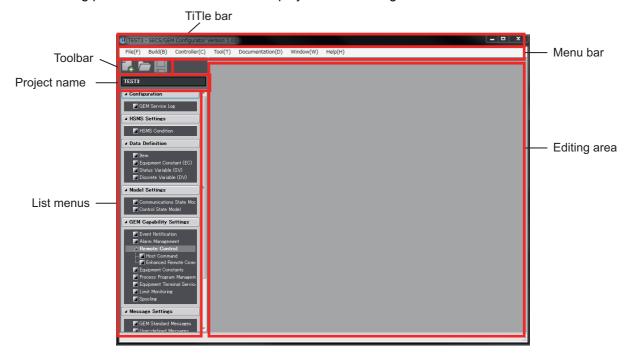
This area displays the name of the project that you are currently editing.

List menus

These menus are used to access settings for the GEM Services.

· Editing area

You use this area to edit the settings for the GEM Services. When you select an item on a list menu, a setting pane for the relevant data is displayed in the editing area.



8-3-2 Menu Structure

This section describes the menu structure. There are three ways to access commands for the SECS/GEM Configurator: the menu bar, the toolbar, and the list menus.

Menu Bar Configuration

The following table shows the configuration of the menus on the menu bar, describes the functions of the commands, and provides reference pages.

Menu	Command	Function	Reference
File	New	Creates a project.	New on page 8-16
	Open	Opens an existing project.	Open on page 8-17
	Close	Closes the project that you are editing.	Close on page 8-17
	Save	Overwrites the project that you are editing with the current file name.	Save on page 8-17
	Save As	Saves the project that you are editing under a new file name.	Save As on page 8-18
	Create SML File	Creates an SML file for use with the Host Simulator.	Create SML File on page 8-18
	Exit	Exits the SECS/GEM Configurator.	Exit on page 8-19
Build	Build	Checks the settings. This command also creates the GEM setting data to transfer to the Controller.	Build on page 8-19
Controller	Connection Settings	Sets the conditions for connecting the SECS/GEM Configurator to the Controller.	Connection Settings on page 8-21
	Transfer to Control- ler	Transfers the GEM setting data from the computer to the Controller.	Transfer to Controller on page 8-22
	Transfer from Controller	Transfers the GEM setting data from the Controller to the computer.	Transfer from Con- troller on page 8-23
	GEM Service Operation	Changes the GEM Service status in the SECS/GEM CPU Unit.	GEM Service Opera- tion on page 8-25
Tool	Folder Settings	Sets the folder in which to save projects.	Folder Settings on page 8-26
	Controller Variable	Used to display Controller variable lists, edit Controller variables, and import/export Controller variables.	Controller Variable on page 8-27
Documentation	Documentation	Outputs CSV files of information that is required for equipment documentation.	8-4-5 Documentation on page 8-30
Window	Cascade	Cascades the dialog boxes that are displayed in the editing area.	Cascade on page 8-34
	Close All	Closes all of the dialog boxes that are displayed in the editing area.	Close All on page 8-34
Help	About Software	Displays version information on the SECS/GEM Configurator.	About Software on page 8-35

Toolbar Configuration

The following three icons are displayed in the toolbar.

- · New Icon
- Open Icon
- Save Icon

Refer to 8-5 Toolbar Configuration on page 8-36 for more information on the toolbar.

List Menu Structure

The following table shows the configuration of the list menus, describes the functions of the commands, and provides reference pages.

Menu	Command	Function	Reference
Configuration	GEM Service Log	Makes settings for saving the GEM	8-7-1 GEM Service
		Service logs.	<i>Log</i> on page 8-42
HSMS Settings	HSMS Condition	Makes settings for HSMS communi-	8-8-1 HSMS Condi-
		cations, such as the host IP address and timeout values.	<i>tion</i> on page 8-43
Data Definition	Item	Used to define items.	8-9-1 Item on page
			8-45
	Equipment Constant	Used to define equipment constants	8-9-2 Equipment
	(EC)	and set link variables.	Constant (EC) on
			page 8-47
	Status Variable (SV)	Used to define status variables and	8-9-3 Status Variable
		set link variables.	(SV) on page 8-50
	Discrete Variable (DV)	Used to define discrete variables and	8-9-4 Discrete Vari-
		set link variables.	<i>able (DV)</i> on page 8-53
Model Settings	Communications State	Sets the default communications	8-10-1 Communica-
	Model	state, the equipment model type, and	tions State Model on
		the software revision.	page 8-58
	Control State Model	Sets the default control state and	8-10-2 Control State
		other settings.	Model on page 8-59

Menu	Command	Function	Reference
GEM Capability Set-	Event Notification	Makes settings related to event defi-	8-11-1 Event Notifica-
tings		nitions and report definitions.	<i>tion</i> on page 8-61
	Alarm Management	Makes settings related to alarm defi-	8-11-2 Alarm Man-
		nitions.	agement on page 8-69
	Remote Control – Host	Makes settings for remote control	8-11-3 Host Com-
	Command	host commands.	mand on page 8-72
	Remote Control –	Makes settings for enhanced remote	8-11-4 Enhanced
	Enhanced Remote	commands for remote control.	Remote Command on
	Command		page 8-76
	Equipment Constants	Makes settings related to equipment	8-11-5 Equipment
		constants.	Constants on page
			8-80
	Process Program Man-	Makes settings related to process	8-11-6 Process Pro-
	agement	programs.	gram Management on
			page 8-81
	Equipment Terminal	Makes settings related to the equip-	8-11-7 Equipment
	Service	ment terminal service.	Terminal Service on
			page 8-90
	Limit Monitoring	Makes settings related to limit moni-	8-11-8 Limit Monitor-
	0 "	toring.	ing on page 8-92
	Spooling	Makes settings related to spooling.	8-11-9 Spooling on
Marrier Outline	OFM OUT IN IM	M. I	page 8-93
Message Settings	GEM Standard Mes-	Makes settings to enable or disable GEM standard messages and set-	8-12-1 GEM Standard
	sages	tings for W bits.	Messages on page
	User-defined Mes-	-	8-95
	sages	Makes settings related to user-defined messages.	8-12-2 User-defined
	Juges	doct defined messages.	Messages on page 8-96
Confirm Settings	Item List	Displays an item list.	8-13-1 Item List on
Commin Octangs	Item List	Displays all item list.	page 8-101
	Message List	Displays a message list.	8-13-2 Message List
	Wicobage Liot	Bioplayo a mossage list.	on page 8-102
	Event List	Displays an event list.	8-13-3 Event List on
	L vonc Liot	Biopiayo an event net	page 8-102
	Report List	Displays a report list.	8-13-4 Report List on
	1	, , , , , , , , , , , , , , , , , , , ,	page 8-103
	Alarm List	Displays an alarm list.	8-13-5 Alarm List on
			page 8-103
	<u> </u>	<u> </u>	1

8-3-3 **Operating Buttons**

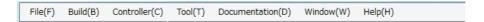
The following tables list the operating buttons that are the same in the dialog boxes for different menu commands and describes their functions.

Button	Function
Apply	Enables the settings in the currently displayed dialog box.
	If you close a dialog box or change the tab page without clicking the Apply Button, the settings
	that were made on the relevant dialog box are discarded.
Edit	Enables editing the selected item.
Add	Adds a new row to an item list.
Delete	Deletes the selected row from an item list.
Сору	Adds a row with the same contents as the selected row to an item list. Use this button to create
	a new item by changing only some of the settings of an existing item.
Cancel	Discards the settings.
Close	Closes the currently displayed dialog box.

8-4 Menu Bar Functions

The menu bar provides the menu commands that you use to connect to the Controller, make file settings, make operation environment settings, and perform other operations. The following seven menus are provided at the top level of the menu structure.

- File
- Build
- Controller
- Tool
- Documentation
- Window
- Help



8-4-1 File

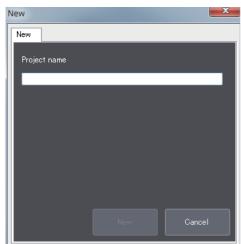
The File Menu is mainly used to make settings related to project files. This menu provides the following seven commands/menus.

- New
- Open
- Close
- · Save
- Save As
- · Create SML File
- Exit



New

The New command creates a project.



If you enter the project name and click the New Button, a project with the entered project name is created.

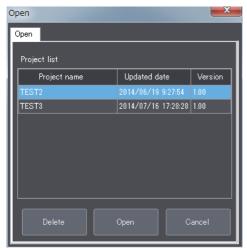
The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
The entered name is already used.	As given in the error	Change the project name.
	message.	
You cannot use following characters for a project name:	As given in the error message.	Set a project name that does not contain invalid characters.
\/*?"<>	moodage.	invalid Gridinastore.

You can also create a project with the icon in the toolbar.

Open

The *Open* command opens an existing project. You can also delete an existing project file by clicking the **Delete** Button.



Double-click the project to open in the list of existing project names. Or, you can select the name of the project to open and click the **Open** Button to open the selected project.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
The project was created with a newer version of the SECS/GEM Configurator. It cannot be opened.	As given in the error message.	Check the project versions that are supported by your SECS/GEM Configurator.

You can also open an existing project by clicking the icon in the toolbar.

Close

The Close command closes the project that you are currently editing.

Save

The Save command overwrites the existing project file with the edited project.

You can also save the file by clicking the icon in the toolbar.

Save As

The Save As command saves the edited project under a new file name. The file is saved in the folder that is specified with *Folder Settings* under the Tool Menu.



If you enter the project name and click the Save Button, the edited project is saved under the project name that you entered.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
The entered name is already used.	As given in the	Change the project name.
	error message.	
You cannot use following characters for a project name:	As given in the	Set a project name that does not
\ / * ? " < >	error message.	contain invalid characters.

Create SML File

The Create SML File command outputs an SML file that you can import to the Host Simulator to simulate standard GEM scenarios.



If you enter the name of the folder in which to save the SML file and click the Execute Button, the SML file is saved in the specified folder. The file name is project_name.sml.

Error message	Cause	Correction
The folder specified as the saving destination	As given in the error	Set a folder that exists on the computer or
for SML file does not exist.	message.	create the specified folder.
The path name includes invalid character(s).	As given in the error	Set a folder name that does not contain
The following characters cannot be used:	message.	invalid characters.
\		
The path name for saving SML files cannot	As given in the error	Specify the path name for saving SML files
exceed 128 characters.	message.	with 128 characters or less.
The Project has not been built.	As given in the error	Build the project first and then create the
	message.	SML file.



Precautions for Correct Use

- The *Create SML File* command cannot be used unless a project is open. Open the project file first and then create the SML file.
- SML files cannot be used with some Host Simulators. Ask where you purchased the Host Simulator for details on the Host Simulator.

Exit

The *Exit* command closes the SECS/GEM Configurator.

8-4-2 **Build**

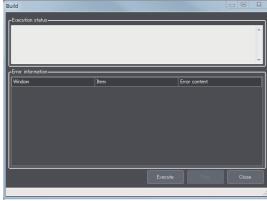
The Build Menu is used to check the settings made on the SECS/GEM Configurator and create the GEM setting data to transfer to the Controller. This menu provides the following command.

Build



Build

Use the following procedure for the *Build* command.



The meanings of the items that are displayed in the Build Dialog Box are described in the following table.

Item	Meaning
Execution status	Displays step numbers to show the progress of the building operation.
Error information	Any errors that are detected up to a maximum of 120 errors are displayed.
Total number of errors	The total number of errors that were detected is displayed in the status bar.

The error messages that are displayed in the Build Dialog Box when the GEM setting data is not created normally are listed in the following table.

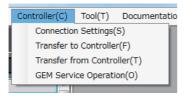
Error message	Cause	Correction*1
No link variable is	A link variable is not registered.	Set a link variable.
assigned.	Variable that was registered as the link variable was deleted or changed.	
The value set for the item (zzzz) is out of the setting range.	 The setting of the zzzz item is outside of the range of values that can be specified for the numeric format that was set in the item definition. The item definition was changed after the item setting was registered. 	Change the item definition or item setting.
The value set for the item (zzzz) is over the valid input range.	 The setting of the zzzz item exceeds the data size of the ASCII format that was set in the item definition. The item definition was changed after the item setting was registered. 	Change the item definition or item setting.
The primary message (Sxx,Fyy) that corresponds to a secondary message is not defined.	As given in the error message.	Define a primary message.
The second message (Sxx,Fyy) that corresponds to a primary message is not defined.	As given in the error message.	Define a secondary message.
Different W-bit settings exist for an identical primary message (Sxx,Fyy).	As given in the error message.	Change the W-bit setting.

^{*1.} You can identify the setting in which the error was detected from the information displayed in the Window and Items columns of the Build Dialog Box.

8-4-3 Controller

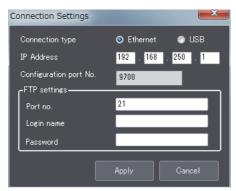
The Controller Menu is used to make settings related to the Controller. This menu provides the following four commands.

- · Connection Settings
- · Transfer to Controller
- · Transfer from Controller
- · GEM Service Operation



Connection Settings

The **Connection Settings** command is used to make settings to connect the SECS/GEM Configurator to the Controller.



The meanings of the items that are displayed in the Connection Settings Dialog Box are described in the following table.

Item	Meaning
Connection type	The connection method between the SECS/GEM Configura-
	tor and Controller.
IP address	The IP address of the Controller.*1
Configuration port No.	The port number to use to connect to the Controller.
FTP settings	The FTP settings for the Controller.
Port No.	The port number to use for FTP communications with the
	Controller.*2
Login name	The login name to use for FTP communications.
Password	The password to use for FTP communications.

^{*1.} This setting is not required if the connection type is set to USB.

^{*2.} Use the same port number as the FTP port number of the Controller.



Precautions for Correct Use

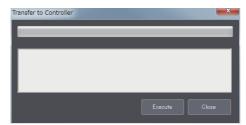
Use the same FTP settings as on the Controller. If any of the settings are different, normal communications are not possible.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
The set IP address is invalid.	As given in the error mes-	Check the IP address.
	sage.	
The entered value is out of the specified range.	As given in the error mes-	Change the value of the FTP port
[Range: xxxxx to xxxxx]	sage.	number.

Transfer to Controller

The Transfer to Controller command is used to transfer the GEM setting data from the SECS/GEM Configurator to the Controller.



When you click the **Execute** Button, the GEM Service status of the SECS/GEM CPU Unit changes to Stop and the GEM setting data is transferred from the SECS/GEM Configurator to the Controller.

Error message	Cause	Correction	
The Project has not	As given in the error mes-	Build the project first and then transfer the GEM setting	
been built.	sage.	data.	
There are some	As given in the error mes-	Save the project settings before you transfer the GEM	
changes that were not	sage.	setting data.	
saved yet.			
Cannot connect to the	An error occurred in the con-	Check the following.	
controller.	nection with the Controller.	Are the settings made with <i>Connection Settings</i> under the Controller Menu correct?	
		Has an error occurred in the Controller?	
		Is the Ethernet cable or USB cable connected cor- rectly?	
		Is the SECS/GEM CPU Unit GEM Service status ShuttingDown or Shutdown?	
Cannot access the SD	As given in the error mes-	Check the following.	
Memory Card.	sage.	Is there a SD Memory Card inserted in the CPU Unit?	
		Is the SD Memory Card write protected?	
		Is there an error in the SD Memory Card?	
Cannot transfer in the	The GEM Service status of	Transfer the GEM setting data when the GEM Service	
current GEM Service	the SECS/GEM CPU Unit is	status of the SECS/GEM CPU Unit is any status other	
status.	EQStarting. Therefore, mov-	than EQStarting. Or, change the GEM Service status to	
	ing to Stop status is not pos-	Stop before transferring the data.	
	sible.		
Failed to change to	As given in the error mes-	Check the following.	
STOP.	sage.	Has an error occurred in the Controller?	
		Is the Ethernet cable or USB cable connected cor- rectly?	

Error message	Cause	Correction
Failed to transfer.	iled to transfer. It was not possible to trans- Check the following.	
	fer the GEM setting data correctly.	Are the settings made with <i>Connection Settings</i> under the Controller Menu correct?
		Has an error occurred in the Controller?
		Is there an error in the SD Memory Card?
		Is the Ethernet cable or USB cable connected cor-
		rectly?
Failed to change to	As given in the error mes-	Check the following.
Release from stop.	sage.	Has an error occurred in the Controller?
		Is the Ethernet cable or USB cable connected correctly?
The version of the con-	As given in the error mes-	Check the SECS/GEM Configurator project versions
nected Controller is not	sage.	that are supported by your Controller.
supported.		

Transfer from Controller

The *Transfer from Controller* command is used to transfer the GEM setting data from the Controller to the SECS/GEM Configurator.



If this command is executed when a project is already open, the project settings are overwritten with the GEM setting data transferred from the Controller.

If a project is not open and this command is executed, the GEM setting data is transferred after you enter a new project name.



Precautions for Correct Use

The contents of the GEM setting data that was transferred with *Transfer from Controller* is the same as the contents of the GEM setting data that was previously transferred with *Transfer to Controller*. Even if the settings in the GEM setting data were changed by the user program or host after the GEM setting data was transferred to the computer, the changes will not be reflected in the GEM setting data transferred to the Controller.

Error message	Cause	Correction	
Cannot connect to the	An error occurred in the con-	Check the following.	
controller.	nection with the Controller.	Are the settings made with <i>Connection Settings</i> under the Controller Menu correct?	
		Has an error occurred in the Controller?	
		Is the Ethernet cable or USB cable connected cor- rectly?	
		Is the SECS/GEM Configurator GEM Service status ShuttingDown or Shutdown?	
Cannot access the SD	As given in the error mes-	Check the following.	
Memory Card.	sage.	• Is there a SD Memory Card inserted in the CPU Unit?	
		Is the SD Memory Card write protected?	
		Is there an error in the SD Memory Card?	
Failed to transfer.	As given in the error mes-	Check the following.	
	sage.	Are the settings made with <i>Connection Settings</i> under the Controller Menu correct?	
		Has an error occurred in the Controller?	
		Is there an error in the SD Memory Card?	
		Is the Ethernet cable or USB cable connected correctly?	
The version of the con-	As given in the error mes-	Check the project versions that are supported by your	
nected Controller is not supported.	sage.	SECS/GEM Configurator.	

GEM Service Operation

The **GEM Service Operation** command is used to check or change the GEM Service status of the SECS/GEM CPU Unit.



The meanings of the items that are displayed in the GEM Service Operation Dialog Box are described in the following table.

Item	Meaning	
Operating status	The GEM Service status of the connected SECS/GEM CPU Unit.	
	If a SECS/GEM CPU Unit is not connected, Not connected is displayed.	
GEM Service oper	a- The buttons that you can use for the GEM Service status of the connected SECS/GEM	
tion	CPU Unit are enabled.	
	There are three buttons: Stop, Release from stop, and Shutdown.	
Project Information		
Project name	The name of the project transferred to the Controller.	
Updated date	The most recent date when the project was transferred to the Controller.	
Version	The version of the project that was transferred to the Controller.	

When you click any of the GEM Service status buttons, the GEM Service status changes as given in the following table.

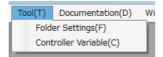
Button	New GEM Service status
Stop	Stop
Release from	Idle
stop	
Shutdown	Shutdown

Error message	Cause	Correction
Failed to change to STOP.	As given in the error message.	Check the following. • Are the settings made with Connection Settings
Failed to change to Release from stop.	As given in the error message.	under the Controller Menu correct? • Has an error occurred in the Controller?
Failed to shutdown.	As given in the error message.	 Is there an error in the SD Memory Card? Is the Ethernet cable or USB cable connected correctly?

8-4-4 **Tool**

The Tool Menu is used to set the folder in which to save projects and to import/export Controller variables. This menu provides the following two commands.

- Folder Settings
- · Controller Variable

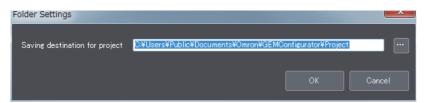


Folder Settings

The Folder Settings command is used to set the folder in which to save projects.

The default folder in which to save the data depends on the operating system of the computer, as shown in the following table.

OS	Default folder	
Windows 7 or Windows Vista	C:\Users\Public\Documents\Omron\GEMConfigurator\Project	
WondowsXP	C:\Documets and Settings\All Users	
	\Documents\Omron\GEMConfigurator\Project	



If you enter the saving destination for projects and then click the **OK** Button, the specified folder is set as the saving destination for projects.

Error message	Cause	Correction
The folder specified as the saving destination	As given in the error	Set a folder that exists on the computer
for projects does not exist.	message.	or create the specified folder.
The path name includes invalid character(s). The following characters cannot be used: \/*?" <>	As given in the error message.	Set a folder name that does not contain invalid characters.
The path name for saving projects cannot exceed 128 characters.	As given in the error message.	Specify the folder name with 128 characters or less.

Controller Variable

The Controller Variable command is used to import and export Controller variables.

Controller variables are registered on the SECS/GEM Configurator and can be imported and exported between the SECS/GEM Configurator and the Sysmac Studio. You select from the Controller variables to set link variables.



The following table gives the meanings of the attributes of the Controller variables.

Attribute	Meaning
Tool	Displays O for Controller variables that were created on the SECS/GEM Configurator.
Name	The name of the Controller variable.
Data Type	The data type of the Controller variable.
Retain	The Retain attribute of the Controller variable.*1
Constant	The Constant attribute of the Controller variable.*1
Number of used	The number of settings as a link variable.
Comment	The user can enter a description of the Controller variable.

^{*1.} You can edit this attribute if the number of used attribute is 0.

The meanings of the buttons are described in the following table.

Button	Meaning	
Check all	Selects the check boxes for all of the Controller variables.	
Uncheck all	Clears the check boxes for all of the Controller variables.	
Check all created	Selects the check boxes for all of the Controller variables that were created on	
	the SECS/GEM Configurator.	
Edit	Enables editing the attributes of the selected Controller variable.	
	The Add, Delete, Apply, and Cancel Buttons are enabled.	
Add	Adds a row to the Controller variable list.	
Delete	Deletes the selected Controller variable.	
Apply	Applies the changes made in editing.	
Cancel	Discards the changes made in editing.	
Close	Closes the Controller variable dialog box.	

Exporting Controller Variables

Use the following procedure to export the Controller variables.

If you click the **Export** Button, the Controller variables are saved to the clipboard.

Import the Controller variables on the clipboard to the global variable table on the Sysmac Studio.

Importing Controller Variables

If you click the Import Button, the Controller variables that were saved on the clipboard are imported to the SECS/GEM Configurator.

If the names of any of the Controller variables on the clipboard are already registered in the SECS/GEM Configurator but the data type, Retain attribute, or Constant attribute is different, the Controller variables are input with "Copy" added to the end of the variable names.



Precautions for Correct Use

The following Controller variables cannot be imported. Even if there are Controller variables that cannot be imported, an error message is not displayed and the Controller variables that can be imported are imported.

- · Controller variables with more than 127 characters in the variable name
- Controller variables with prohibited characters in the variable name
- Controller variables with data types that cannot be used in the Controller variable definitions
- A Controller variable with a text string that is neither TRUE nor FALSE for the Retain attribute
- · A Controller variable with a text string that is neither TRUE nor FALSE for the Constant attribute
- · Controller variables with more than 127 characters in the comment

Error message	Cause	Correction
The name is empty.	As given in the error	Enter a name for the Controller vari-
. ,	message.	able.
The data type is empty.	As given in the error	Enter a data type for the Controller
,, , , , , , , , , , , , , , , , , , ,	message.	variable.
A string starting with underscore cannot be used.	As given in the error	Change the name of the Controller
	message.	variable.
A string starting with numerical value (0 to 9)	As given in the error	Change the name of the Controller
cannot be used.	message.	variable.
The string includes a character that cannot be	As given in the error	Change the name of the Controller
used.	message.	variable.
<usable characters=""></usable>		
0 to 9, A to Z, a to z, _ (underscore)		
The data type name has an invalid value.	As given in the error	Change the data type name for the
•	message.	Controller variable. You cannot use
		spaces or two-byte characters.
The link variable name is duplicated.	As given in the error	Change the name of the Controller
·	message.	variable.
The string format is invalid.	As given in the error	Change the text string format for the
	message.	data type of the Controller variable.
The element numbers should be specified in the	As given in the error	Change the first and last element
order from lower to higher values.	message.	numbers of the array in the data
		type of the Controller variable.
The array length has an invalid format.	As given in the error	Change the array length format for
Examples:	message.	the data type of the Controller vari-
ARRAY[010] OF BOOL		able.
ARRAY[010,010] OF BOOL		
ARRAY[010,010,010] OF BOOL		
The string format is invalid.	As given in the error	Change the text string length for the
Specify an integer between 1 and 1986.	message.	data type of the Controller variable.
The array length is out of range.	As given in the error	Change the total size of the array for
Specify a value so that the total array size does	message.	the data type of the Controller vari-
not exceed 65536.		able.
The set name is used for other data type.	As given in the error	Change the name of the Controller
	message.	variable.
The specified array element is invalid.	As given in the error	Set the first element number of the
The first element must be 0.	message.	array to 0 in the data type of the
		Controller variable.
A string having two or more underscores in	As given in the error	Change the name of the Controller
series cannot be used.	message.	variable.
A string ending with underscore cannot be used	As given in the error	Change the name of the Controller
	message.	variable.
A string starting with P_ cannot be used.	As given in the error	Change the name of the Controller
	message.	variable.

8-4-5 **Documentation**

The Documentation Menu is used to output information on the GEM Services. This menu provides the following command.

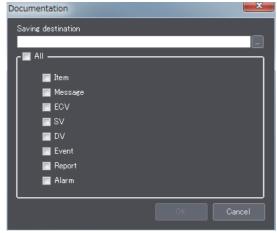
Documentation



Documentation

The **Documentation** command can be used to output the following eight types of information.

- · Items
- · Messages
- Equipment constants (ECVs)
- · Status variables (SVs)
- · Discrete variables (DVs)
- Events
- · Reports
- Alarms



The file names and file formats for the various output files are described next.

Items

The items that are displayed in the Item Definition Dialog Box are output to the item file.

The file name is Document_Item.txt.

The file format is given below.

```
Data name <TAB> Description <TAB> Format <TAB> Data size <TAB> Fixed length
ACKC5 <TAB> Acknowledge code <TAB> 10 <TAB> 1 <TAB> N/A
ACKC6 <TAB> Acknowledge code <TAB> 10 <TAB> 1 <TAB> N/A
```

Messages

The items that are displayed in the GEM Standard Messages Dialog Box and User-defined Messages Dialog Box are output to the message file. The branch numbers of user-defined messages are displayed after the function code and separated from it with a hyphen.

The file name is Document Message.txt.

The file format is given below.

```
SF <TAB> Message name <TAB> Direction <TAB> Enable/disable <TAB> W-bit setting

S1,F1 <TAB> Are You There Request(R) <TAB> H←→E <TAB> Enable <TAB> ON

S1,F2 <TAB> On-Line Data <TAB> H←→E <TAB> Enable <TAB> OFF

S65,F65-1 <TAB> User-defined Message <TAB> H→E <TAB> ON

:
:
```

Equipment Constants (ECVs)

The items that are displayed in the Equipment Constant Definition Dialog Box are output to the equipment constant (ECV) file.

The file name is Document_ECV.txt.

The file format is given below.

```
ECID <TAB> ECNAME <TAB> Format <TAB> Data size <TAB> Link variable <TAB> Description <TAB> ECMAX <TAB> ECMIN <TAB> ECDEF <TAB> UNITS <TAB> Fixed length

1 <TAB> EstablishCommunicationsTimeout <TAB> 52 <TAB> 1 <TAB> __GEM_EstblishCommunicationsTimeout <TAB> Used to initialize between attempt to resend <TAB> 256 <TAB> 1 <TAB> 60 <TAB> s <TAB> N/A

:
:
:
```

Status Variables (SVs)

The items that are displayed in the Status Variable Definition Dialog Box are output to the status variable (SV) file.

The file name is Document SV.txt.

The file format is given below.

SVID <TAB> SVNAME <TAB> Format <TAB> Data size <TAB> Link variable <TAB> Description <TAB> UNITS <TAB> Fixed length <TAB> Trace target <TAB> Limit monitoring target <TAB> LIMIT MIN <TAB> LIMITMAX <TAB> CEID

102 < TAB > CLOCK < TAB > 20 < TAB > 16 < TAB > N/A < TAB > This status variable contains the code which identifies the current control state of the equipment

<TAB>N/A<TAB>Enable<TAB>OFF<TAB>N/A<TAB>N/A<TAB>N/A

:

Discrete Variables (DVs)

The items that are displayed in the Discrete Variable Definition Dialog Box are output to the discrete variable (DV) file.

The file name is Document DV.txt.

The file format is given below.

```
DVID <TAB> DVNAME <TAB> Format <TAB> Link variable <TAB> Description <TAB> Data size <TAB>
Description <TAB> Fixed length
```

304 <TAB> PPChangeName <TAB> 20 <TAB> 80 <TAB> _GEM_PPChangeInfo.PPChangeName <TAB> N/A <TAB> The PPID which was affected upon the event of the creation, editing, or deletion of a Process Program local to the equipment <TAB>Disable

Events

The items that are displayed in the Event Definition Dialog Box are output to the event file.

The file name is Document Event.txt.

The file format is given below.

```
CEID <TAB> Event name <TAB> Linked RPTID*1 <TAB> Enable/disableCEID
1 <TAB> Equipment Off-Line <TAB> 1<TAB>Enable
```

Reports

The items that are displayed in the Report Definition Dialog Box are output to the report file.

The file name is Document Report.txt.

The file format is given below.

```
RPTID <TAB> Report name <TAB> Structure
1 <TAB> Control State Change Report <TAB> "L,2<CR>1.<ControlState><CR>2<Clock>" <TAB>
```

Alarms

The items that are displayed in the Alarm Definition Dialog Box are output to the alarm file.

The file name is Document Alarm.txt.

The file format is given below.

```
ALID <TAB> ALCD <TAB> ALTX<TAB> CEID on Alarm Set <TAB> CEID on Alarm Clear
1 <TAB> 0 <TAB> Unit 1 exhaust pressure error <TAB> 1001 <TAB> 1002
```

^{*1.} If there is more than one linked RPTID registered, they are given and separated by commas. Example: 1,2

Error message	Cause	Correction
The folder specified as the saving destination does not exist.	As given in the error message.	Specify a folder that exists on the computer or create the specified folder before you apply the setting.
The path name includes invalid character(s). The following characters cannot be used: ex. * ? " < >	As given in the error message.	Change the path name.
The path name for saving destination cannot exceed 128 characters.	As given in the error message.	Correct the saving destination.

8-4-6 Window

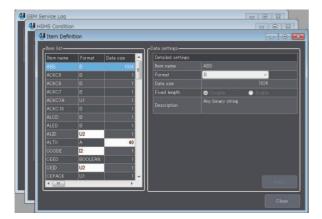
The Window Menu is used to arrange the dialog boxes that are displayed in the editing area. This menu provides the following two commands.

- Cascade
- · Close All



Cascade

The Cascade command is used to cascade the dialog boxes in the editing area. When you execute this command, the dialog boxes are displayed as shown below.



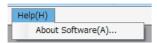
Close All

The Close All command is used to close all of the dialog boxes in the editing area.

8-4-7 Help

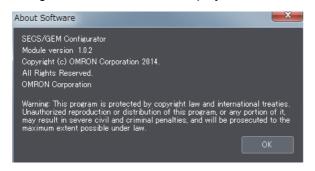
The Help Menu is used to display version information. This menu provides the following command.

· About Software



About Software

The *About Software* command displays version information on the SECS/GEM Configurator. The following version information is displayed.



Toolbar Configuration 8-5

The toolbar displays icons for the following menu bar commands: New, Open, and Save. The following icons are used for these three commands.



New Icon

The following icon is used for the *New* command.



The function of the New Icon is the same as the New command on the File Menu. Refer to New on page 8-16 for details.

Open Icon

The following icon is used for the *Open* command.



The function of the Open Icon is the same as the Open command on the File Menu. Refer to Open on page 8-17 for details.

Save Icon

The following icon is used for the Save command.



The function of the Save Icon is the same as the Save command on the File Menu. Refer to Save on page 8-17 for details.

8-6 Basic Operations on the List Menus

The list menus are used to make settings for GEM Services. The following seven menus are provided at the top level of the menu structure.

- Configuration
- HSMS Settings
- · Data Definition
- · Model Settings
- GEM Capability Settings
- · Message Settings
- · Confirm Settings

Before we describe the individual items on the list menus, we will describe the dialog box configuration and operating methods that are the same for all of the list menus.

8-6-1 List Menu Dialog Boxes

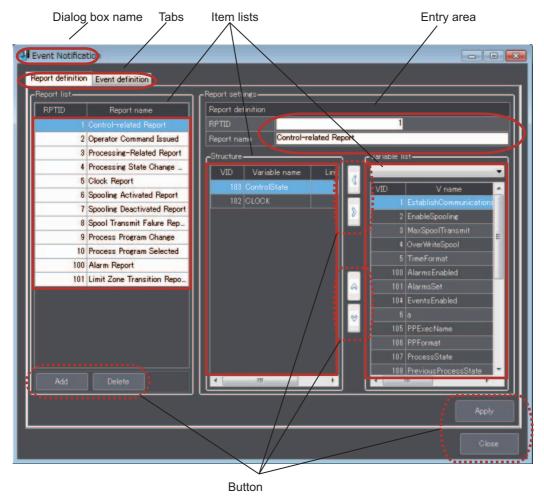
There are the following two types of List Menu Dialog Boxes.

- Setting Dialog Boxes
 A setting dialog box is displayed in the editing area if you select a top-level list menu. You can select the tab pages and make settings other than those for Controller variables.
- Variable Dialog Boxes
 If you click a variable name box in any of the setting dialog boxes, a variable dialog box is displayed.

 These dialog boxes are used to create Controller variables or link them to other variables.

8-6-2 **Setting Dialog Boxes**

The configuration of the setting dialog boxes is shown below.



Dialog Box Name

The name of the setting dialog box. The dialog box name is the same as the top-level list menu name.

Tabs

If there is more than one type of item that can be set on the setting dialog box, you can select a tab to change the display. Not all setting dialog boxes have tabs.

Item Lists

Items such as report names and event names are displayed in lists. You can click the column titles to sort the rows in ascending or descending order. The highlighted item in a list is the item that is currently selected.

Entry Area

In this area, you can click into the boxes to directly enter numbers or text strings.

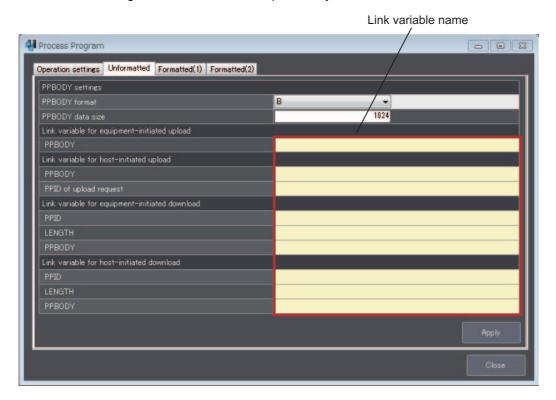
Button

The buttons are used to perform various operations. The buttons that are displayed are shown in the following table.

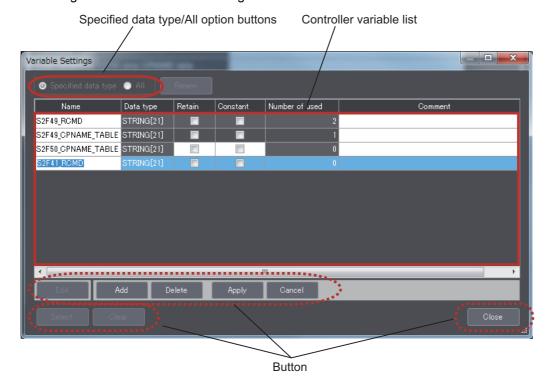
Button	Function	
Apply	Enables the settings in the currently displayed dialog box.	
	If you close a dialog box or change the tab page without clicking the Apply Button, the settings	
	that were made on the relevant dialog box are discarded.	
Add	Adds a new row to an item list.	
Delete	Deletes the selected row from an item list.	
Сору	Adds a row with the same contents as the selected row to an item list. Use this button to create	
	a new item by changing only some of the settings of an existing item.	
Close	Closes the currently displayed dialog box.	
< and >	These buttons are used to move items between two lists that are displayed side by side.	
∧ and ∨	These buttons are used to move the selected item up and down in the list.	

8-6-3 **Variable Dialog Boxes**

The variable dialog boxes are displayed when link variable names are clicked in the setting dialog boxes. These dialog boxes are used to link previously created Controller variables to other variables.



The configuration of the variable dialog boxes is shown below.



Specified Data Type/All Option Buttons

The option that is selected determines the items that are displayed in the Controller variable list. Select an option and click the **Renew** Button to change the display.

Button	Controller variable list display	
Specified data	Of the Controller variables that are registered in the project, only the Controller variables that	
type	have the same data types, Constant attributes, and Retain attributes as the linked variables	
	are displayed.*1	
All	All of the Controller variables that are registered in the project are displayed.	

^{*1.} Refer to 2-3-3 Link Variables on page 2-14 for information on the Constant attribute and Retain attribute of link variables.

Controller Variable List

The Controller variables are displayed. You can click the column titles of the Controller variable attributes to sort the rows in ascending or descending order. The highlighted item in a Controller variable list is the Controller variable that is currently being selected.

The following table gives the meanings of the attributes of the Controller variables.

Attribute	Meaning	
Name The name of the Controller variable.		
Data type	The data type of the Controller variable.	
Retain	The Retain attribute of the Controller variable.	
Constant	The Constant attribute of the Controller variable.	
Number of used	The number of registrations as a link variable.	
Comment	The user can enter a description of the Controller variable.	



Precautions for Correct Use

If a Controller variable is set for more than one link variable, the number of used attributes is set to 2 or higher. An error will not occur in the user program, but the intended operation may not be achieved. Always keep the number of used attributes at 0 or 1.

Button

The buttons are used to perform various operations. The buttons that are displayed are shown in the following table.

Button	Function	
Edit	Enables editing the attributes of the selected Controller variable.	
	When you click the Edit Button, the Add , Delete , Apply , and Cancel Buttons are enabled.	
Add	Adds a row to the Controller variable list.	
Delete	Deletes the selected row from a Controller variable list.	
Apply	Enables the settings in the currently displayed dialog box.	
	If you close a dialog box without clicking the Apply Button, the settings that were made on the	
	relevant dialog box are discarded.	
Cancel	Discards the changes made in editing.	
Select	Links the selected Controller variable to a variable.	
Close	Closes the dialog box.	



Precautions for Correct Use

If you delete a Controller variable that is linked to another variable, the link to the other variable is also deleted. If you change the attributes of a Controller variable that is linked to another variable, the link to the other variable may also be deleted.

Configuration 8-7

The Configuration Menu is used to make settings for the GEM Service logs. This menu provides the following command.

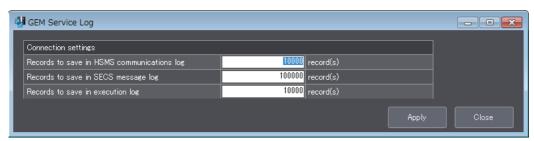
· GEM Service Log



GEM Service Log 8-7-1

The GEM Service Log command is used to set the numbers of records in the HSMS communications log, SECS message log, and execution log.

For details on the GEM Service logs, refer to Section 6 GEM Service Logs.



The items that are displayed in the GEM Service Log Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item		Meaning	Range of values
C	onnection settings		
	Records to save in HSMS communications log	Sets the maximum number of records to save in the HSMS communications log in increments of 100 records.*1	0-100,000
	Records to save in SECS message log	Sets the maximum number of records to save in the SECS message log in increments of 100 records.*1	0-1,000,000
	Records to save in execution log	Sets the maximum number of records to save in the execution log in increments of 100 records.*1	0-100,000

^{*1.} Records are not saved in the logs if you set 0.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range.		range.
Set it in units of 100.	As given in the error message.	Set the value to a multiple of 100.

8-8 HSMS Settings

The HSMS Settings Menu is used to set the conditions for HSMS communications between the host and CPU Unit. This menu provides the following command.

HSMS Condition



8-8-1 HSMS Condition

The **HSMS Condition** command is used to set the conditions for HSMS communications between the host and CPU Unit.

Refer to 5-2 HSMS Communications on page 5-14 for details on HSMS communications.



The items that are displayed in the HSMS Condition Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Communications settings		
Connect mode	The connect mode that is used to open HSMS communications.	Active/ Passive
IP address assignment on PASSIVE	Specifies whether to set a Controller IP address when the connect mode is set to passive.	No/Yes
Host IP address	The IP address of the host. If the TCP/IP connect mode is set to active, this is the IP address of the host to which to send connection requests. If the TCP/IP connect mode is set to passive and specifying an IP address for passive connections has been set, this is the IP address of the host from which to accept connection requests.	Any value except for 0.0.0.0 and 255.255.255
IP port	If the TCP/IP connect mode is set to active, this is the host TCP port number. If the TCP/IP connect mode is set to passive, this is the Controller TCP port number.*1	1-65535
Device ID	The device ID that is attached to the header of SECS-II messages.	0-65535
T3 (Reply timeout)	T3 (reply timeout) [s].	1-120
T5 (Connect separation timeout)	T5 (connect separation timeout) [s]. This is the minimum time interval for an entity to cancel a TCP/IP connection.	1-240
T6 (Control transaction timeout)	T6 (control transaction timeout) [s]. The maximum time that an HSMS control connection can remain open until it is assumed that a communications error occurred.	1-240
T7 (NOT SELECTED time- out)	T7 (NOT SELECTED timeout) [s]. The time after a TCP/IP connection is established until it is assumed that a communications error occurred.	1-240
T8 (Network intercharacter timeout)	T8 (network intercharacter timeout) [s]. The maximum time until it is assumed that a communications error occurred. This is the time between receiving consecutive bytes of one complete HSMS message.	1-240
Conversation timeout	This is the timeout value in seconds until the expected transaction is received for specific transactions.	1-240
Linktest.req send interval	The send interval for Linktest messages [s].	0-65535
Logging Linktest message	Specifies whether to record Linktest records in the HSMS communications log.	Enabled/dis- abled

^{*1.} You cannot specify port numbers that are reserved by the system. Refer to the *NJ/NX-series CPU Unit Built-in* EtherNet/IP User's Manual (Cat. No. W506) for details.

The error messages that may be displayed for this menu command are described in the following table.

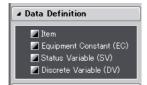
Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range.		range.
The set IP address is invalid.	As given in the error message.	Change the IP address.
The set IP port is reserved for the xxxx.	The set IP port is reserved for	Change the port number of the IP
	another application.*1	port.

^{*1.} Refer to the NJ/NX-series Built-in EtherNet/IP User's Manual (Cat. No. W506) for details.

8-9 Data Definition

The Data Definition Menu is used to define items, equipment constants (ECs), status variables (SVs), and discrete variables (DVs). This menu provides the following four commands.

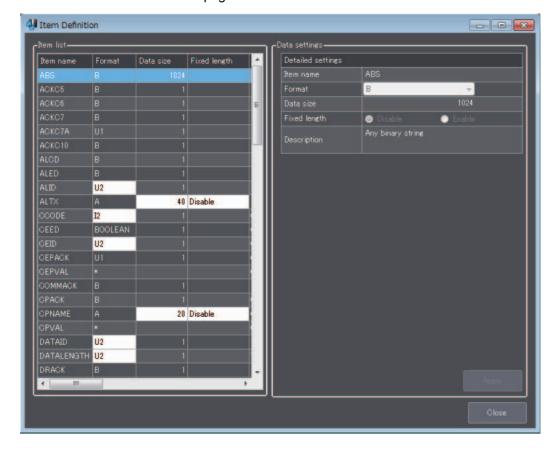
- Item
- Equipment Constant (EC)
- · Status Variable (SV)
- · Discrete Variable (DV)



8-9-1 Item

The *Item* command is used to define items.

Refer to 5-3 Item Definitions on page 5-17 for details on item definitions.



The data settings that are displayed in the Item Definition Dialog Box are described in the following table along with the meanings and value ranges of the settings.

Item	Meaning	Range of values
Detailed settings		
Item name	The name of the item.	
Format	The format of the item.	Depends on the item
	The format cannot be changed for items that have only one format specified in the SECS/GEM standards.	setting range.
Data size	The size of the data in bytes.	Depends on the item set-
	The data size cannot be changed for items that have only one data size specified in the SECS/GEM standards.	ting range.
Fixed length	Specifies whether to use a fixed data size or a variable data size for format A. Enable: Fixed length*1 Disable: Variable length	Enable/disable
Description	A description of the item that is entered by the user.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.

^{*1.} If a fixed length is specified, spaces are added for items that are smaller than the data size.

You can click an item name to sort the list by that item.

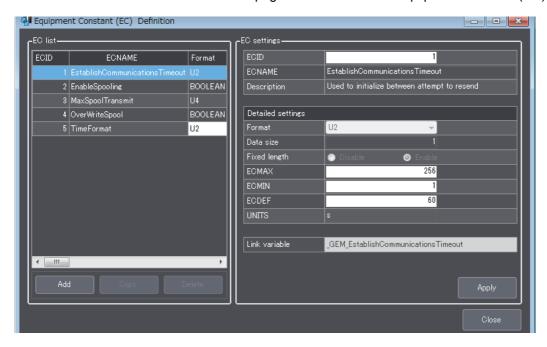
The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.

8-9-2 Equipment Constant (EC)

The *Equipment Constant (EC)* command is used to define equipment constants (ECs). You can edit, add, or delete equipment constants.

Refer to 5-4 Variable Data Definitions on page 5-21 for details on equipment constant (EC) definitions.



The EC settings that are displayed in the Equipment Constants (EC) Definition Dialog Box are described in the following table along with the meanings and value ranges of the settings.

Item	Meaning	Range of values
ECID	The equipment constant ID.	Depends on the format that is set for the VID in the item definitions. You cannot set the ECID to 0.
ECNAME	The equipment constant name. You cannot change equipment constants that are defined in the SECS/GEM standards.	Alphanumerics The maximum data size is the data size specified for the ECNAME in the item definitions.
Description	A description of the equipment constant that is entered by the user. You cannot change equipment constants that are defined in the SECS/GEM standards.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.
Detailed settings		
Format	The format of the equipment constant. The format cannot be changed for equipment constants that have only one format specified in the SECS/GEM standards.	B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4
Data size	The data size in bytes for format B or A. The data size cannot be changed for equipment constants that have only one data size specified in the SECS/GEM standards.	1-120
Fixed length	Specifies whether to use a fixed data size or a variable data size for format A. Enable: Fixed length*1 Disable: Variable length	Enable/disable
ECMAX	The maximum value that can be set.	Depends on the format. This is the upper limit for verifying the value for New Equipment Constant Send (S2,F15). *2
ECMIN	The minimum value that can be set.	Depends on the format. This is the lower limit for verifying the value for New Equipment Constant Send (S2,F15). *3
ECDEF	The default value when the system is started.	Depends on the format, EXMAX, and ECMIN.
UNITS	The unit of the value. You cannot change equipment constants that are defined in the SECS/GEM standards.	The maximum value is the data size set for UNITS in the item definitions.
Link variable	The variable that is linked to the equipment constant. You cannot change equipment constants that are defined in the SECS/GEM standards.	

^{*1.} If a fixed length is specified, spaces are added for equipment constants that are smaller than the data size.

You can click an item name to sort the list by that item.

^{*2.} This value is not used for verifying the value for New Equipment Constant Send (S2,F15) for format B or A. Only the value of the ECMAX item is used for Equipment Constant Namelist (S2,F30). For format B, enter the limit with one byte.

^{*3.} This value is not used for verifying the value for New Equipment Constant Send (S2,F15) for format B or A. Only the value of the ECMIN item is used for Equipment Constant Namelist (S2,F30). For format B, enter the limit with one byte.

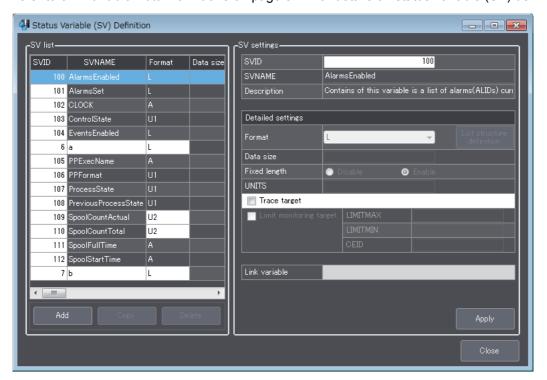
The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid
[Range: xxxx to yyyy]	message.	setting range.
An ECID is duplicated.	As given in the error	Change the value of the
	message.	ECID.
An entry may be over the valid input range. [Valid	As given in the error	Make the setting within the
input range: xx characters or less]	message.	maximum number of charac-
- <u></u>		ters.
An ECNAME includes a character that cannot be	As given in the error	Change the setting of
used.	message.	ECNAME.
<use><usable characters="">0.45, 0. A.45, 7. a.45, 7. (various access)(b.valous access)</usable></use>		
0 to 9, A to Z, a to z, _ (underscore), - (hyphen)	A	Observe the setting of
An ECNAME is duplicated.	As given in the error	Change the setting of ECNAME.
The input value in the himse. (D) formed is not a have	message.	
The input value in the binary (B) format is not a hexadecimal character.	As given in the error	Enter a hexadecimal number.
<pre><hexadecimal characters=""></hexadecimal></pre>	message.	bei.
Any combination of characters among 0 to 9, a to f,		
and A to F in units of two characters.		
The input value in binary (B) format does not agree	As given in the error	Specify a hexadecimal num-
with the data size.	message.	ber that is twice the data
		size.
The value includes a character that cannot be used	As given in the error	Set only usable characters.
for integer type (I and U). 0 to 9, - (hyphen) [for U only]	message.	
The value includes a character that cannot be used	As given in the error	Set only usable characters.
for floating-point type. Or, the entered value exceeds	message.	
the valid range.		
<usable characters=""></usable>		
0 to 9, - (hyphen), . (decimal point)		
A link variable is not specified	As given in the error	Specify a link variable.
	message.	
The value specified to the minimum value is bigger	As given in the error	Set a minimum value that is
than the maximum value.	message.	smaller than the maximum
		value.
The link variable is already used for other variable	As given in the error	Change the link variable.
data (EC, SV or DV).	message.	

8-9-3 Status Variable (SV)

The Status Variable (SV) command is used to define status variables (SVs). You can edit, add, or delete status variables.

Refer to 5-4 Variable Data Definitions on page 5-21 for details on status variable (SV) definitions.



The SV settings that are displayed in the Status Variable (SV) Definition Dialog Box are described in the following table along with the meanings and value ranges of the settings.

	Item	Meaning	Range of values
SVIE)	The status variable ID.	Depends on the format that is set for the VID in the item definitions. You cannot set the SVID to 0.
SVN	AME	The status variable name. You cannot change status variables that are defined in the SECS/GEM standards.	Alphanumerics The maximum data size is the data size specified for the SVNAME in the item definitions.
Desc	cription	A description of the status variable that is entered by the user. You cannot change status variables that are defined in the SECS/GEM standards.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.
Deta	iled settings		
	ormat	The format of the status variable. The format cannot be changed for status variables that have only one format specified in GEM. Set a list structure definition for format L.*1 The maximum number of lists is 64. The maximum number of nesting levels is 3.	L, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4
D	ata size	Data size [bytes] For format A or B, specify the data length. For formats other than A and B, specify the number of elements. The data size cannot be changed for status variables that have only one data size specified in the SECS/GEM standards.	Format A or B: 1 to 120 bytes Formats other than A and B: 1 to 32 items
Fi	xed length	Specifies whether to use a fixed data size or a variable data size for format A. Enable: Fixed length*2 Disable: Variable length	Enable/disable
U	NITS	The unit of the value. You cannot change status variables that are defined in the SECS/GEM standards.	The maximum value is the data size set for UNITS in the item definitions.
Tr	ace target	Specifies targets for trace data collection.	Target or not a target.
	mit monitoring rget	Specifies targets for limit monitoring. Specifying a limit monitoring target is not possible for status variables with formats L, A, or B or for status variables with numeric formats with multiple elements.	Target or not a target.
	LIMITMAX	The maximum value of the status variable when it is specified as a limit monitoring target.	Depends on the format of the monitored SV.
	LIMITMIN	The minimum value of the status variable when it is specified as a limit monitoring target.	Depends on the format of the monitored SV.
	CEID	The CEID of the Limit Zone Transition event.	Depends on the format of CEID. You cannot set the CEID to 0.
Link	variable	The variable that is linked to the status variable. You cannot change status variables that are defined in the SECS/GEM standards.	

^{*1.} Refer to 5-4 Variable Data Definitions on page 5-21 for the setting methods for list structure definitions.

^{*2.} If a fixed length is specified, spaces are added for status variables that are smaller than the data size.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the	Set all of the items.
	error message.	
The entered value is out of the specified range.	As given in the	Set a value within the valid setting
[Range: xxxx to yyyy]	error message.	range.
A SVID is duplicated.	As given in the	Change the value of the SVID.
	error message.	
An entry may be over the valid input range. [Valid	As given in the	Make the setting within the maxi-
input range: xx characters or less]	error message.	mum number of characters.
A SVNAME includes a character that cannot be	As given in the	Change the setting of SVNAME.
used.	error message.	
<usable characters=""></usable>		
0 to 9, A to Z, a to z, _ (underscore), - (hyphen)		
A SVNAME is duplicated.	As given in the	Change the setting of SVNAME.
	error message.	
A link variable is not specified	As given in the	Specify a link variable.
	error message.	
The CEID xxxx for the Limit monitoring is duplicated.	As given in the	Change the value of the CEID for
	error message.	limit monitoring.
The number of collection events exceeds the maxi-	As given in the	Change the number of registered
mum.	error message.	collection events.
The link variable is already used for other variable	As given in the	Change the link variable.
data (EC, SV or DV).	error message.	
The list structure is not defined.	As given in the	Define the list structure.
	error message.	
Specify the link variable of the list structure.	The list structure	Set the list structure.
	link variable is not	
	registered.	
The number of defined list structures exceeds the	There are more	Change the list structure.
maximum.	than 64 variables	
	with list structures.	



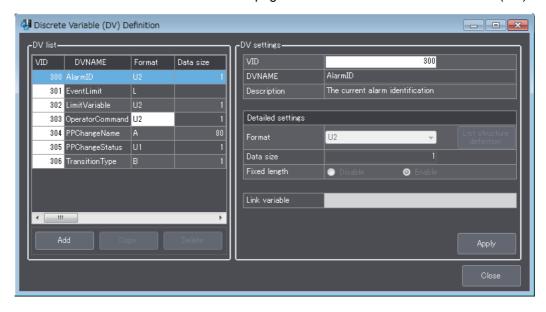
Precautions for Correct Use

If you delete a status variable that is registered in a report structure, the status variable is also deleted from the report structure.

8-9-4 Discrete Variable (DV)

The *Discrete Variable (DV)* command is used to define discrete variables (DVs). You can edit, add, or delete discrete variables.

Refer to 5-4 Variable Data Definitions on page 5-21 for details on discrete variable (DV) definitions.



The DV settings that are displayed in the Discrete Variable (DV) Definition Dialog Box are described in the following table along with the meanings and value ranges of the settings.

Item	Meaning	Range of values
VID	The discrete variable ID.	Depends on the format that is set for the VID in the item definitions. You cannot set the VID to 0.
DVNAME	The discrete variable name. You cannot change discrete variables that are defined in the SECS/GEM standards.	Alphanumerics The maximum data size is the data size specified for the SVNAME in the item definitions.
Description	A description of the discrete variable that is entered by the user. You cannot change discrete variables that are defined in the SECS/GEM standards.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.
Detailed settings		
Format	The format of the discrete variable. The format cannot be changed for discrete variables that have only one format specified in the SECS/GEM standards. Set a list structure definition for format L. *1	L, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4
	The maximum number of lists is 64. The maximum number of nesting levels is 3.	
Data size	Data size [bytes] For format A or B, specify the data length. For formats other than A and B, specify the number of elements. The data size cannot be changed for discrete variables that have only one data size specified in the SECS/GEM standards.	Format A or B: 1 to 120 bytes Formats other than A and B: 1 to 32 items
Fixed length	Specifies whether to use a fixed data size or a variable data size for format A. Enable: Fixed length*2 Disable: Variable length	Enable/disable
Link variable	The variable that is linked to the discrete variable. You cannot change discrete variables that are defined in the SECS/GEM standards.	

^{*1.} Refer to 5-4 Variable Data Definitions on page 5-21 for the setting methods for list structure definitions.

^{*2.} If a fixed length is specified, spaces are added for discrete variables that are smaller than the data size.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
A VID is duplicated.	As given in the error	Change the value of the VID.
	message.	
An entry may be over the valid input range. [Valid	As given in the error	Make the setting within the maxi-
input range: xx characters or less]	message.	mum number of characters.
A DVNAME includes a character that cannot be	As given in the error	Change the setting of DVNAME.
used.	message.	
<usable characters=""></usable>		
0 to 9, A to Z, a to z, _ (underscore), - (hyphen)		
A DVNAME is duplicated.	As given in the error	Change the setting of DVNAME.
	message.	
A link variable is not specified	As given in the error	Specify a link variable.
	message.	
The link variable is already used for other variable	As given in the error	Change the link variable.
data (EC, SV or DV).	message.	
The number of defined list structures exceeds the	There are more than	Change the list structure.
maximum.	64 variables with list	
	structures.	

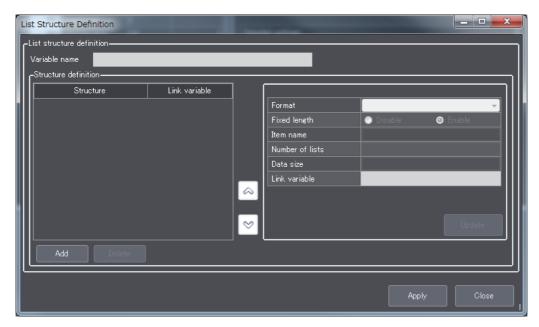


Precautions for Correct Use

If you delete a discrete variable that is registered in a report structure, the discrete variable is also deleted from the report structure.

8-9-5 **List Structure Definitions**

The List Structure Definition command is used to define data item list structures for format L in the status variable definitions or discrete variable definitions. You can edit, add, or delete data items.



The structure settings that are displayed in the List Structure Definition Dialog Box are described in the following table along with the meanings and value ranges of the settings.

Item	Meaning	Range of values
Format	The format for each data item set in the list structure.	List of fixed length data, List of length-variable data, B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or U4
Fixed length	Specifies whether to use a fixed data size or a variable data size for format A. Enable: Fixed length*1 Disable: Variable length	Enable/disable
Item name	The name of the message item except for the following formats: List of fixed length data or list of length-variable data.	A to Z, a to z, and 0 to 9 20 characters max.
Number of lists	The number of lists in a list of fixed length data. The maximum number of lists in a list of length-variable data.	List of fixed length data: 0 to 64 List of length-variable data: 1 to 64
Data size	For format A or B, specify the data length. For formats other than A and B, specify the number of elements.	1-120
Link variable	The variable that is linked to the list of length-variable data or the item. There are the following two variables.	
	 List element count*2 List element table*3 	

^{*1.} If a fixed length is specified, spaces are added for data items that are smaller than the data size.

^{*2.} This is the link variable for a list of length-variable data.

^{*3.} It is an array variable. The array element data type must agree with the format of the data items. The number of array elements must be equal to or greater than the maximum number of lists for the data items.

The items that you can set in a list structure depend on the formats of the data items. The following table shows the relationship between the data item formats and the settings in the List Structure Definition Dialog Box.

Format	Item				
Format	Item name	Fixed length	Number of lists	Data size	Link variable
L, fixed length			Can be set.		
L, variable length	*1		Can be set.		Can be set.
В	Can be set.			Can be set.	Can be set.
BOOLEAN	Can be set.			Can be set.	Can be set.
A	Can be set.	Can be set.		Can be set.	Can be set.
I1	Can be set.			Can be set.	Can be set.
12	Can be set.			Can be set.	Can be set.
14	Can be set.			Can be set.	Can be set.
F4	Can be set.			Can be set.	Can be set.
F8	Can be set.			Can be set.	Can be set.
U1	Can be set.			Can be set.	Can be set.
U2	Can be set.			Can be set.	Can be set.
U4	Can be set.			Can be set.	Can be set.

^{*1.} Structures of lists of length-variable data are displayed as follows: L,n (maximum_number_of_lists).

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
An item includes a character that cannot be used.	As given in the error	Change the data item setting.
<usable characters=""></usable>	message.	
A to Z, a to z, 0 to 9		
The message structure is invalid.	As given in the error	Change the message structure.
	message.	
The data type of the link variable is invalid.	As given in the error	Change the link variable or the item
	message.	structure.
Plural items are specified without list structure	As given in the error	Define the list structure.
definition.	message.	
Message levels exceed the specified nest levels.	As given in the error	Do not use more than three nesting
	message.	levels for a message list.
The length-variable list is nested.	As given in the error	Do not nest lists of length-variable
	message.	data.
A link variable is not specified	As given in the error	Specify a link variable.
	message.	

8-10 Model Settings

The Model Setting Menu is used to define the communications state model and control state model. This menu provides the following two commands.

- · Communications State Model
- · Control State Model



8-10-1 Communications State Model

The Communications State Model command is used to define the default communications state, the equipment model type, and the equipment software revision code in the communications state model.

Refer to 5-5-1 Communications State Model on page 5-27 for details on the communications state model.



The items that are displayed in the Communications State Model Dialog Box are described in the following table along with the meanings and value ranges of the items.

	Item	Meaning	Range of values
(Communications State		
Ν	Model		
	Default Communica-	The default communications state when	ENABLE/
	tions state	the system is started.	DISABLE
	MDLN	The equipment model type.	Depends on the format of MDLN.
	SOFTREV	The equipment software revision code.	Depends on the format of SOFTREV.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry may be over the valid input range.	As given in the error	Make the setting within the maxi-
[Valid input range: xx characters or less]	message.	mum number of characters.

8-10-2 Control State Model

The Control State Model Menu is used to define states in the control state model.

Refer to 5-5-2 Control State Model on page 5-31 for details on the control state model.



The items that are displayed in the Control State Model Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Control State Model		
Default Control state	The default control state when the system is started.	ONLINE, Equipment OFF-LINE, Attempt ON-LINE, or Host OFF-LINE
Default Online substate	The substate when changing to ON-LINE when the system is started or for Request ON-LINE (S1,F17).	REMOTE or LOCAL
Failed Online state	The default state for failures to go ON-LINE.	Equipment OFF-LINE or Host OFF-LINE

GEM Capability Settings 8-11

The GEM Capability Settings Menu is used to make settings for the GEM capabilities. This menu provides the following eight commands/menus.

- · Event Notification
- · Alarm Management
- · Remote Control
- · Equipment Constants
- Process Program Management
- · Equipment Terminal Service
- · Limit Monitoring
- Spooling



The Remote Control Menu provides the following two commands.

- Host Command
- · Enhanced Remote Command

8-11-1 Event Notification

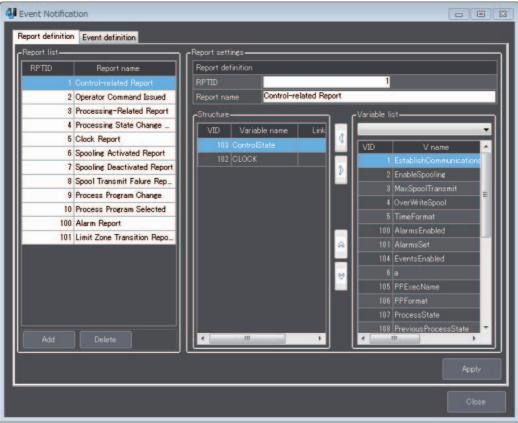
The **Event Notification** command is used to define the reports to link to events and the variables to include in reports when collection events occur.

Refer to 5-5-4 Event Notification on page 5-40 for details on event notification.

The Event Notification Dialog Box has a Report definition Tab Page to define the variables in reports and an Event definition Tab Page to define the reports to link to events.

Report Definition Tab Page

The Report definition Tab Page is used to define the variables to include in reports.



The report settings that are displayed on the Report definition Tab Page are described in the following table along with the meanings and value ranges of the settings.

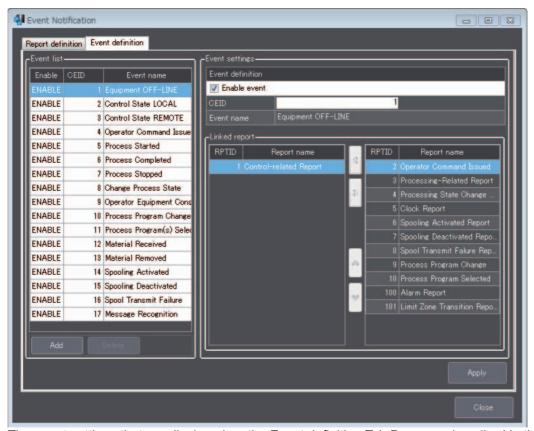
Item	Meaning	Range of values
Report definition		
RPTID	RPTID	Depends on the format that is set for the RPTID in the item definitions. You cannot set the RPTID to 0.
Report name	The report name that is entered by the user.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.
Structure	The variable data and variable data sequence of the report members.	Maximum number of members: 64

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error mes-	Set all of the items.
	sage.	
The entered value is out of the specified range.	As given in the error mes-	Set a value within the valid setting
[Range: xxxx to yyyy]	sage.	range.
A ReportID is duplicated.	As given in the error mes-	Change the value of the RPTID.
	sage.	
An entry may be over the valid input range.	As given in the error mes-	Make the setting within the maxi-
[Valid input range: xx characters or less]	sage.	mum number of characters.
The number of collection events exceeds the	There are more than 256	Change the number of registered
maximum.	collection event defini-	collection events.
	tions.	

Event Definition Tab Page

The Event definition Tab Page is used to define the reports to link to events.



The event settings that are displayed on the Event definition Tab Page are described in the following table along with the meanings and value ranges of the settings.

Item	Meaning	Range of values
Event definition		
Enable event	Whether to enable the selected event.	Enable/disable
CEID	CEID	Depends on the format that is set for the CEID in the item definitions. You cannot set the CEID to 0.
Event name	The event name that is entered by the user.	Single-byte characters: 128 characters max. Double-byte characters: 64 characters max.
Linked report	The RPTID of the report to link to the event.	Maximum number of links: 32

In the SECS/GEM standard collection events, you cannot delete the following collection events, which are automatically issued by the GEM Services. The **Delete** Button is disabled for them.

- · Control State LOCAL
- · Control State REMOTE
- · Spooling Activated
- · Spooling Deactivated
- · Spool Transmit Failure
- · Alarm Detected
- · Alarm Cleared
- · Limit Zone Transition

The Alarm Detected and Alarm Cleared collection events are deleted if the registration of the relevant alarm is deleted.

Limit Zone Transition collection events are deleted if the limit monitoring target specification is deleted for the status variable (SV).

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid set-
range. [Range: xxxx to yyyy]		ting range.
A CEID is duplicated.	The value of the CEID is used	Change the value of the CEID.
	for another collection event.	
An entry may be over the valid input range.	As given in the error message.	Make the setting within the maxi-
[Valid input range: xx characters or less]		mum number of characters.

Setting Collection Events

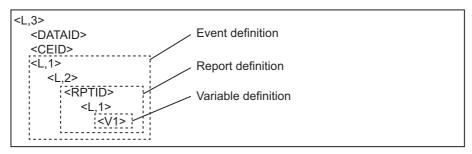
The setting procedure for collection events is described below using the Operator Equipment Constant Change collection event as an example.

The type, CEID, and report variable data for the Operator Equipment Constant Change collection event are given in the following table.

Туре	Collection event	CEID	Report variable data
Equipment constant	Operator Equipment Constant Change	9	ECID

Structure of Operator Equipment Constant Change Message

The message structure for the collection event is shown in the following figure. To set up a collection event, you must set the variable definition, report definition, and event definition.



The structure of the Operator Equipment Constant Change message is defined as shown below. In the variable definition, the ECIDs changed by the operator are registered.

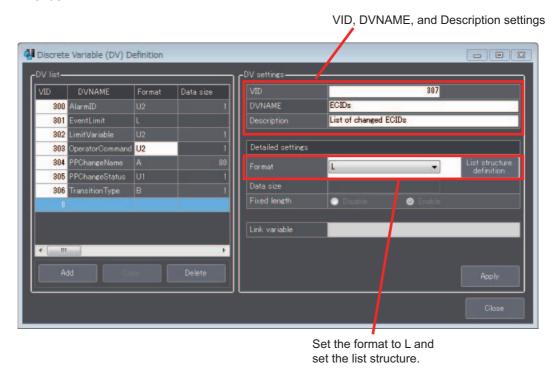
```
<L,3>
   <DATAID>
   <CEID>
   <L,1>
      <L,2>
          <RPTID>
                                       ECIDs changed by the operator
              <L,n>
                 <ECID<sub>1</sub>>
                  <ECID<sub>2</sub>>
                  <ECID<sub>n</sub>>
```

Setting the Variable Definition

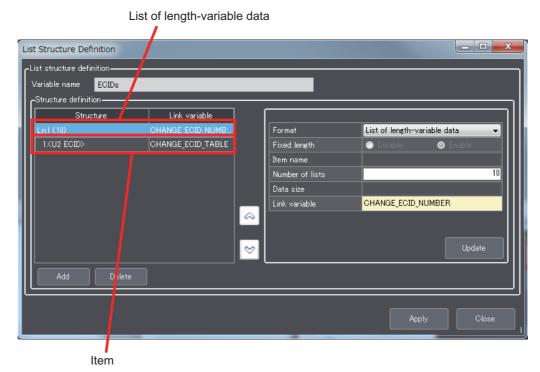
The variable definition in the structure of the Operator Equipment Constant Change message is set. This variable is used only in the collection event, so a discrete variable is defined. The specifications of the defined discrete variable are given in the following table.

VID	DVNAME	Description	Format
307	ECIDs	Changed ECID list	L

The following settings are made under **Data Definition** – **Discrete Variable Definition** in the List Menus.



Set the format to L and set the list structure. The settings for the list structure are shown below.



The list of length-variable data and item to set are given in the following table.

Туре	Item name	Number of lists	Data size	Link variable
List of length-variable data		10		CHANGE_ECID_NUMBER
Item	ECID		1	CHANGE_ECID_TABLE

Report Definition Settings

The report definition in the structure of the Operator Equipment Constant Change message is set. The specifications of the defined report are given in the following table.

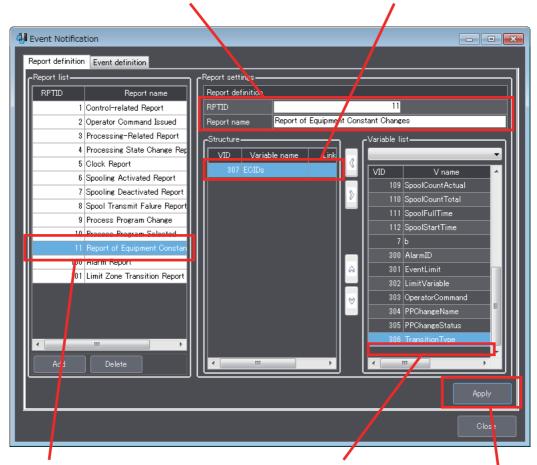
RPTID	Report name	Linked VID
11	Equipment Constant Changed Report	307

The following procedure is used for the settings on the Report Definition Tab Page accessed from **GEM capability – Event Notification** in the List Menus.

- 1 Add RPTID 11 (Equipment Constant Changed Report) to the report list.
- Enter the PRTID and report name in the report definition.
- 3 In the variable list, select VID 307 (ECIDs).
- Move *ECIDs* to the structure.
- Click the **Apply** Button.

The Report Definition Tab Page appears as shown below.





- 1. Add RPTID 11 (Equipment Constant Changed Report) to the report list.
- 3. In the variable list, select VID 307 (ECIDs).
 - 5. Click the **Apply** Button.

Event Definition Settings

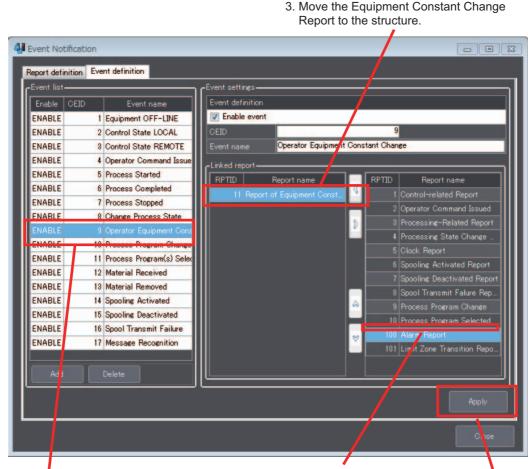
The event definition in the structure of the Operator Equipment Constant Change message is set. The specifications of the defined event are given in the following table.

CEID	Event name	Linked RPTID
9	Operator Equipment Constant Change	11

The following procedure is used for the settings on the Event Definition Tab Page accessed from GEM capability - Event Notification in the List Menus.

- Select CEID 9 (Operator Equipment Constant Change) to the event list.
- Select RPTID 11 (Equipment Constant Changed Report) in the report name list.
- Move the Equipment Constant Change Report to the event structure.
- Click the **Apply** Button.

The Event Definition Tab Page appears as shown below.



- 1. Select CEID 9 (Operator Equipment Constant Change) to the event list.
- 2. Select RPTID 11 (Equipment Constant Changed Report) in the report name list.
 - 4. Click the **Apply** Button.

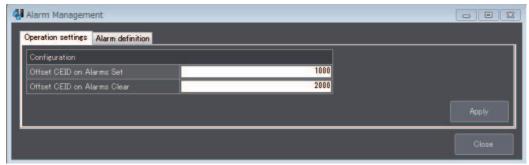
8-11-2 Alarm Management

The *Alarm Management* command is used to set alarm operation and define alarms. Refer to *5-5-11 Alarm Management* on page 5-53 for details on alarm management.

The Alarm Management Dialog Box has an Operation Settings Tab Page to define alarm operation and an Alarm Definition Tab Page to define alarms.

Operation Settings Tab Page

The Operation Settings Tab Page is used to set the CEID offset when alarms occur and the CEID offset when alarms are cleared for alarm management.



The items that are displayed on the Operation Settings Tab Page are described in the following table along with the meanings and value ranges of the items.

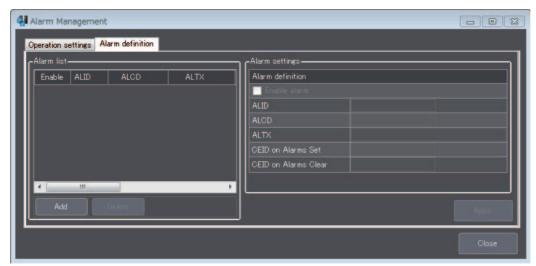
	Item	Meaning	Range of values
С	onfiguration		
	Offset CEID on	The CEID offset of the collection events that	Depends on the format that is set for
	Alarms Set	are issued when alarms occur.	the CEID in the item definitions.
	Offset CEID on	The CEID offset of the collection events that	Depends on the format that is set for
	Alarms Clear	are issued when alarms are cleared.	the CEID in the item definitions.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the	As given in the error message.	Set a value within the valid setting
specified range. [Range: xxxx to yyyy]		range.
The CEID on Alarms Set is duplicated.	The value of a CEID when an	Change the values of the CEIDs
	alarm occurs is used by another	when alarms occur.
	collection event.	
The CEID on Alarms Clear is dupli-	The value of a CEID when an	Change the values of the CEIDs
cated.	alarm is cleared is used by	when alarms are cleared.
	another collection event.	

Alarm Definition Tab Page

The Alarm Definition Tab Page is used to edit, add, and delete alarm definitions.



The alarm settings that are displayed on the Alarm Definition Tab Page are described in the following table along with the meanings and value ranges of the settings.

Item		Meaning	Range of values
Alarm definition			
	Enable alarm	Whether to enable the selected alarm.	Enable/disable
	ALID	ALID	Depends on the format that is set for the
			ALID in the item definitions.
			You cannot set the ALID to 0.
	ALCD	ALCD	0-63
	ALTX	ALTX	Alphanumerics
			The maximum data size is the data size
			specified for the ALTX in the item definitions.
	CEID on	The CEID of the collection event that is issued	This value cannot be changed.
	Alarms Set	when the alarm occurs.	
	CEID on	The CEID of the collection event that is issued	This value cannot be changed.
	Alarms Clear	when the alarm is cleared.	

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
An ALID is duplicated.	As given in the error	Change the value of the ALID.
	message.	
The CEID _n on Alarms Set is duplicated.	As given in the error	Change the value of CEID _n when the
"	message.	alarm occurs.
The CEID, on Alarms Clear is duplicated.	As given in the error	Change the value of CEID, when the
n ·	message.	alarm is cleared.
The CEID on Alarms Set is out of range.	As given in the error	Change the value of the CEID when
[Range: xxxx to yyyy]	message.	the alarm occurs. If you change the
		format of CEID on Alarms Set,
		change the item definition.
The CEID on Alarms Clear is out of range.	As given in the error	Change the value of the CEID when
[Range: xxxx to yyyy]	message.	the alarm is cleared. If you change
		the format of CEID on Alarms Clear,
		change the item definition.
The ALTX exceeds the maximum number of	As given in the error	Specify the ALTX with 128 characters
characters that can be entered. [Maximum: 128]	message.	or less.

8-11-3 Host Command

The Host Command command on the Remote Control Menu is used to define host command operation and to define host commands.

Refer to 5-5-12 Host Commands on page 5-56 for details on host commands. The Host Command Dialog Box has an Operation Settings Tab Page to define host command operation and a Host Command Definition Tab Page to define host commands.

Operation Settings Tab Page

The Operation Settings Tab Page is used to set the operation conditions for host commands, such as the attributes and the variables to which to pass item information.



The items that are displayed on the Operation Settings Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Host command definition		
Link variable for S2F41: RCMD	A link variable to store the value of RCMD.*1	
Max number of CPNAMEs	The maximum number of CPNAMEs that can be received. The CPNAME count with the highest number of CPNAMEs of all the host commands.	0-32
Link variable for S2F41: CPNAME list	A variable to store number of received CPNAMEs. There are the following two variables.	
	CPNAME Count*2	
	CPNAME Table*3	
Link variable for S2F42: error CPNAME table	A variable to store the values of CPNAMEs with CPVAL errors.*3	
Link variable for S2F42: CPACK table	A variable to store the values of CPACKs with CPVAL errors*4	

^{*1.} A host command cannot be used if link variables are not specified.

^{*2.} The data type is UINT.

^{*3.} It is an array variable. The array element data type must agree with the format of the CPNAMEs. The number of array elements exceeds the maximum number of CPNAMEs.

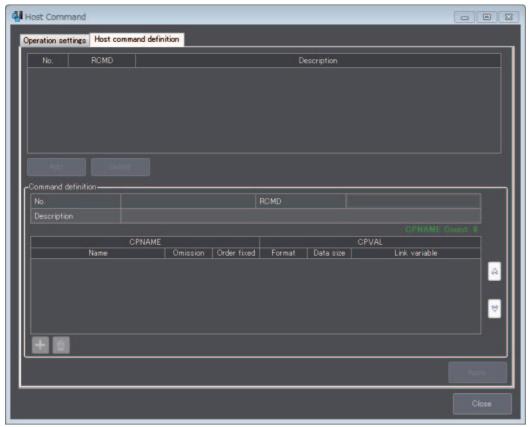
^{*4.} It is an array variable. The array element data type must agree with the format of the CPACKs. The number of array elements exceeds the maximum number of CPNAMEs.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified	As given in the error	Set a value within the valid setting range.
range. [Range: xxxx to yyyy]	message.	
The specified maximum number of CPNAMEs	As given in the error	Change the value of the maximum num-
is smaller than the number of already regis-	message.	ber of CPNAMEs. Or, delete registered
tered CPNAMEs.		CPNAMEs.
A link variable is not specified	As given in the error	Specify a link variable.
	message.	

Host Command Definition Tab Page

The Host Command Definition Tab Page is used to edit, add, and delete host command definitions.



The command definition items that are displayed on the Host Command Definition Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
RCMD	RCMD	Alphanumerics
		The maximum value is the data size set for
		RCMD in the item definitions.
Description	A description of the operation of the host	Single-byte characters: 128 characters max.
	command.	Double-byte characters: 64 characters max.
CPNAME		
Name	CPNAME	Alphanumerics
		The maximum value is the data size set for
		CPNAME in the item definitions.
Omission	Specifies whether Host Command Send	Selected: Accepted.
	(S2,F41) is to be accepted if a CPNAME is	Not selected: Not accepted.
	not specified.	
Order fixed	Specifies whether Host Command Send	Selected: Accepted.
	(S2,F41) is to be accepted if the CPNAMEs	Not selected: Not accepted.
	are not in the registered reception order.	
CPVAL		
Format	The format of CPVAL.	B, BOOLEAN, A, I1, I2, I4, U1, U2, or U4
Data size	The data size of CPVAL.	When format of CPVAL is B or A: 1 to 120
		Other formats: 1
Link variable	A link variable to store the value of CPVAL.	

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range. [Range: xxxx to yyyy]		range.
The reception order cannot be set to fix	As given in the error message.	Set all CPNAMEs after any
for the CPNAME which is set to omit		CPNAME that is set to allow omis-
and for the subsequent CPNAMEs.		sion, so that the CPNAME order is
		not fixed.
An RCMD is duplicated.	As given in the error message.	Change the value of the RCMD.
A CPNAME is duplicated.	The value of the CPNAME is	Change the value of the CPNAME.
	used for another host com-	
	mand.	
A link variable is not specified	As given in the error message.	Specify the variable to link.
An entry may be over the valid input	The number of characters	Change the number of characters in
range. [Valid input range: xx characters	entered for RCMD or CPNAME	the RCMD or CPNAME.
or less]	exceeds the maximum num-	
	ber of characters.	

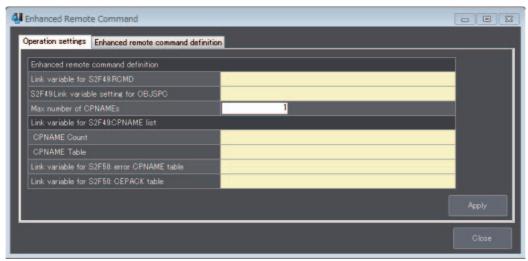
8-11-4 Enhanced Remote Command

The Enhanced Remote Command command on the Remote Control Menu is used to define enhanced remote command operation and to define enhanced remote commands. Refer to 5-5-13 Enhanced Remote Commands on page 5-60 for details on enhanced remote commands.

The Enhanced Remote Command Dialog Box has an Operation Settings Tab Page to define enhanced remote command operation and an Enhanced Remote Command Definition Tab Page to define enhanced remote commands.

Operation Settings Tab Page

The Operation Settings Tab Page is used to set the operation conditions for enhanced remote commands, such as the attributes and the variables to which to pass item information.



The items that are displayed on the Operation Settings Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Enhanced remote command defi-		
nition		
Link variable for S2F49: RCMD	A link variable to store the value of RCMD.*1	
Link variable for S2F49:	A link variable to store the value of OBJSPEC.	
OBJSPEC		
Max number of CPNAMEs	The maximum number of CPNAMEs that can be received.	0-32
	The CPNAME count with the highest number of CPNAMEs of	
	all the enhanced remote commands.	
Link variable for S2F49:	A link variable to store the number of received CPNAMEs.	
CPNAME list	There are the following two variables.	
	CPNAME Count*2	
	• CPNAME Table ^{*3}	
Link variable for S2F50: error	A link variable to store the values of CPNAMEs with CEPVAL	
CPNAME table	errors.*3	
Link variable for S2F50:	A link variable to store the values of CEPACKs with CEPVAL	
CEPACK table	errors.*4	

^{*1.} An enhanced remote command cannot be used if the link variables are not specified.

^{*2.} The data type is UINT.

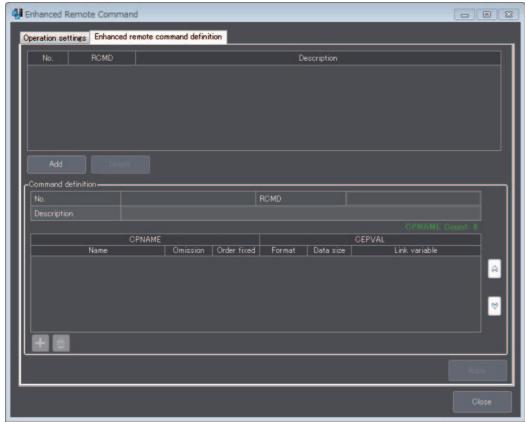
- *3. It is an array variable. The array element data type must agree with the format of the CPNAMEs. The number of array elements exceeds the maximum number of CPNAMEs.
- *4. It is an array variable. The array element data type must agree with the format of the CEPACKs. The number of array elements exceeds the maximum number of CPNAMEs.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
The specified maximum number of CPNAMEs is	As given in the error	Change the value of the maximum
smaller than the number of already registered	message.	number of CPNAMEs. Or, delete reg-
CPNAMEs.		istered CPNAMEs.
A link variable is not specified	As given in the error	Specify the variable to link.
	message.	

Enhanced Remote Command Definition Tab Page

The Enhanced Remote Command Definition Tab Page is used to edit, add, and delete enhanced remote command definitions.



The command definition items that are displayed on the Enhanced Remote Command Definition Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
RCMD	RCMD	Alphanumerics
		The maximum value is the data size set for
		RCMD in the item definitions.
Description	A description of the operation of the	Single-byte characters: 128 characters max.
	enhanced remote command.	Double-byte characters: 64 characters max.
CPNAME		
Name	CPNAME	Alphanumerics
		The maximum value is the data size set for
		CPNAME in the item definitions.
Omission	Specifies whether Enhanced Remote Com-	Selected: Accepted.
	mand (S2,F49) is to be accepted if a	Not selected: Not accepted.
	CPNAME is not specified.	
Order fixed	Specifies whether Enhanced Remote Com-	Selected: Accepted.
	mand (S2,F49) is to be accepted if the	Not selected: Not accepted.
	CPNAMEs are not in the registered reception	
	order.	
CEPVAL		
Format	The format of CEPVAL.	B, BOOLEAN, A, I1, I2, I4, F4, F8, U1, U2, or
		U4
Data size	The data size of CEPVAL.	Depends on the format of CEPVAL.
Link variable	A link variable to store the value of CEPVAL.	

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range. [Range: xxxx to yyyy]		range.
The reception order cannot be set to fix	As given in the error message.	Set all CPNAMEs after any
for the CPNAME which is set to omit		CPNAME that is set to allow omis-
and for the subsequent CPNAMEs.		sion, so that the CPNAME order is
		not fixed.
An RCMD is duplicated.	As given in the error message.	Change the value of the RCMD.
A CPNAME is duplicated.	The value of the CPNAME is	Change the value of the CPNAME.
	used for another enhanced	
	remote command.	
A link variable is not specified	As given in the error message.	Specify the variable to link.
An entry may be over the valid input	The number of characters	Change the number of characters in
range. [Valid input range: xx characters	entered for RCMD or CPNAME	the RCMD or CPNAME.
or less]	exceeds the maximum num-	
	ber of characters.	

8-11-5 Equipment Constants

The **Equipment Constants** command is used to set the variables to which to pass ECID lists when there are change requests for them from the host.

Refer to 5-5-14 Equipment Constants on page 5-62 for details on equipment constants.



The items that are displayed in the Equipment Constants Dialog Box are described in the following table along with the meanings and value ranges of the items.

	Item	Meaning	Range of values
Е	quipment constant settings		
	Max number of change requested ECs	The maximum number of ECIDs that can be specified with New Equipment Constant Send (S2,F15).	0-100*1
	Link variable for change requested ECID list	A link variable to report the ECID list specified with New Equipment Constant Send (S2,F15). There are the following two variables.	
		• ECID Count ^{*2}	
		• ECID Table ^{*3}	

- *1. You cannot use the equipment constant if you specify 0.
- *2. The data type is UINT.
- *3. It is an array variable. The array element data type must agree with the format of the ECIDs. The number of array elements exceeds the maximum number of change requested ECs.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
A link variable is not specified	As given in the error	Specify the variable to link.
	message.	

8-11-6 Process Program Management

The **Process Program Management** command is used to define the operation of unformatted process programs and formatted process programs.

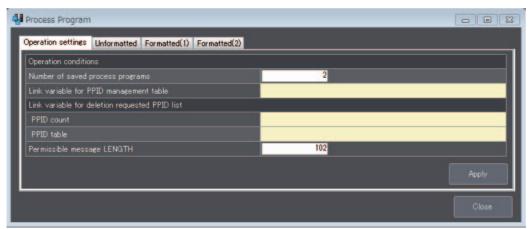
Refer to 5-5-15 Process Program Management on page 5-66 for details on process program management.

The Process Program Management Dialog Box has the following four tab pages.

- Operation Settings Tab Page
 This tab page is used to define the common operation of the unformatted process programs and formatted process programs.
- Unformatted Tab Page Used to define unformatted process programs.
- Formatted (1)
 Used to define the CCODE/PPARM structure for formatted process programs.
- Formatted (2)
 Used to define the link variables for formatted process programs.

Operation Settings Tab Page

The Operation Settings Tab Page is used to set the number of saved process programs and the operation conditions of the process program management table.



The items that are displayed on the Operation Settings Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Operation conditions		
Number of saved process pro-	The maximum number of unformatted process programs and	0-40*1
grams	formatted process programs to save.	
Link variable for PPID	A link variable for the PPID management table.	
management table		
Link variable for deletion	A link variable for the PPID list of deletion requests from the	
requested PPID list	host. There are the following two variables.	
	• PPID Count ^{*2}	
	• PPID Table ^{*3}	
Permissible message LENGTH	The maximum data size in Kbytes without the header for Pro-	1-257
	cess Program Send (S7,F3) and Formatted Process Program	
	Send (S7,F23). *4	

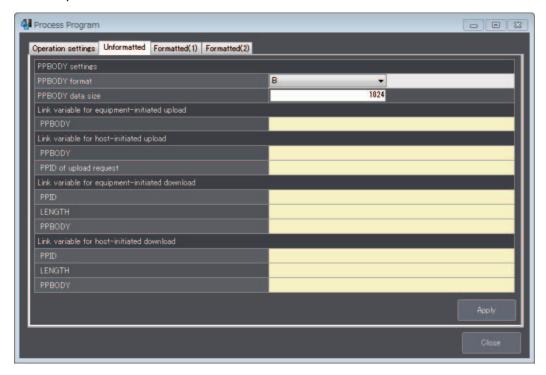
- *1. You cannot use process program management if you specify 0.
- *2. The data type is UINT.
- *3. It is an array variable. The array element data type must agree with the format of the PPIDs. The number of array elements must be equal to or greater than the number of unformatted process programs and formatted process programs to save.
- *4. If both Process Program Send (S7,F3) and Formatted Process Program Send (S7,F23) are used, set the larger maximum data size.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
A link variable is not specified	As given in the error	Specify the variable to link.
	message.	

Unformatted Tab Page

The Unformatted Tab Page is used to define unformatted process programs and to set the variables to which to pass the data.



The items that are displayed on the Unformatted Tab Page are described in the following table along with the meanings and value ranges of the items. You cannot use unformatted process programs if you do not set all of the link variables on the Unformatted Tab Page.

Item	Meaning	Range of values
PPBODY settings		
PPBODY format	The format of PPBODY.	B, A, I1, I2, I4, U1, U2, or U4
PPBODY data size	The data size in bytes of PPBODY. For format A or B, specify the data length. For formats other than A and B, specify the number of elements.	Depends on the format.
Link variable for equipment-initiated upload	A link variable for an unformatted process program from an equipment-initiated upload. There is the following one variable. • PPBODY	
Link variable for host-initiated upload	A link variable for an unformatted process program from a host-initiated upload. There are the following two variables. • PPBODY • PPID of upload request	
Link variable for equipment-initiated download	A link variable for an unformatted process program from an equipment-initiated download. There are the following three variables. • PPID*1 • LENGTH*2 • PPBODY*3	
Link variable for host-initiated down load	A link variable for an unformatted process program from a host-initiated download. There are the following three variables. • PPID*1 • LENGTH*2 • PPBODY*3	

^{*1.} The data type must agree with the format of the PPIDs.

The error messages that may be displayed on this tab page are described in the following table.

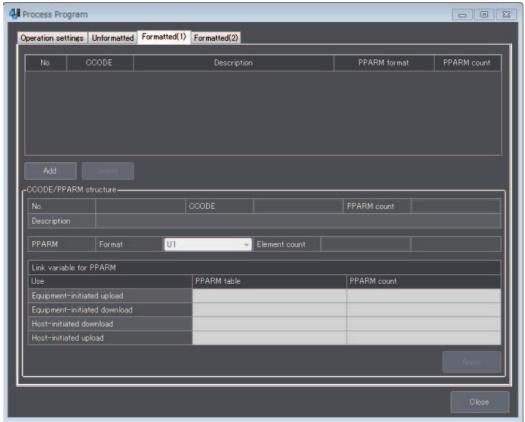
Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
A link variable is not specified	As given in the error	Specify the variable to link.
	message.	

^{*2.} The data type must agree with the format of the LENGTH.

^{*3.} The data type must agree with the format of the PPBODY.

Formatted (1) Tab Page

The Formatted (1) Tab Page is used to edit, add, and delete CCODE/PPARM definitions for formatted process programs.



The CCODE/PPARM definition items that are displayed on the Formatted (1) Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
CCODE	CCODE*1	A, I2, I4, U2, or U4
		50 max.
PPARM count	The maximum number of linked PPARMs for each	1-20
	CCODE.	
Description	A description of the command code.	Single-byte characters: 128
		characters max.
		Double-byte characters: 64
		characters max.
PPARM		
Format	The PPARM format for each CCODE.	BOOLEAN, A, I1, I2, I4, F4, F8, U1,
		U2, or U4
Data size	The data size in bytes of PPARM.	Format A: 1 to 120 bytes
	For format A or B, specify the data length. For for-	Formats other than A: 1 to 32 items
	mats other than A and B, specify the number of ele-	
	ments.	

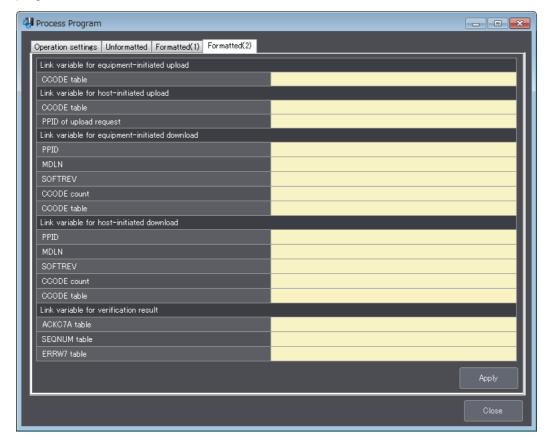
^{*1.} You cannot use formatted process programs if the CCODEs are not registered.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range.		range.
[Range: xxxx to yyyy]		
A CCODE is duplicated.	The value of CCODE is used in	Change the value of the CCODE.
	another unformatted process	
	program or formatted process	
	program.	
A link variable is not specified	As given in the error message.	Specify the variable to link.
An entry may be over the valid input	As given in the error message.	Change the number of entered
range.		characters.
[Valid input range: xx characters or less]		
A message in the process program	As given in the error message.	Change the format definition or per-
exceeds the permissible message		missible message length.
LENGTH.		

Formatted (2) Tab Page

The Formatted (2) Tab Page is used to set the variables to which to pass the data for formatted process programs.



The items that are displayed on the Formatted (2) Settings Tab Page are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Link variable for	A link variable for a formatted process program from an equipment-initiated	
equipment-initi-	upload.	
ated upload	There is the following one variable.	
	CCODE table*1	
Link variable for	A link variable for a formatted process program from a host-initiated upload.	
host-initiated upload	There are the following two variables.	
ирюач	• CCODE table ^{*1}	
	PPID of upload request	
Link variable for	A link variable for a formatted process program from an equipment-initiated	
equipment-initiate d download	download. There is the following one variable.	
a download	• PPID*2	
	• MDLN*3	
	• SOFTREV ^{*4}	
	CCODE count	
	CCODE table ^{*1}	
Link variable for	A link variable for an formatted process program from a host-initiated download.	
host-initiated	There are the following five variables.	
download	• PPID ^{*2}	
	• MDLN*3	
	• SOFTREV*4	
	CCODE count	
	CCODE table*1	
Link variable for	A link variable for the detected error information for a downloaded formatted	
verification check	process program. *5	
result	There are the following three variables.	
	ACKC7A table*6	
	SEQNUM table*7	
	• ERRW7 table ^{*8}	

^{*1.} It is an array variable. The array element data type must agree with the format of the CCODE. The number of array elements exceeds the registered CCODE count.

^{*2.} The data type must agree with the format of the PPID.

^{*3.} The data type must agree with the format of the MDLN.

^{*4.} The data type must agree with the format of the SOFTREV.

^{*5.} This setting is made for verification.

^{*6.} It is an array variable. The array element data type must agree with the format of the ACKC7A. The number of array elements exceeds the registered CCODE count.

^{*7.} It is an array variable. The array element data type must agree with the format of the SEQNUM. The number of array elements exceeds the registered CCODE count.

^{*8.} It is an array variable. The array element data type must agree with the format of the ERRW7. The number of array elements exceeds the registered CCODE count.

The error messages that may be displayed on this tab page are described in the following table.

Error message	Cause	Correction
There is a link variable that is not	As given in the error mes-	Set variable names for all of the link vari-
set.	sage.	ables.
A link variable is not specified	As given in the error mes-	Specify a link variable.
	sage.	

8-11-7 **Equipment Terminal Service**

The **Equipment Terminal Service** command is used to set the maximum number of TEXTs and the additional terminal TIDs for the terminal service.

Refer to 5-5-17 Equipment Terminal Service on page 5-88 for details on the equipment terminal service.



The items that are displayed in the Equipment Terminal Service Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Equipment terminal specifi-		
cation		
Number of terminals	The number of terminals in the equipment.	0-2*1
	1: Main terminal (TID = 0)	
	2: Main terminal (TID = 0) and additional terminal (TID = 1)	
Number of terminal mes-	The number of message lines displayed on the terminal.	0-20*2
sages displayed on a ter-	The maximum number of TEXTs that can be received for Terminal	
minal	Display, Multi-block (S10,F5).	
Link variable for displayed	A link variable for the value of TEXT for which display was requested	
TEXT of single-block ter-	with Terminal Display, Single (S10,F3).*3	
minal messages	There is the following one variable.	
	Displayed TEXT	
Link variable for displayed	A link variable for the value of TEXT for which display was requested	
TEXT of multi-block termi-	with Terminal Display, Multi-block (S10,F5).	
nal messages	There are the following two variables.	
	Displayed TEXT Count*4	
	Displayed TEXT Table ^{*5}	

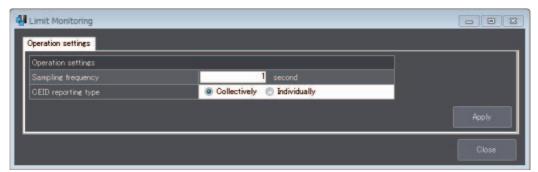
- *1. You cannot use the equipment terminal display if you specify 0.
- *2. You cannot use multi-block equipment terminal messages if you specify 0.
- *3. The data type is STRING with the number of characters set in the TEXT item.
- *4. The data type is UINT.
- *5. It is an array variable. The array element data type is STRING with the number of characters set in the TEXT item. The number of array elements must be equal to or greater than the number of displayed terminal messages.

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.
A link variable is not specified	As given in the error	Specify a link variable.
	message.	

8-11-8 Limit Monitoring

The *Limit Monitoring* command is used to set the operation conditions for limit monitoring. Refer to 5-5-19 Limit Monitoring on page 5-93 for details on limit monitoring.



The items that are displayed in the Limit Monitoring Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Operation settings		
Sampling fre- quency	The sampling period in seconds for limit monitoring.	1-360
CEID reporting type	The collection event reporting method when more than one zone transition occurs in the same sampling period.	Collectively or Individually

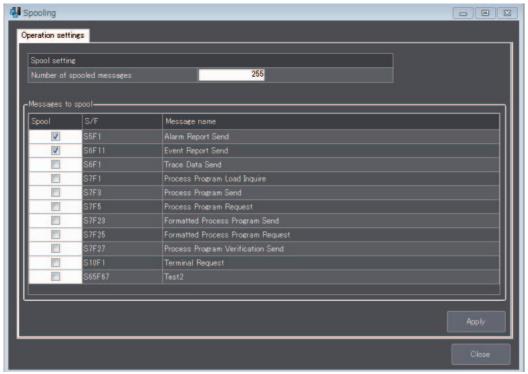
The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error mes-	Set all of the items.
	sage.	
The entered value is out of the specified range.	As given in the error mes-	Set a value within the valid setting
[Range: xxxx to yyyy]	sage.	range.

8-11-9 Spooling

The **Spooling** command is used to set operation conditions for spooling, such as the number of spooled messages.

Refer to 5-5-20 Spooling on page 5-96 for details on spooling.



The items that are displayed in the Spooling Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning	Range of values
Spool setting		
Number of	The maximum	255-1000 ^{*1}
spooled mes-	number of	
sages	messages to	
	spool.	
Messages to	The primary	You can enable or disable spooling individually for the following SECS mes-
spool	messages to	sages.
	spool.	Alarm Report Send (S5,F1)
		Event Report Send (S6,F11)
		Trace Data Send (S6,F1)
		Process Program Load Inquire (S7,F1)
		Process Program Send (S7,F3)
		Process Program Request (S7,F5)
		Formatted Process Program Send (S7,F23)
		Formatted Process Program Request (S7,F25)
		Process Program Verification Send (S7,F27)
		Terminal Request (S10,F1)
		User-defined Messages

^{*1.} If the format of *SpoolCountActual* (actual number of spooled messages) is U1, the maximum number of spooled messages is 255 regardless of the setting.

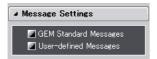
The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error	Set all of the items.
	message.	
The entered value is out of the specified range.	As given in the error	Set a value within the valid setting
[Range: xxxx to yyyy]	message.	range.

8-12 Message Settings

The Message Settings Menu is used to define GEM standard messages and user-defined messages. This menu provides the following two commands.

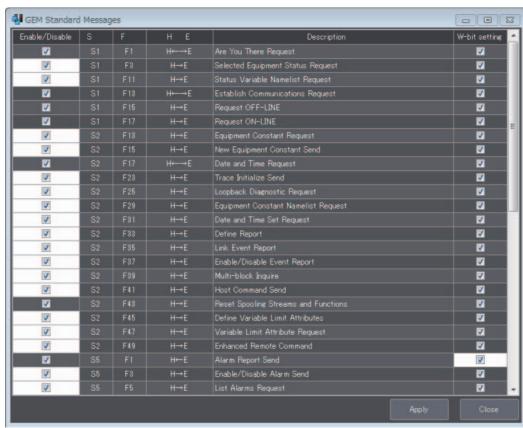
- · GEM Standard Messages
- · User-defined Messages



8-12-1 GEM Standard Messages

The **GEM Standard Messages** command is used to enable and disable SECS/GEM standard primary messages from the host and to set the W bits to ON or OFF in primary messages from the equipment.

Refer to 5-6-1 GEM Standard Messages on page 5-102 for details on GEM standard messages.

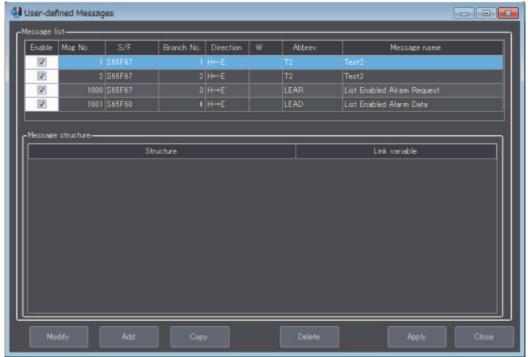


The items that are displayed in the GEM Standard Messages Dialog Box are described in the following table along with the meanings and value ranges of the items.

Item	Meaning
Enable/Disable	A setting to enable/disable the primary message from the host.
	Enable: Select the check box.
	Disable: Clear the check box.
W-bit setting	The W-bit setting for the primary message from the equipment.
	ON: Select the check box.
	OFF: Clear the check box.

8-12-2 User-defined Messages

The User-defined Messages command is used to define SECS messages prepared by the user. Refer to 5-6-2 User-defined Messages on page 5-104 for details on user-defined messages.



This dialog box is used to check the settings of user-defined messages in a table. The meaning of each item is given below.

The functions of the buttons in the User-defined Messages Dialog Box are given in the following table.

Button	Function
Modify	Changes the definition of a previously set user-defined message. *1
Add	Adds a new user-defined message. *1
Сору	Copies a previously set user-defined message and uses it to add a new user-defined message.
Delete	Deletes a previously set user-defined message.
Apply	Applies the settings in the currently displayed dialog box.
	If you close the dialog box without clicking the Apply Button, the settings that were made are discarded.
Close	Closes the User-defined Messages Dialog Box.

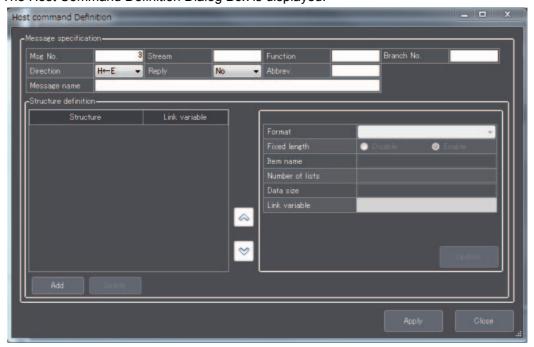
^{*1.} The Host Command Definition Dialog Box is displayed when you click this button.

You can click an item name to sort the list by that item.

Setting Procedure for User-defined Messages

Use the following procedure to set a user-defined message.

1 Click the Add Button in the User-defined Messages Dialog Box.
The Host Command Definition Dialog Box is displayed.



2 Set the message attributes on the Host Command Definition Dialog Box.

The message attributes, meanings, and value ranges are given in the following table.

Item	Meaning	Range of values
MsgNo.	The SECS message number.	1-65535
Stream	The stream number of the SECS message.	1-127
Function	The function number of the SECS message.	1-255
Branch No.	An identifier for different messages that have the same stream and function numbers but different communications directions or data structures.	1-20
Direction	The communications direction of the SECS message. H→E: Host to equipment H←E: Equipment to host	H→E or H←E
Reply	Whether a secondary message is returned.*1	Yes or No
Abbrev.	An abbreviation for the SECS message.	A to Z and 0 to 9 20 characters max.
Message name	The name of the SECS message.	A to Z, a to z, 0 to 9, spaces, underscores, and hyphens 64 characters max.

^{*1.} Setting *Reply* to *Yes* achieves the same thing as turning ON the W bit. Setting *Reply* to *No* achieves the same thing as turning OFF the W bit.

3 Click the **Apply** Button.

The user-defined message with the attributes set is added to the message list in the User-defined Messages Dialog Box.

Set the message structure settings at the bottom of the Host Command Definition Dialog Box. The message structure settings, meanings, and value ranges are given in the following table.

Item	Meaning	Range of values
Format	The format of the data item.	List of fixed length data, List of length-variable data, B, BOOL-EAN, A, I1, I2, I4, F4, F8, U1, U2, or U4
Fixed length	Specifies whether to use a fixed data size or a variable data size for format A.	Fixed length or variable length
Item name	The name of the data item except for the following formats: List of fixed length data or list of length-variable data.	A to Z, a to z, and 0 to 9 20 characters max.
Number of lists	The number of lists in a list of fixed length data. The maximum number of lists in a list of length-variable data.	List of fixed length data: 0 to 128 List of length-variable data: 1 to 128
Data size	For format B or A, the data size in bytes. For formats other than B and A, the number of array elements for a numeric array.	1-120
Link variable	The link variable for the data item. There are the following two link variables for a list of length-variable data. • List element count*1	
	List element table *2	

^{*1.} The data type is UINT.

Click the **Update** Button.

The set message structure is added to the left side of the lower part of the Host Command Definition Dialog Box.

- Click the **Add** Button to set the new message structure. Repeat steps 4 to 6 to complete all of the message structure.
- After all of the message structure is complete, click the **Apply** Button.

^{*2.} It is an array variable. The array element data type must agree with the format of the data items. The number of array elements must be equal to or greater than the maximum number of lists for the data items.

Error Messages for User-defined Messages

The error messages that may be displayed for this menu command are described in the following table.

Error message	Cause	Correction
An entry is empty.	As given in the error message.	Set all of the items.
The entered value is out of the specified	As given in the error message.	Set a value within the valid setting
range.		range.
[Range: xxxx to yyyy]		
An abbreviation includes a character	As given in the error message.	Set an abbreviation that does not
that cannot be used.		contain invalid characters.
<usable characters=""></usable>		
A to Z, 0 to 9		
A message name includes a character	As given in the error message.	Set a message name that does not
that cannot be used.		contain invalid characters.
<usable characters=""></usable>		
0 to 9, A to Z, a to z, _ (underscore), -		
(hyphen), (space)		
A link variable is not specified	As given in the error message.	Specify a link variable.
The message number is duplicated.	As given in the error message.	Change the value of the message number.
The S/F branch number is duplicated.	As given in the error message.	Change the value of the
The on branch humber is duplicated.	7.6 given in the error message.	stream/function branch number.
The message structure is invalid.	As given in the error message.	Change the message structure.
The data type of the link variable is	As given in the error message.	Change the link variable or the item
invalid.	, to given in the error message.	structure.
Plural items are specified without list	As given in the error message.	Define the list structure.
structure definition.		
Message levels exceed the specified	More than three nesting levels	Do not use more than three nesting
nest levels.	are used in the list in the mes-	levels for a message list.
	sage.	
The length-variable list is nested.	A list of length-variable data is	Do not nest lists of length-variable
	set inside a list of length-vari-	data.
	able data.	
The message size exceeds the maxi-	The size of the defined mes-	Change the structure of the
mum.	sage exceeds 257 Kbytes.	user-defined message.
An item name includes a character that	As given in the error message.	Set an item name that does not con-
cannot be used.		tain invalid characters.
<usable characters=""></usable>		
A to Z, a to z, 0 to 9		
The specified code is used for a stan-	The stream and function num-	Change the stream or function num-
dard Stream/Function message.	bers for a standard SECS mes-	ber.
	sage were used for a	
An item name is dualizated	user-defined message.	Change the item re-
An item name is duplicated.	As given in the error message.	Change the item name.

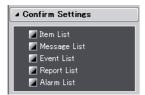
If there are problems in the definitions of user-defined messages, error messages will be displayed when you build the project. The error messages that may be displayed when you build the project are described in the following table.

Error message	Cause	Correction
The primary message (SxxFyy) that cor-	The primary message is not	Define the primary message for the
responds to the secondary message is	defined for a secondary mes-	secondary message.
not defined.	sage.	
The secondary message (SxxFyy) that corresponds to the primary message is not defined.	The secondary message is not defined for a primary message that has an ON W-bit setting.	Define the secondary message. Or, change the W-bit setting of the primary message to OFF.
Different W-bit settings exist for an identical primary message (SxxFyy).	SECS messages with the same stream and function do not have the same W-bit setting.	Use the same W-bit setting for all SECS messages with the same stream and function.

8-13 Confirm Settings

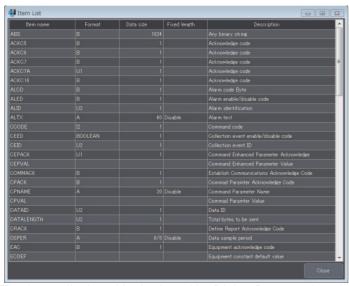
The Confirm Settings Menu is used to display tables of the definitions of items, messages, events, reports, and alarms. This menu provides the following five commands.

- · Item List
- · Message List
- · Event List
- · Report List
- · Alarm List



8-13-1 Item List

The Item List command displays a list of items defined in the SECS/GEM standards.



The items displayed in the Item List Dialog Box are given in the following table.

Item	Meaning
Item name	The name of the item.
Format	The format of the item.
Data size	The byte length of the item.
Fixed length	Specifies whether to use a fixed length or a variable length for format A.
	Enable: Fixed length
	Disable: Variable length
Description	A description of the item.

8-13-2 Message List





The items displayed in the Message List Dialog Box are given in the following table.

Item	Meaning
SF	The stream number and function number of the SECS message.
Description	The name of the SECS message.
Direction	The communications direction of the SECS message.
	H→E: Host to equipment
	H←E: Equipment to host
W-bit setting	The W-bit setting.
	W: ON
	Blank: OFF

8-13-3 Event List

The *Event List* command displays a list of events defined in the SECS/GEM standards and events defined by the user.

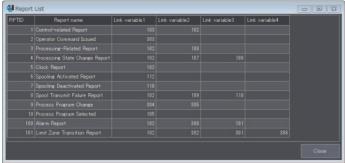


The items displayed in the Event List Dialog Box are given in the following table.

Item	Meaning
Enable	Whether the event is enabled.
CEID	CEID
Event name	The name of the event.
RPTID	The RPTID of the report to link to the event.

8-13-4 Report List

The **Report List** command displays a list of reports defined in the SECS/GEM standards and reports defined by the user.

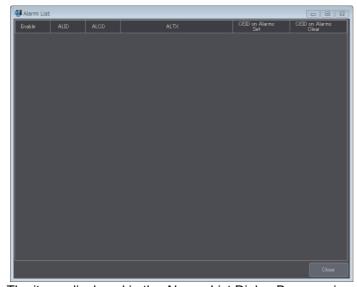


The items displayed in the Report List Dialog Box are given in the following table.

Item	Meaning
RPTID	RPTID
Report name	The name of the report.
Link variable 1 to Link variable 4	The link variables that are linked to the report.

8-13-5 Alarm List

The *Alarm List* command displays a list of alarms defined in the SECS/GEM standards and alarms defined by the user.



The items displayed in the Alarms List Dialog Box are given in the following table.

Item	Meaning
Enable	Whether the alarm is enabled.
ALID	ALID
ALCD	ALCD
ALTX	ALTX
CEID on Alarms Set	The CEID of the collection event that is issued when the alarm occurs.
CEID on Alarms Clear	The CEID of the collection event that is issued when the alarm is cleared.



Troubleshooting

This section describes the following items for errors that can occur on a SECS/GEM CPU Unit: Error confirmation methods, error meanings, and error correction methods.

9-1	Operation for Errors and Error Confirmation Methods						
9-2	Errors	Related to SECS/GEM	9-3				
	9-2-1	Error Table	. 9-3				
	9-2-2	Error Descriptions	9-5				

Operation for Errors and Error Con-9-1 firmation Methods

The operation for errors and the error confirmation methods for the SECS/GEM CPU Units are the same as those for the NJ-series CPU Units.

Refer to the following manuals for detailed information on error operation and error confirmation methods for the NJ-series Standard CPU Units: NJ/NX-series Troubleshooting Manual (Cat. No. W503), NJ-series CPU Unit Hardware User's Manual (Cat. No. W500), and NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501).

9-2 Errors Related to SECS/GEM

There are errors that are specific to the SECS/GEM CPU Units in addition to the errors (events) that can occur for NJ-series Standard CPU Units. This section describes the errors that are specific to SECS/GEM CPU Units. Refer to the following manuals for detailed information on errors that can occur for the NJ-series Standard CPU Units: NJ/NX-series Troubleshooting Manual (Cat. No. W503), NJ-series CPU Unit Hardware User's Manual (Cat. No. W500), and NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501).

For detailed information on errors that can occur for GEM instructions, refer to *A-1-7 Events That Occur for GEM Instruction Execution* on page A-187.

9-2-1 Error Table

This section provides a table of the events that can occur in a SECS/GEM CPU Unit. Event levels are given as following in the tables:

Maj: Major fault level Prt: Partial fault level Min: Minor fault level Obs: Observation Info: Information

Event code Event name Meaning		Assumed cause		Level				Reference	
Event code	Event name	Wearing	Assumed Cause	Maj	Prt	Min	Obs	Info	Reference
14E00000 hex	Invalid GEM Setting Data	The GEM setting data is invalid.	The power supply to the CPU Unit was interrupted during a transfer of the setting data of the GEM Service. The setting data of the GEM						P. 9-6
			Service is not correct because the power supply to the Controller was inter- rupted during a Clear All Memory operation. Non-volatile memory failed.			√			
14E20000 hex	Spool Data Discarded	The spool data is discarded.	The spool data was discarded because the power supply to the CPU Unit was interrupted with no shutdown.			√			P. 9-6
14E30000 hex	Spool Save Failed	Failed to save the spooled data to the SD Memory Card.	The capacity of the SD Memory Card is insufficient. The SD Memory Card is damaged.			√			P. 9-7
3540 0000 hex	Illegal Variable Allocation	Resolution of the variable allocation failed.	The variable that is specified in the SECS/GEM Configurator does not exist in the global variables. The data type, constant attribute, number of array dimensions or number of array elements of the variable that is set in the SECS/GEM Configurator is different from the variable defined in the global variables.			*			P. 9-7

Event code	Event name	Magning	Assumed cause	Level				Reference	
Event code	Event name	Meaning	Assumed cause	Maj Prt Min Obs Info				Reference	
35410000 hex	Illegal TCP Port Number	The TCP port number for the host communications is illegal.	The TCP port number for the host communications is also used as the TCP port num- ber of another function.			√			P. 9-8
44100000 hex	System Error in GEM Service	A system error occurred in the GEM Service.	A system error occurred in the GEM Service.			√			P. 9-8
14E10000 hex	GEM Service Log Save Failed	An error occurred when the GEM Service log is written to the SD Memory Card.	The capacity of the SD Memory Card is insufficient. The SD Memory Card is damaged.				~		P. 9-9
14E40000 hex	Invalid SD Memory Card	An SD Memory Card is not inserted or an SD Memory Card that cannot be written is inserted.	 An SD Memory Card is not inserted. The SD Memory Card type is not correct. The format of the SD Memory Card is not correct. The SD Memory Card is write protected. 				✓		P. 9-9
66000000 hex	Send Trans- action Queue Overrun	The send transaction exceeded the capacity for temporary storage.	The capacity to process the send transaction is insuffi- cient.				~		P. 9-10
66010000 hex	Reception Transaction Queue Over- run	The reception transaction exceeded the capacity for temporary storage.	The capacity to process the reception transaction is insufficient.				~		P. 9-10
66020000 hex	Too Long SECS Mes- sage	The SECS message to be sent to the host exceeds the maximum length.	The SECS message to be sent to the host exceeds the maximum length.				✓		P. 9-10
95420000 hex	GEM Service Started	The GEM Service started normally.	The GEM Service started normally.					✓	P. 9-11
95430000 hex	Shutdown Completed	The shutdown processing was completed normally.	The shutdown processing was completed normally.					✓	P. 9-11
95440000 hex	GEM Setting Data Changed	The setting data of the GEM Service was changed.	The setting data of the GEM Service from the SECS/GEM Configurator was changed.					~	P. 9-11
95450000 hex	Valid SD Memory Card	An SD Memory Card that can be written is inserted.	An SD Memory Card that can be written is inserted.					✓	P. 9-12

9-2-2 Error Descriptions

This section describes the information that is given for individual errors.

Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

Event name	Gives the name of the error.			Event code	Gives the code o	f the error.		
Meaning	Gives a short des	Gives a short description of the error.						
Source	Gives the source of the error.		Source details	Gives details on the source of the error.	Detection timing	Tells when the error is detected.		
Error attri- butes	Level	Tells the level of influence on control.*1	Recovery	Gives the recovery method.*2	Log category	Tells which log the error is saved in.*3		
Effects	User program	Tells what will happen to execution of the user program.*4	Operation	Provides special results from the e	information on the	operation that		
System-	Variable		Data type	type Name				
defined	Lists the variable	names, data type:	s, and meanings fo	or system-defined	variables that prov	ide direct error		
variables	notification, that a	are directly affecte	d by the error, or th	nat contain settings	s that cause the er	ror.		
Cause and	Assumed cause		Correction		Prevention			
correction	Lists the possible	causes, correctio	ns, and preventive	measures for the	error.			
Attached information	This is the attached information that is displayed by the Sysmac Studio or an HMI.*5							
Precautions/ Remarks					user can set the evon, and other infor			

^{*1.} One of the following:

Major fault: Major fault level Partial fault: Partial fault level Minor fault: Minor fault level

Observation Information

*2. One of the following:

Automatic recovery: Normal status is restored automatically when the cause of the error is removed.

Error reset: Normal status is restored when the error is reset after the cause of the error is removed.

Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.

Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.

Depends on cause: The recovery method depends on the cause of the error.

*3. One of the following:

System: System event log Access: Access event log

*4. One of the following:

Continues: Execution of the user program will continue.

Stops: Execution of the user program stops. Starts: Execution of the user program starts.

*5. Refer to the appendices of the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503) for the applicable range of the HMI Troubleshooter.

Errors Related to SECS/GEM

Event name	Invalid GEM Sett	ing Data		Event code	14E00000 hex		
Meaning	The GEM setting data is invalid.						
Source	PLC Function Module		PLC Function Module Source details SECS/GEM		Detection timing	At download, power ON, or Controller reset	
Error attri- butes	Level	Minor fault	Recovery	Automatic recovery	Log category System		
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type		Name		
defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and correction	was interrupted during a transfer		Transfer the setti GEM Service from SECS/GEM Conf	m the	None		
Attached information	The setting data of the GEM Service is not correct because the power supply to the Controller was interrupted during a Clear All Memory operation.						
Precautions/ Remarks	Non-volatile mem	nory failed.	Replace the CPU	J Unit.			
Event name	None						
Meaning	None						

Event name	Spool Data Discarded			Event code	14E20000 hex			
Meaning	The spool data is	The spool data is discarded.						
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing	While spool is active		
Error attri- butes	Level	Minor fault	Recovery	Reset error	Log category System			
Effects	User program	Continues.	Operation	Not affected.				
System-	Variable		Data type		Name			
defined variables	None	None						
	Assumed cause)	Correction		Prevention			
Cause and correction	The spool data was discarded because the power supply to the CPU Unit was interrupted with no shutdown.		Interrupt the power supply to the CPU Unit after a shutdown.		None			
Event name	None		•		•			
Meaning	None							

Event name	Spool Save Failed			Event code	14E30000 hex			
Meaning	Failed to save the spooled data to the SD Memory Card.							
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	When commu- nications are interrupted		
Error attri- butes	Level	Minor fault	Recovery	Automatic recovery	Log category	System		
Effects	User program	Continues.	Operation	Not affected.				
System-	Variable	Variable		Data type		Name		
defined	None	None						
variables								
	Assumed cause		Correction		Prevention			
	The capacity of the SD Memory		Replace the SD Memory Card for		Replace the SD Memory Card for			
	Card is insufficient.		one with sufficient available		one with sufficient available			
		capacity.			capacity.			
Cause and	The SD Memory Card is damaged.		Replace the SD Memory Card.		Do not remove the SD Memory			
correction					Card or turn OFF the power sup- ply while the SD BUSY indicator is lit. Replace the SD Memory Card periodically according to the write			
					life of the SD Me	•		
	Attached information 1: Cause of errors							
Event name	0005 hex: The capacity of the SD Memory Card is insufficient.							
	0302 hex: Saving the file to the SD Memory Card failed or the SD Memory Card is faulty.							
Meaning	None							

Event name	Illegal Variable Allocation			Event code	3540 0000 hex		
Meaning	Resolution of the variable allocation failed.						
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	When the operating mode is changed	
Error attri- butes	Level	Minor fault	Recovery	Automatic recovery	Log category	System	
Effects	User program	Continues.	Operation	Not affected.	·		
System-	Variable		Data type		Name		
defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and correction	The variable that is specified in the SECS/GEM Configurator does not exist in the global variables. The data type, constant attribute, number of array dimensions or number of array elements of the variable that is set in the SECS/GEM Configurator is different from the variable defined in the global variables.		Check the data type and attribute of the variable that is allocated in the SECS/GEM Configurator with the variable in the global variables and set again.		None		
Event name	Attached information 1: Variable name						
Meaning	None						

Event name	Illegal TCP Port Number			Event code	35410000 hex		
Meaning	The TCP port number for the host communications is illegal.						
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	At the start of host communications	
Error attri- butes	Level	Minor fault	Recovery	Automatic recovery	Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type		Name		
defined	_GEM_HSMSPa	_GEM_HSMSParam		_sGEM_HSMS_PARAM		HSMS Communication Parame-	
variables					ters		
	Assumed cause		Correction		Prevention		
	The TCP port number for the host		Change the TCP port number of		None		
Cause and	communications is also used as		another function or one for the				
correction	the TCP port number of another host communic		host communicat	ions so that the			
	function.		same TCP port n	umber is not			
			used.				
Event name	Attached information 1: TCP port number						
Meaning	None						

Event name	System Error in GEM Service			Event code	44100000 hex			
Meaning	A system error occurred in the GEM Service.							
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	Continuously		
Error attri- butes	Level	Minor fault	Recovery	Automatic recovery	Log category	System		
Effects	User program	Continues.	Operation	Not affected.				
System-	Variable		Data type		Name			
defined variables	None							
Cause and correction	Assumed cause		Correction		Prevention			
	A system error occurred in the		Contact your OMRON representa-		None			
	GEM Service.		tive.					
Event name	Attached information 1: System information							
	Attached information 2: System information							
Meaning	None							

Event name	GEM Service Log	g Save Failed		Event code	14E10000 hex		
Meaning	An error occurred	when the GEM S	Service log is writte	n to the SD Memo	ry Card.	_	
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	During commu- nications	
Error attri- butes	Level	Observation	Recovery	Automatic recovery	Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type		Name		
defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and	The capacity of the SD Memory		Replace the SD Memory Card for		Replace the SD Memory Card for		
correction	Card is insufficier	nt.	one with sufficier	nt available	one with sufficient available		
			capacity.		capacity.		
Attached information	The SD Memory aged.	Card is dam-	Replace the SD I	Memory Card.	Do not remove the SD Memory Card or turn OFF the power sup- ply while the SD BUSY indicator is lit. Replace the SD Memory Card periodically according to the write life of the SD Memory Card.		
Precautions/		tion 1: Cause of e					
Remarks			Memory Card is ins		0 1: 6 1:		
		the file to the SD	Memory Card faile	ed or the SD Mem	ory Card is faulty.		
Event name	None					_	

Event name	Invalid SD Memo	ory Card		Event code	14E40000 hex	
Meaning	An SD Memory C	Card is not inserted	d or an SD Memor	y Card that cannot	be written is inser	rted.
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing At power ON Controller re or when SD Memory Car inserted	
Error attri- butes	Level	Observation	Recovery	Automatic recovery	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-	Variable		Data type		Name	
defined variables	None					
	Assumed cause		Correction		Prevention	
	An SD Memory Card is not inserted.		Insert an SD Memory Card.		Insert an SD Memory Card.	
Cause and correction	The SD Memory Card type is not correct.		Replace the SD Memory Card with an SD or SDHC card.		Replace the SD Memory Card with an SD or SDHC card.	
correction	The format of the SD Memory Card is not correct.		Format the SD Memory Card with the Sysmac Studio.		Use a formatted SD Memory Card.	
	The SD Memory Card is write protected.		Remove write protection from the SD Memory Card.		Make sure that the SD Memory Card is not write protected.	
		tion 1: Cause of e				
Event name	0002 hex: The S	D Memory Card is	faulty, the format	of the SD Memory	Card is not correct	t, or the SD Mem-
		e correct type of on the correct type of one of the correct type o				
Moaning	None	D Memory Card is	write protected.			
Meaning	None					

Event name	Send Transaction	n Queue Overrun		Event code	66000000 hex	
Meaning	The send transac	The send transaction exceeded the capacity for temporary storage.				
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing	During commu- nications
Error attri- butes	Level	Observation	Recovery	Automatic recovery	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-	Variable		Data type		Name	
defined variables	None					
Cause and	Assumed cause	•	Correction		Prevention	
correction	The capacity to process the send transaction is insufficient.		Increase the syst	em service time.	Increase the syst	tem service time.
Event name	None					
Meaning	None					

Event name	Reception Transa	action Queue Over	run	Event code	66010000 hex	
Meaning	The reception transaction exceeded the capacity for temporary storage.					
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing	During commu- nications
Error attri- butes	Level	Observation	Recovery	Automatic recovery	Log category	System
Effects	User program	Continues.	Operation	Not affected.		
System-	Variable		Data type		Name	
defined variables	None					
Cause and	Assumed cause		Correction		Prevention	
correction	The capacity to process the reception transaction is insufficient.		Increase the syst	em service time.	Increase the syst	tem service time.
Event name	None					
Meaning	None					

Event name	Too Long SECS	Message	Event code	66020000 hex			
Meaning	The SECS mess	The SECS message to be sent to the host exceeds the maximum length.					
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	During host communications	
Error attri- butes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type		Name		
defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and correction	The SECS message to be sent to the host exceeds the maximum length.		Set the SECS message length to be less than the maximum on the SECS/GEM Configurator, and transfer the setting again.		None		
	Attached informa	tion 1: Stream and	function numbers				
Event name		Upper byte	: Stream number				
		Lower byte	: Function number				
Meaning	None	_			_		

Event name	GEM Service Sta	ırted		Event code	95420000 hex		
Meaning	The GEM Service	The GEM Service started normally.					
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing	At power ON or Controller reset	
Error attri- butes	Level	Information	Recovery		Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type	Data type		Name	
defined variables	None						
Cause and	Assumed cause	•	Correction	Correction		Prevention	
correction	The GEM Service started normally.						
Event name	None						
Meaning	None						

Event name	Shutdown Completed			Event code	9543 0000 hex		
Meaning	The shutdown pr	The shutdown processing was completed normally.					
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	At shutdown	
Error attri- butes	Level	Information	Recovery		Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type Name				
defined	_GEM_ServiceS	tatus	_sGEM_SERVIC	E_STATUS	GEM Service St	atus	
variables							
Cause and	Assumed cause	•	Correction	Correction		Prevention	
correction	The shutdown processing was completed normally.						
Event name	None						
Meaning	None						

Event name	GEM Setting Dat	a Changed		Event code	9544 0000 hex		
Meaning	The setting data	he setting data of the GEM Service was changed.					
Source	PLC Function Mo	odule	Source details	SECS/GEM	Detection timing	When the set- ting data of the GEM Service is downloaded	
Error attri- butes	Level	Information	Recovery		Log category	System	
Effects	User program Continues.		Operation	Not affected.	affected.		
System-	Variable		Data type		Name		
defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and	The setting data					_	
correction	vice from the SE	CS/GEM Config-					
	urator was changed.						
Event name	None						
Meaning	None						

Event name	Valid SD Memory	/ Card		Event code	9545 0000 hex		
Meaning	An SD Memory C	n SD Memory Card that can be written is inserted.					
Source	PLC Function Module		Source details	SECS/GEM	Detection timing	At power ON, at Controller reset, or when SD Memory Card is inserted	
Error attri- butes	Level	Information	Recovery		Log category	System	
Effects	User program	Continues.	Operation	Not affected.			
System-	Variable		Data type		Name		
defined variables	None						
Cause and	Assumed cause		Correction		Prevention		
correction	An SD Memory Card that can be written is inserted.						
Event name	None		_		_		
Meaning	None						



Appendices

The appendices provide details on the GEM instructions and system-defined variables.

A-1	GEM I	nstructions	. A-3
	A-1-1	Table of GEM Instructions	. A-3
	A-1-2	Common Variables in GEM Instructions	
	A-1-3	Common Precautions for Correct Use of GEM Instructions	. A-4
	A-1-4	Error Codes That Occur for GEM Instruction Execution	. A-5
	A-1-5	Global Variables Used in the Sample Programming for GEM Instructions	. A-6
	A-1-6	Specifications of Individual GEM Instructions	. A-9
	A-1-7	Events That Occur for GEM Instruction Execution	4-187
A-2	Syster	m-defined Variables A	-211
	A-2-1	GEM Service Version	4-212
	A-2-2	Equipment Information	4-212
	A-2-3	GEM Service Status	4-212
	A-2-4	SECS Communications	4-213
	A-2-5	Interlocks	4-215
	A-2-6	HSMS Communications	4-215
	A-2-7	Communications State Model	4-218
	A-2-8	Equipment Processing State	4-218
	A-2-9	Control State Model	4-218
	A-2-10	Remote Control	4-219
	A-2-11	Equipment Constants	
	A-2-12	Process Program Management	4-220
		Equipment Terminal Services	
		Error Messages	
		Clock	
		Spooling	
	A-2-17	User-defined Messages	4-228
A-3	Corres	spondence between Formats and Data Types	-230
A-4	Design	ning Tasks to Use the GEM ServicesA	\-231
	A-4-1	GEM Service Startup Time	4-231
	A-4-2	Communications Performance of GEM Instructions	4-232
	A-4-3	Checking the Task Execution Time Ratio	4-234
A-5		Specifications, Performance Specifications,	
	and Fเ	unctional Specifications A	235-۱

A-6	Version	on Information
	A-6-1	Checking Versions
	A-6-2	Relationship between Unit Version and GEM Service Version
	A-6-3	Relationship between Unit Version and Sysmac Studio Version
	A-6-4	Combinations of Versions That Require Attention and How to Deal with Them $$. A-237

A-1 GEM Instructions

This appendix provides a table of GEM instructions, instruction specifications, and error codes/events for instruction execution.

A-1-1 Table of GEM Instructions

Instruction	Name	Function	Page
GEM_ControlService	Control GEM Service Status	Changes the GEM Service status to EQInitializing or EQRun.	P. A-10
GEM_Shutdown	Shutdown GEM Service	Shuts down the GEM Service.	P. A-14
GEM_GetCommLog	Get SECS Communications Log	Gets the SECS communications log.	P. A-17
GEM_SetHSMS Param	Set HSMS Communications Parameters	Sets HSMS communications.	P. A-20
GEM_ChangeCom- mState	Change Communications State	Changes the equipment communications state to the specified state. The communications states are defined in the communications state model.	P. A-25
GEM_Change ControlState	Change Control State	Changes the equipment control state to the specified state and reports the event to the host. The control states are defined in the equipment control state model.	P. A-32
GEM_InitEvent	Initialize Events	Initializes event information.	P. A-38
GEM_ReportEvent	Report Event	Reports events to the host.	P. A-41
GEM_ReportAlarm	Report Alarm	Reports alarms and events to the host.	P. A-45
GEM_AckHostCmd	Acknowledge Host Command	Sends the execution accept/reject result in reply to an execution request for a host command.	P. A-50
GEM_AckEnhanced- RmtCmd	Acknowledge Enhanced Remote Command	Sends the execution accept/reject result in reply to an execution request for an enhanced remote command.	P. A-60
GEM_ChangeECV	Change Equipment Constant	Changes the value of an equipment constant.	P. A-65
GEM_AckChange ECV	Acknowledge Equipment Constant Change	Sends the equipment constant change accept/reject result in reply to an equipment constant change request from the host.	P. A-71
GEM_AckPPDelete	Acknowledge Process Program Deletion	Sends a deletion accept/reject result in reply to a process program deletion request from the host.	P. A-76
GEM_Resp FormattedPPUpload	Respond to Formatted Process Program Upload	Sends the formatted process program in reply to an upload formatted process program request from the host.	P. A-82
GEM_RespPP Upload	Respond to Process Program Upload	Sends the process program in reply to a process program upload request from the host.	P. A-91
GEM_Upload FormattedPP	Upload Formatted Process Program	Uploads a formatted process program to the host.	P. A-98
GEM_UploadPP	Upload Process Program	Uploads a process program to the host.	P. A-107
GEM_AckFormattedP-	Acknowledge Formatted Pro-	Sends the accept/reject result in reply to a request for	D A 115
PDownload	cess Program Download	a formatted process program download from the host.	P. A-115
GEM_Ack PPDownload	Acknowlege Process Program Download	Sends the accept/reject result in reply to a request for a process program download from the host.	P. A-125
GEM_Request FormattedPP DownLoad	Request Formatted Process Program Download	Sends a request for a formatted process program download to the host.	P. A-132
GEM_RequestPP Download	Request Process Program Download	Sends a process program download request to the host.	P. A-142

Instruction	Name	Function	Page
GEM_SendPPVerify	Send Process Program Verification Result	Sends the formatted process program verification result to the host.	P. A-151
GEM_Send TerminalMsg	Send Equipment Terminal Message	Sends an equipment terminal message to the host.	P. A-155
GEM_Ack TerminalMsgSB	Acknowledge Single-block Equipment Terminal Message	Sends the terminal message display result for a sin- gle-block equipment terminal message received from the host.	P. A-160
GEM_Ack TerminalMsgMB	Acknowledge Multi-block Equipment Terminal Message	Sends the terminal message display result for a multi-block equipment terminal message received from the host.	P. A-165
GEM_Request ChangeTime	Request Time Change	Gets the time from the host and changes the controller time.	P. A-171
GEM_SendEquip UserMsg	Send Equipment-initiated User-defined Message	Sends a user-defined message to the host.	P. A-175
GEM_RespHost UserMsg	Respond to Host-initiated User-defined Message	Returns the user-defined message with the specified message number as the reply for a user-defined message received from the host.	P. A-182

A-1-2 Common Variables in GEM Instructions

The following common variables are used in GEM instructions: *Execute, Done, Busy, Error,* and *ErrorID.*

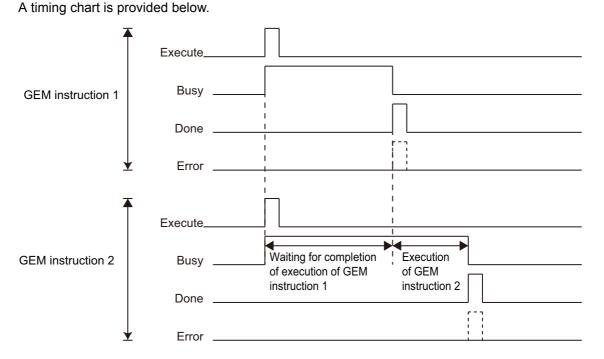
- For specifications and timing charts, refer to the *NJ/NX-series Instructions Reference Manual* (Cat. No. W502).
- The output values for Simulator execution are given in the following table.

Output variable	Meaning	Data type	Execution result
Done	Done	BOOL	TRUE: Normal end
			FALSE: Error end, execution in progress, or execution condition not met.
Busy	Busy	BOOL	TRUE: Execution processing is in progress.
			FALSE: Execution processing is not in progress.
Error	Error	BOOL	TRUE: Error end
			FALSE: Normal end, execution in progress, or execution
			condition not met.
ErrorID	Error code	WORD	Error end: Error code
			Normal end: WORD16#0

A-1-3 Common Precautions for Correct Use of GEM Instructions

- The operation of GEM instructions depends on the communications states and control states defined in SEMI E30. Check the specifications for each GEM instruction.
- Execution of this instruction is continued until processing is completed even if the value of *Execute* changes to FALSE or the execution time exceeds the task period. The value of *Done* changes to TRUE when processing is completed. Use this to confirm normal end of processing.
- · You cannot use GEM instructions in an event task.
- You can execute a maximum of 32 GEM instructions at the same time. If you execute more than 32 instructions at the same time, *Error* will change to TRUE.

- Set the user-defined variables for GEM instructions to the same data types and variable names as
 those set with the SECS/GEM Configurator. The names of user-defined variables and their settings
 on the SEC/GEM Configurator are given in the user-defined variable sections for the related GEM
 instructions.
- The operation is as follows when more than one GEM instruction is executed at the same time:
 - a) Executing the Same GEM Instructions at the Same Time.
 The operation depends on the instruction. Check the specifications for each instruction.
 - b) Executing Different GEM Instructions at the Same Time
 The instructions are processed one at a time.



Do not change the status of the system-defined variables and user-defined variables that are
accessed by an instruction to execute until the *Done* output variable from the instruction changes to
TRUE.

A-1-4 Error Codes That Occur for GEM Instruction Execution

Error codes are assigned to the errors that can occur when instructions are executed. You can use the error code output variable (*ErrorID*) to program error processing.

Lists of the error codes that can occur for the individual instructions are given in the following individual instruction specifications. For details on error codes, refer to *A-1-7 Events That Occur for GEM Instruction Execution* on page A-187.

The priority of the error codes stored in *ErrorID* when more than one error cause occurs at the same time is the same as the order in which the error codes are listed for each instruction.

A-1-5 Global Variables Used in the Sample Programming for GEM Instructions

Sample programming is provided in the descriptions of individual GEM instructions. If you want to use the sample programming on the Sysmac Studio, you must register the following variables in the global variable table.

Name	Data type	Retain	Con- stant	Network Publish	Comment
CHANGE_ECID_NUMBER	UINT	FALSE	FALSE	Do not publish	Number of Change Notification ECIDs
CHANGE_ECID_TABLE	ARRAY[09] OF UINT	FALSE	FALSE	Do not publish	Change Notification ECID Table
CHANGEREQ_ECID _NUMBER	UINT	FALSE	FALSE	Do not publish	Number of Change Request ECIDs
CHANGEREQ_ECID _TABLE	ARRAY[09] OF UINT	FALSE	FALSE	Do not publish	Change Request ECID Table
DELETE_PP_NUMBER	UINT	FALSE	FALSE	Do not publish	PPID count
DELETE_PP_TABLE	ARRAY[04] OF STRING[81]	FALSE	FALSE	Do not publish	PPID table
EQUIP_DOWNLOAD_FPP _CCODE_NUMBER	UINT	FALSE	FALSE	Do not publish	Equipment-initiated download CCODE count
EQUIP_DOWNLOAD_FPP _CCODE_TABLE	ARRAY[01] OF INT	FALSE	FALSE	Do not publish	Equipment-initiated download CCODE table
EQUIP_DOWNLOAD_FPP _MDLN	STRING[7]	FALSE	FALSE	Do not publish	Equipment-initiated download MDLN
EQUIP_DOWNLOAD_FPP _PPARM1_NUMBER	UINT	FALSE	FALSE	Do not publish	Equipment-initiated formatted download, PPARM count for CCODE = 1
EQUIP_DOWNLOAD_FPP _PPARM1_TABLE	ARRAY[02] OF INT	FALSE	FALSE	Do not publish	Equipment-initiated formatted download, PPRAM table for CCODE = 1
EQUIP_DOWNLOAD_FPP _PPARM2_NUMBER	UINT	FALSE	FALSE	Do not publish	Equipment-initiated formatted download, PPARM count for CCODE = 2
EQUIP_DOWNLOAD_FPP _PPARM2_TABLE	ARRAY[01] OF UINT	FALSE	FALSE	Do not publish	Equipment-initiated formatted download, PPRAM for table CCODE = 2
EQUIP_DOWNLOAD_FPP _PPID	STRING[81]	FALSE	FALSE	Do not publish	Equipment-initiated download PPID
EQUIP_DOWNLOAD_FPP _SOFTREV	STRING[7]	FALSE	FALSE	Do not publish	Equipment-initiated download SOFTREV
EQUIP_DOWNLOAD _PPBODY	ARRAY[01023] OF BYTE	FALSE	FALSE	Do not publish	Equipment-initiated download PPBODY
EQUIP_DOWNLOAD_PPID	STRING[81]	FALSE	FALSE	Do not publish	Equipment-initiated download PPID
EQUIP_DOWNLOAD _LENGTH	UINT	FALSE	FALSE	Do not publish	Equipment-initiated download LENGTH
EQUIP_UPLOAD_FPP _CCODE_TABLE	ARRAY[01] OF INT	FALSE	FALSE	Do not publish	Equipment-initiated upload CCODE table

Name	Data type	Retain	Con- stant	Network Publish	Comment
EQUIP UPLOAD FPP	UINT	FALSE	FALSE	Do not	Equipment-initiated
_PPARM1_NUMBER				publish	formatted upload, PPARM count for CCODE = 1
EQUIP_UPLOAD_FPP	ARRAY[02] OF INT	FALSE	FALSE	Do not	Equipment-initiated
_PPARM1_TABLE				publish	formatted upload, PPRAM
					table for CCODE = 1
EQUIP_UPLOAD_FPP	UINT	FALSE	FALSE	Do not	Equipment-initiated
_PPARM2_NUMBER				publish	formatted upload, PPARM count for CCODE = 1
EQUIP_UPLOAD_FPP	ARRAY[01] OF UINT	FALSE	FALSE	Do not	Equipment-initiated
_PPARM2_TABLE				publish	formatted upload, PPRAM table for CCODE = 2
EQUIP_UPLOAD_PPBODY	ARRAY[01023] OF	FALSE	FALSE	Do not	Equipment-initiated upload
	BYTE			publish	PPBODY
FPP_VERIFY_ACKC7A	ARRAY[01] OF	FALSE	FALSE	Do not	Verification result: ACKC7A
_TABLE	USINT			publish	table
FPP_VERIFY_ERRW7	ARRAY[01] OF	FALSE	FALSE	Do not	Verification result: ERRW7
_TABLE	STRING[41]			publish	table
FPP_VERIFY_SEQNUM	ARRAY[01] OF UINT	FALSE	FALSE	Do not	Verification result:
_TABLE				publish	SEQNUM table
HOST_DOWNLOAD_FPP	UINT	FALSE	FALSE	Do not	Host-initiated formatted
_CCODE_NUMBER				publish	download, CCODE count
HOST_DOWNLOAD_FPP	ARRAY[01] OF INT	FALSE	FALSE	Do not	Host-initiated formatted
_CCODE_TABLE	OTDINIOITI	E41.0E	E41.0E	publish	download, CCODE table
HOST_DOWNLOAD_FPP _MDLN	STRING[7]	FALSE	FALSE	Do not publish	Host-initiated formatted download MDLN
HOST_DOWNLOAD_FPP	UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM1_NUMBER				publish	download, PPARM count
					for CCODE = 1
HOST_DOWNLOAD_FPP	ARRAY[02] OF INT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM1_TABLE				publish	download, PPRAM table for CCODE = 1
HOST_DOWNLOAD_FPP	UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM2_NUMBER				publish	download, PPARM count for CCODE = 2
HOST_DOWNLOAD_FPP	ARRAY[01] OF UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM2_TABLE				publish	download, PPRAM table for CCODE = 2
HOST_DOWNLOAD_FPP _PPID	STRING[81]	FALSE	FALSE	Do not publish	Host-initiated formatted download PPID
HOST_DOWNLOAD_FPP _SOFTREV	STRING[7]	FALSE	FALSE	Do not publish	Host-initiated formatted download SOFTREV
HOST_DOWNLOAD	ARRAY[01023] OF	FALSE	FALSE	Do not	Host-initiated download
_PPBODY	BYTE			publish	PPBODY
HOST_DOWNLOAD_PPID	STRING[81]	FALSE	FALSE	Do not publish	Host-initiated download PPID
HOST_DOWNLOAD LENGTH	UINT	FALSE	FALSE	Do not publish	Host-initiated download LENGTH
HOST_UPLOAD_FPP	ARRAY[01] OF INT	FALSE	FALSE	Do not	Host-initiated upload
_CCODE_TABLE				publish	CCODE table
HOST_UPLOAD_FPP	UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM1_NUMBER				publish	upload, PPARM count for
					CCODE = 1

Name	Data type	Retain	Con- stant	Network Publish	Comment
HOST_UPLOAD_FPP	ARRAY[02] OF INT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM1_TABLE				publish	upload, PPRAM table for CCODE = 1
HOST_UPLOAD_FPP	UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM2_NUMBER				publish	upload, PPARM count for CCODE = 2
HOST_UPLOAD_FPP	ARRAY[01] OF UINT	FALSE	FALSE	Do not	Host-initiated formatted
_PPARM2_TABLE				publish	upload, PPRAM table for CCODE = 2
HOST_UPLOAD_PPBODY	ARRAY[01023] OF BYTE	FALSE	FALSE	Do not publish	Host-initiated upload PPBODY
HOST_UPLOADREQ_PPID	STRING[81]	FALSE	FALSE	Do not	Host-initiated upload
				publish	request PPID
HOST_UPLOADREQ_FPP	STRING[81]	FALSE	FALSE	Do not	Host-initiated formatted
_PPID				publish	upload request PPID
HOST_UPLOADREQ_PPID	STRING[81]	FALSE	FALSE	Do not	Host-initiated upload
PPID TABLE	ADDAVIO 41 OF	TRUE	FALSE	publish Do not	request PPID
PPID_IABLE	ARRAY[04] OF STRING[81]	IKUE	FALSE	publish	PPID management table
S2F25 00001 Var	ARRAY[09] OF	FALSE	FALSE	Do not	User-defined message
	BYTE			publish	S2,F25
S2F26_00002_Var	ARRAY[09] OF	FALSE	FALSE	Do not	User-defined message
	BYTE			publish	S2,F26
S2F41_CPNAME_NUMBER	UINT	FALSE	FALSE	Do not	S2,F41: CPNAME Count
				publish	
S2F41_CPNAME_TABLE	ARRAY[02] OF STRING[21]	FALSE	FALSE	Do not publish	S2,F41: CPNAME table
S2F41_RCMD	STRING[21]	FALSE	FALSE	Do not publish	S2,F41: RCMD variable name
S2F41_START_LOTID	STRING[17]	FALSE	FALSE	Do not	CPVAL of LOTID in START
				publish	host command
S2F41_START_MID	STRING[17]	FALSE	FALSE	Do not	CPVAL of MID in START
				publish	host command
S2F41_START_PPID	STRING[81]	FALSE	FALSE	Do not	CPVAL of PPID in START
00540 00401/ TABLE	A D D A V (10 01 0 F	FALOE	EALOE	publish	host command
S2F42_CPACK_TABLE	ARRAY[02] OF BYTE	FALSE	FALSE	Do not publish	S2,F42: CPACK table
S2F42_CPNAME_TABLE	ARRAY[02] OF	FALSE	FALSE	Do not	S2,F42: Error CPNAME
	STRING[21]			publish	table
TERMINAL_MSG_MB	UINT	FALSE	FALSE	Do not	Displayed TEXT of
_NUMBER				publish	multi-block terminal
					message - Displayed TEXT Count
TERMINAL_MSG_MB	ARRAY[09] OF	FALSE	FALSE	Do not	Displayed TEXT of
_TABLE	STRING[161]			publish	multi-block terminal
					message - Displayed TEXT Table
TERMINAL_MSG_SB	STRING[161]	FALSE	FALSE	Do not	Link variable for displayed
_TEXT				publish	TEXT of single-block
					terminal messages - Displayed TEXT
1	<u> </u>				Displayed TEXT

A-1-6 Specifications of Individual GEM Instructions

This section provides the specifications of the individual GEM instructions that are listed in the table of GEM instructions.

GEM_ControlService

The GEM_ControlService instruction changes the GEM Service status to EQInitializing or EQRun.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
			OFM ControlOpping instance	GEM_ControlService_instance(
			GEM_ControlService_instance GEM_ControlService	Execute,
			Execute Done	Cmd,
GEM_Control- Service	Control GEM Service Status	FB	Cmd Busy Error	Done,
Service	Service Status		ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
Cmd	Command	Input	Commend to everyte	_GEM_CMD_EQINIT,		_GEM_CM-
Cmd	Command	Input	Command to execute	_GEM_CMD_EQRUN		D_EQINIT

	Bool- ean	Bit strings			Integers			Real be			dates	dura , and tring	l text							
	вооц	ВҮТЕ	WORD	DWORD	LWORD	LNISN	UINT	UDINT	ULINI	TNIS	INI	DINT	LINIT	REAL	LREAL	BWIL	DATE	DOL	ΙΠ	STRING
Cmd	Refer to	Function for the enumerators of the enumerated type _eGEM_CMD.																		

Function

The GEM_ControlService instruction changes the GEM Service status to the status specified with Cmd.

The data type of *Cmd* is enumerated type _eGEM_CMD. The changes in the GEM Service status for the values of the enumerator are given in the following table.

Enumerator	Change in GEM Service status
_GEM_CMD_EQINIT	The status changes to EQInitializing.
_GEM_CMD_EQRUN	The status changes to EQRun.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0400	Input Value Out of Range	The value of <i>Cmd</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed with _GEM_CMD_EQRUN specified for Cmd when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed with _GEM_CMD_EQINT specified for Cmd when the GEM Service status was EQInitializing.
16#3813	GEM Service Status in EQRun	The instruction was executed with _GEM_CMD_EQRUN specified for Cmd when the GEM Service status was EQRun.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Precautions for Correct Use

Check _GEM_ServiceStatus before you execute this instruction. If the instruction is executed for a
value of Cmd in any status other than those given as OK in the following table, an error will occur and
Error will change to TRUE.

	GEM Service Status								
Specified value of Cmd	EQStarting status	EQInitializing status	EQRun status	Other status					
_GEM_CMD_EQINIT	OK	Error	OK	Error					
_GEM_CMD_EQRUN	Error	OK	Error	Error					

Sample Programming

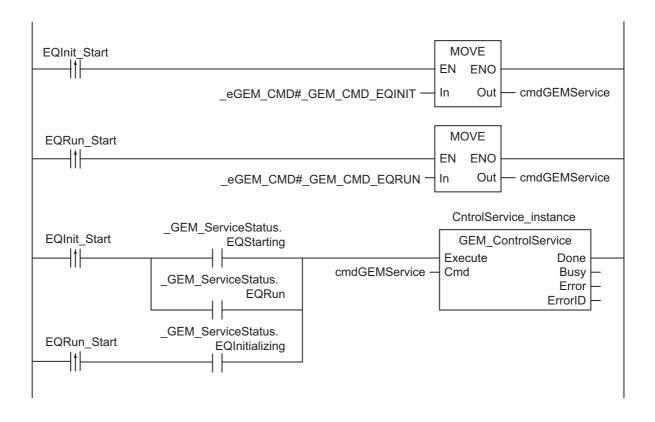
In this sample, the GEM Service status is changed to EQInitializing or EQRun.

- If the GEM Service status is EQStarting or EQRun and the *EQInit_Start* internal variable changes from FALSE to TRUE, the GEM Service status changes to EQInitializing.
- If the GEM Service status is EQInitializing and the *EQRun_Start* internal variable changes from FALSE to TRUE, the GEM Service status changes to EQRun.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	EQInit_Start	BOOL	FALSE	Flag to start changing to EQInitializing
	EQRun_Start		FALSE	Flag to start changing to EQRun
	cmdGEMService	_eGEM_CMD	_GEM _CMD _EQINIT	Command to change the status
	ControlService_instance	GEM_Control Service		Instance of GEM_ControlService instruction

External Variables	Variable	Comment	
_GEM_ServiceStatus		GEM Service status	



ST

Internal Variables	Variable	Data type	Initial value	Comment
	EQInit_Start	BOOL	FALSE	Flag to start changing from EQStart- ing or EQRun to EQInitializing
	EQRun_Start	BOOL	FALSE	Flag to start changing to EQRun
	cmdGEMService	_eGEM_CMD	_GEM _CMD _EQINIT	Command to change the status
	R_TRIG_EQInit_instance	R_TRIG		Instance of R_TRIG instruction for EQInit
	R_TRIG_EQRun_instance	R_TRIG		Instance of R_TRIG instruction for EQRun
	Trigger_EQInit	BOOL	FALSE	Flag for FALSE to TRUE change in EQInit_Start
	Trigger_EQRun	BOOL	FALSE	Flag for FALSE to TRUE change in EQRun_Start
	ControlService_instance	GEM_Control- Service		Instance of GEM_ControlService instruction
	Stage	INT	0	Program execution status

External Variables	Variable	Comment	
_GEM_ServiceStatus		GEM Service status	

```
CASE Stage Of
    R TRIG EQInit instance ( EQInit Start, Trigger EQInit );
   R TRIG EQRun instance ( EQRun Start, Trigger EQRun );
    IF( ( Trigger EQInit = TRUE )
       AND ( ( _GEM_ServiceStatus.EQStarting = TRUE ) OR ( _GEM_ServiceStatus.EQRun =
TRUE )) ) THEN
        cmdGEMService := _eGEM_CMD#_GEM_CMD_EQINIT;
    ELSIF( ( Trigger_EQRun = TRUE )
        AND ( GEM ServiceStatus.EQInitializing = TRUE) ) THEN
        cmdGEMService := eGEM CMD# GEM CMD EQRUN;
       RETURN;
    END IF;
    // Initialization
    ControlService instance( Execute:=FALSE );
   Stage := 1;
1:
   ControlService instance( Execute:=TRUE, cmd:= cmdGEMService );
    IF( ControlService instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( ControlService instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
   END IF;
10: // End
    Stage := 0;
END CASE;
```

GEM_Shutdown

The GEM_Shutdown instruction shuts down the GEM Service.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Shutdown	Shutdown GEM Service	FB	GEM_ShutDown_instance GEM_ShutDown Execute Done Busy Error ErrorID	GEM_Shutdown_instance(

Variables

Only common variables are used.

Function

The GEM_Shutdown instruction shuts down the GEM Service.

During execution of the instruction, the *_GEM_ServiceStatus* system-defined variable is ShuttingDown. If execution ends normally, it changes to Shutdown.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#041D	Exceeded Simultaneous Instruction Exe-	The number of simultaneously executed GEM instructions
	cuted Resources	exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status
10#3010	GEIVI GEIVICE Status III IIIItializing	was Initializing.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status
10#3010	GEW Service Status III ShuttingDown	was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status
10#3017	GEWI Service Status III Struttown	was Shutdown.

Precautions for Correct Use

- Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is ShuttingDown or Shutdown, an error will occur and Error will change to TRUE.
- Execute this instruction before you turn OFF the power supply to the controller. If you do not execute this instruction before you turn OFF the power supply to the controller, the data in internal non-volatile memory or on the SD Memory Card may be corrupted.

Sample Programming

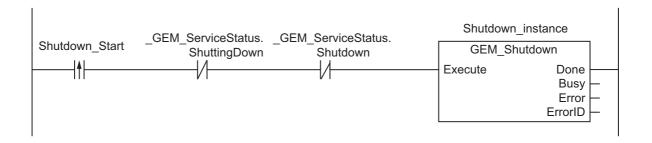
This sample shuts down the GEM Services.

If the GEM Service status is ShuttingDown or Shutdown and the *Shutdown_Start* internal variable changes from FALSE to TRUE, the GEM Services are shut down.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	Shutdown_Start	BOOL	FALSE	Flag to start shutting down the GEM Services
	Shutdown_instance	GEM_Shutdown		Instance of GEM_Shutdown instruction

External Variables	Variable	Comment	
	_GEM_ServiceStatus	GEM Service status	



ST

Internal Variables	Variable	Data type	Initial value	Comment
	Shutdown_Start	BOOL	FALSE	Flag to start shutting down the GEM Services
R_TRIG_instance		R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in Shut-down_Start
	Shutdown_instance	GEM_Shutdown		Instance of GEM_Shutdown instruction
	Stage	INT	0	Program execution status

External Variables	Variable	Comment	
	_GEM_ServiceStatus	GEM Service status	

```
CASE Stage Of
   R TRIG instance ( Shutdown Start, Trigger );
   IF( ( Trigger = TRUE )
   AND ( (_GEM_ServiceStatus.ShuttingDown = FALSE) AND (_GEM_ServiceStatus.Shutdown
= FALSE) ) THEN
        // Initialization
        Shutdown_instance( Execute:=FALSE );
       Stage := 1;
       END IF;
1: // Start send.
    Shutdown instance( Execute:=TRUE );
    IF( Shutdown_instance.Done = TRUE ) THEN
       Stage := 10;
    ELSIF( Shutdown instance.Error = TRUE ) THEN
       // Add error processing as required.
       Stage := 10;
   END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_GetCommLog

The GEM_GetCommLog instruction gets the SECS communications log.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_GetCom mLog	Get SECS Communicatio ns Log	FB	GEM_GetCommLog_instance GEM_GetCommLog — Execute Done — Busy — Error — ErrorID	GEM_GetCommLog_instance(

Variables

Only common variables are used.

Function

The GEM_GetCommLog instruction gets the SECS communications log.

You can get up to 100 log records with each execution of the instruction.

The SECS communications log records that are read are stored in the _GEM_CommLog[] system-defined variable.

The most recent SECS communications log record is stored in _GEM_CommLog[0]. Other records are stored in chronological order in _GEM_CommLog[1] and on.

The number of SECS communications log records that are read is stored in the *_GEM_CommLogCnt* system-defined variable.

Related System-defined Variables

Name	Meaning	Data type	Description
GEM Comml ogCnt	SECS Communications	UINT	Gives the number of SECS communications
_GEM_CommLogCnt	Log Count	Olivi	log records that were gotten.
_GEM_CommLog	SECS Communications	ARRAY[099] OF	Stores the SECS communications log
_GEM_CommLog	Log	_sGEM_CommLog	records.
OFM Coming Status	CEM Comice Status	_sGEM_SER-	Gives the GEM Service status.
_GEM_ServiceStatus	GEM Service Status	VICE_STATUS	Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0/1D	Exceeded Simultaneous Instruction Exe-	The number of simultaneously executed GEM instructions
16#041D	cuted Resources	exceeded the limit.

Error code	Name	Description
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Precautions for Correct Use

 Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQInitializing or EQRun, an error will occur and Error will change to TRUE.

Sample Programming

This sample gets the SECS communications log.

If the GEM Service status is EQInitializing or EQRun and the *GetCommLog_Start* internal variable changes from FALSE to TRUE, the SECS communications log is obtained.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	GetCommLog_Start		FALSE	Flag to start getting the SECS communications log
	GetCommLog_instance	GEM_Get CommLog		Instance of GEM_GetCommLog instruction

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status

```
GetCommLog_Start EQInitializing GetCommLog_instance

GetCommLog_instance

GEM_GetCommLog
Execute Done
Busy
Error —
EQRun

EQRun
```

ST

Internal Variables	Variable	Data type	Initial value	Comment				
	GetCommLog_Start	BOOL	FALSE	Flag to start getting the SECS communications log				
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction				
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in GetCommLog_Start				
	GetCommLog_instance	GEM_Get CommLog		Instance of GEM_GetCommLog instruction				
	Stage	INT	0	Program execution status				

External Variables	Variable	Comment
•	_GEM_ServiceStatus	GEM Service status

```
CASE Stage Of
    R_TRIG_instance( GetCommLog_Start, Trigger );
    IF( ( Trigger = TRUE )
      AND ( (_GEM_ServiceStatus.EQInitializing = TRUE) OR (_GEM_ServiceStatus.EQRun
= TRUE) )) THEN
        // Initialization
        GetCommLog_instance( Execute:=FALSE );
        Stage := 1;
   END IF;
1: // Start send.
   GetCommLog_instance( Execute:=TRUE );
    IF( GetCommLog_instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( GetCommLog_instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
   END_IF;
10: // End
   Stage := 0;
END_CASE;
```

GEM_SetHSMSParam

The GEM_SetHSMSParam instruction sets HSMS communications.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
			OFM O HIGHOR	GEM_SetHSMSParam_instance(
			GEM_SetHSMSParam_instance GEM_SetHSMSParam	Execute,
0514 0 41014	Set HSMS Communications Parameters		Execute Done	HSMSParam,
GEM_SetHSM SParam		FB	HSMSParam Busy Error	Done,
Oi aiaiii			ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
HSM- SParam	HSMS com- munications parameters	Input	HSMS communications parameters			*1

^{*1.} If you omit an input parameter, the default value is not applied. A building error will occur.

	Bool- ean		Bit s	trings	5		Integers				Real be	Times, durations, dates, and text strings								
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	TNIDU	ULINT	SINT	INT	DINT	LINIT	REAL	LREAL	TIME	DATE	DOL	ΙΠ	STRING
HSM- SParam	Refer to	Refer to Function for details on the structure _GEM_HSMS_PARAM.																		

Function

The GEM_SetHSMSParam instruction sets up HSMS communications with the host according to the specification with *HSMSParam*.

If execution of this instruction ends normally, the set HSMS communications parameters are saved in non-volatile memory and stored in the controller.

The set HSMS communications parameters are not applied immediately. They are applied when execution of the GEM_ControlService instruction in which Start Equipment is specified for *Cmd* ends normally.

The data type of *HSMSParam* is structure _sGEM_HSMS_PARAM. The meanings of the members are as follows:

Variable	Meaning	Description	Data type	Valid range	Unit	Default
Member HSMSParam	HSMS Com- munications Parameters	HSMS communications settings	_sGEM_HS MS_PARAM			

Variable Member	Meaning	Description	Data type	Valid range	Unit	Default
ConnectMode	TCP/IP Connection Mode	TCP/IP connection mode	_eGEM CONNECT	_GEM_CON- NECT_PAS- SIVE(0):Pass ive _GEM_CON- NECT_AC- TIVE(1):Activ e		
PassivelPSel	IP Address Connection Restriction Flag	Connectable IP address restriction*1 FALSE: No restriction. TRUE: Connection is possible only with the IP address set in <i>IpAdr</i> .	BOOL	Depends on data type.		
IpAdr	IP Address	IP address of host	STRING[256]			
PortNo	Port Number	Active Mode TCP/IP Connection: Host port number Passive Mode TCP/IP Connection: Standby port number for GEM Service	UINT	1 to 65,535		
DeviceID	Device ID	ID that identifies the HSMS message	UINT	0 to 32,767		
Т3	Reply Time- out Time	Maximum time to wait for a response message in HSMS message communications	USINT	1 to 120	s	
Т5	Connection Separation Timeout Time	Interval to resend Select Requests when a selec- tion response is not received to a sent Select Request	USINT	1 to 240	s	
Т6	Control Time- out Time	Maximum time to wait for a response message in HSMS message communications	USINT	1 to 240	s	
Т7	Connection Idle Timeout Time	Maximum time to wait for a Select Request*1	USINT	1 to 240	s	
Т8	Network Inter- character Timeout Time	Time to monitor for HSMS messages sent in multi-packets	USINT	1 to 120	s	
Conversation- Timeout	Conversation Timeout Time	Maximum time to wait for a reply after sending a message	USINT	1 to 240	s	

^{*1.} These settings are valid for a Passive Mode TCP/IP connection.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_HSMSParam	HSMS Communications Parameters	sGEM_HS MS_PARA M	Gives the active HSMS communications settings. Refer to P. A-216 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#3828	HSMS Communications Setting Out of Range	A value specified in <i>HSMSParam</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Precautions for Correct Use

 Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQInitializing or EQRun, an error will occur and Error will change to TRUE.

Sample Programming

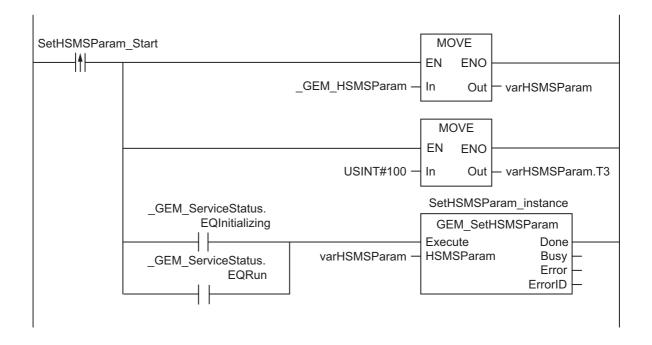
This sample sets T3 (reply timeout time) in the HSMS communications settings to 100 s.

If the GEM Service status is EQInitializing or EQRun and the SetHSMSParam_Start internal variable changes from FALSE to TRUE, setting the HSMS communications is started.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	SetHSMSParam Start	BOOL	FALSE	Flag to start setting HSMS com-
	can	BOOL	ITTLOE	munications setting T3
	varHSMSParam	_sGEM_HSMS_		HSMS communications setting to
	Vali iSiviSFalalli	PARAM		change
	SetHSMSParam instance	GEM_SetHSMS		Instance of GEM_SetHSM-
	Sethoworalam_mstance	Param		SParam instruction

External Variables	Variable	Comment		
	_GEM_ServiceStatus	GEM Service status		
_GEM_HSMSParam		HSMS Communications Parameters		



ST

Internal Variables	Variable	Data type	Initial value	Comment
	SetHSMSParam_Start	BOOL	FALSE	Flag to start setting HSMS communications setting T3
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in SetHSMSParam_Start
	SetHSMSParam_instance	GEM_Set HSMSParam		Instance of GEM_SetHSMSParam instruction
	varHSMSParam	_sGEM_HSMS _PARAM		HSMS communications setting to change
	Stage	INT	0	Program execution status

External Variables	Variable	Comment				
	_GEM_ServiceStatus	GEM Service status				
_GEM_HSMSParam		HSMS Communications Parameters				

```
CASE Stage Of
0:
    R_TRIG_instance( SetHSMSParam_Start, Trigger );
    IF( ( Trigger = TRUE )
       AND (( \_GEM\_ServiceStatus.EQInitializing = TRUE ) OR ( \_GEM\_ServiceStatus.EQInitializing = TRUE )
tus.EQRun = TRUE ))) THEN
        // Initialization
        varHSMSParam := _GEM_HSMSParam;
        varHSMSParam.T3:= 100;
        SetHSMSParam_instance( Execute:=FALSE, HSMSParam:=varHSMSParam );
        Stage := 1;
    END_IF;
1:
    // Start send.
    SetHSMSParam_instance( Execute:=TRUE, HSMSParam:=varHSMSParam );
     \  \  \, \text{IF( SetHSMSParam\_instance.Done = TRUE ) THEN} \\
        Stage := 10;
    {\tt ELSIF} ( {\tt SetHSMSParam\_instance.Error} = {\tt TRUE} ) THEN
        // Add error processing as required.
        Stage := 10;
    END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_ChangeCommState

The GEM_ChangeCommState instruction changes the equipment communications state to the specified state. The communications states are defined in the communications state model.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_ChangeCommState_instance(
			GEM_ChangeCommState_instance GEM_ChangeCommState	Execute,
Change C	Change Com-	•	Execute Done	TransitionEvent,
GEM_Change CommState	munications		TransitionEvent Busy Error	Done,
State		ErrorID —	Busy,	
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
Transition-	Transition	Input	Requested communica-	_GEM_COMM_DISABLED,		_GEM_COM-
Event	request	IIIput	tions state	_GEM_COMM_ENABLED		M_DISABLED

	Bool- ean		Bit strings		Integers						Real num- bers		Times, durations, dates, and text strings							
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	ΤO	STRING
Transition- Event	Refer to	Refer to Function for the enumerators of the enumerated type _eGEM_COMM.																		

Function

The GEM_ChangeCommState instruction changes the equipment communications state to the state specified with transition request *TransitionEvent*. The communications states are defined in the communications state model.

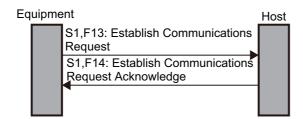
The data type of *TransitionEvent* is enumerated type _eGEM_COMM. The communications state that is changed to for each enumerator is given in the following table.

Enumerator	New communications state
_GEM_COMM_DISABLED	DISABLED
_GEM_COMM_ENABLED	ENABLED

The communications state transition is started when the instruction ends normally. Use the _GEM_CommunicationsState system-defined variable to confirm when the communications state transition is completed.

Additional Information

- This instruction uses the Equipment Attempts to Establish Communications scenario for the GEM Establish Communications capability.
- The SECS message exchange between the equipment and host is given below.
 However, a SECS message is sent from the equipment to the host only when _GEM_COMM_EN-ABLED is specified for the *TransitionEvent* input variable.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_Communications	Communications State	_sGEM_CO	Gives the state of the communications state model.
State	Communications State	MM_STATE	Refer to P. A-218 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0400	Input Value Out of Range	The value of <i>TransitionEvent</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#381A	State Transition in Progress	The instruction was executed when waiting for Establish Communications Request Acknowledge (S1,F14) from the host.
-		This error will not occur when a reply timeout occurs.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQRun, an error will occur and Error will change to TRUE.
- The instruction will end normally if the communications state requested with the *TransitionEvent* input variable is the same as the current communications state. The communications state will not change.
- If the instruction is executed when the communications state is NOT COMMUNICATING, an error will
 occur and *Error* will change to TRUE. However, if Establish Communications Request Acknowledge
 (S1,F14) is received or if a reply timeout occurs, the instruction will end normally. If the instruction
 ends in an error with an error code of 16#381A, wait for the reply timeout time and then execute the
 instruction again.

Sample Programming

This sample changes the communications state to ENABLED or DISABLED. It also confirms that the communications state has changed.

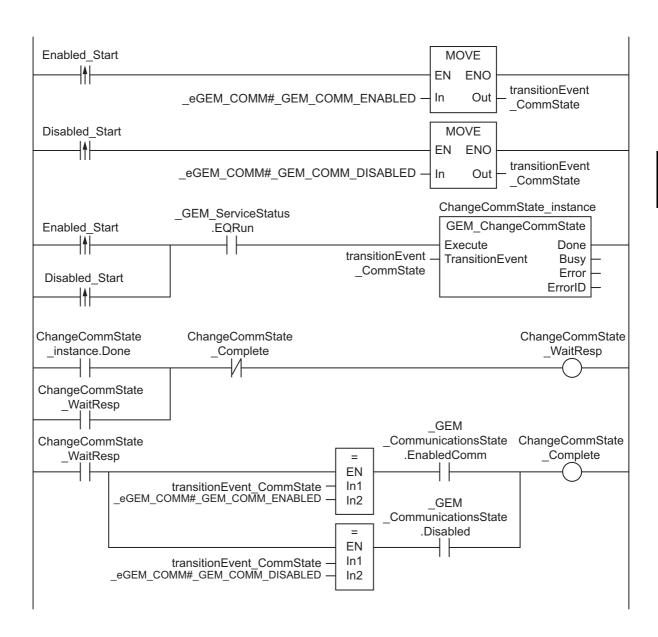
If the GEM Service status is EQRun, the communications state is changed for the following changes.

- If the *Enabled_Start* internal variable changes from FALSE to TRUE, the communications state is changed to ENABLED.
- If the *Disabled_Start* internal variable changes from FALSE to TRUE, the communications state is changed to DISABLED.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	Enabled_Start	BOOL	FALSE	Flag to start changing the communications state to Enabled
	Disabled_Start	BOOL	FALSE	Flag to start changing the communications state to Disabled
	transitionEvent_Comm State	_eGEM_ COMM	_GEM_ COMM_ DISABLED	Event to request the change
	ChangeCommState_ instance	GEM_Change CommState		Instance of GEM_ChangeCom- mState instruction
	ChangeCommState_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of state change
	ChangeCommState_ Complete	BOOL	FALSE	State change completion flag

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_Communications State	Communications state



ST

Internal Variables	Variable	Data type	Initial value	Comment
	Enabled_Start	BOOL	FALSE	Flag to start changing the communications state to Enabled
	Disabled_Start	BOOL	FALSE	Flag to start changing the communications state to Disabled
	transitionEvent_Comm State	_eGEM_ COMM	_GEM_ COM- M_DIS- ABLED	Event to request the change
	ChangeCommState_ instance	GEM_Change CommState		Instance of GEM_ChangeCom- mState instruction
	R_TRIG_Enabled_instance	R_TRIG		Instance of R_TRIG instruction for Enabled
	R_TRIG_Disabled_instance	R_TRIG		Instance of R_TRIG instruction for Disabled
	Trigger_Disabled	BOOL	FALSE	Flag for FALSE to TRUE change in Enabled_Start
	Trigger_Enabled	BOOL	FALSE	Flag for FALSE to TRUE change in Disabled_Start
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
_	_GEM_ServiceStatus	GEM Service status
	_GEM_Communications State	Communications state

```
CASE Stage Of
    R_TRIG_Enabled_instance( Enabled_Start, Trigger_Enabled );
    R_TRIG_Disabled_instance( Disabled_Start, Trigger_Disabled );
    IF( Trigger_Enabled = TRUE ) THEN
       transitionEvent CommState := eGEM COMM# GEM COMM ENABLED;
    ELSIF( Trigger Disabled = TRUE ) THEN
       transitionEvent_CommState := _eGEM_COMM#_GEM_COMM_DISABLED;
    ELSE
       RETURN;
    END_IF;
    IF( _GEM_ServiceStatus.EQRun = TRUE ) THEN
        // Initialization
        ChangeCommState_instance( Execute:=FALSE, transitionEvent:=transition-
Event_CommState );
        Stage := 1;
    END_IF;
1:
    // Start state change.
    ChangeCommState_instance( Execute:=TRUE, transitionEvent:= transitionEvent_Com-
mState );
    IF( ChangeCommState_instance.Done = TRUE ) THEN
        Stage := 2;
    ELSIF( ChangeCommState_instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END_IF;
```

```
2:
    // Wait for state change.
    IF(( transitionEvent_CommState = _eGEM_COMM#_GEM_COMM_ENABLED)
        AND _GEM_CommunicationsState.EnabledComm = TRUE ) THEN
        Stage := 10;
ELSIF(( transitionEvent_CommState = _eGEM_COMM#_GEM_COMM_DISABLED )
        AND _GEM_CommunicationsState.Disabled = TRUE ) THEN
        Stage := 10;
END_IF;
10: // End
        Stage := 0;
END_CASE;
```

GEM_ChangeControlState

The GEM_ChangeControlState instruction changes the equipment control state to the specified state and reports the event to the host. The control states are defined in the equipment control state model.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
			OFM Observe ControlOtate instance	GEM_ChangeCotrolState_instance(
			GEM_ChangeControlState_instance GEM_ChangeControlState	Execute,
GEM_Change ControlState	Change Control State	FB	Execute Done	TransitionEvent,
			TransitionEvent Busy Error	Done,
			ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
Transition- Event	Transition request	Input	Requested control state	_GEM_CONTROL_OFFLINE, _GEM_CONTROL_ON- LINE_LOCAL, _GEM_COM- M_ENABLED		_GEM CON- TROL_OFF LINE

	Bool- ean	Bit strings			Integers							Real be	Times, durations, dates, and text strings							
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	LINT DINT INT SINT UDINT UDINT USINT					LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING	
Transition- Event	Refer to	Fun	ction	for th	e enu	ımera	ators	of the	enu	mera	ited t	уре _	eGE	M_CON	ITROL.					

Function

The GEM_ChangeControlState instruction changes the equipment control state to the state specified with transition request *TransitionEvent*. The control states are defined in the equipment control state model. After the state is changed, the event is reported to the host.

The data type of TransitionEvent is enumerated type _eGEM_CONTROL.

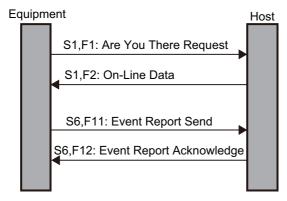
The control state that is changed to for each enumerator is given in the following table.

Enumerator	New control state
_GEM_CONTROL_OFFLINE	OFF-LINE
_GEM_CONTROL_ONLINE_LOCAL	ON-LINE/LOCAL
_GEM_CONTROL_ONLINE_REMOTE	ON-LINE/REMOTE

The specified control state transition is started when the instruction ends normally. Use the _GEM_ControlState system-defined variable to confirm when the control state transition is completed.

Additional Information

• The SECS message exchange between the equipment and host is given below.



The Are You There Request (S1,F1) SECS message is sent to the host when this instruction is executed under the following two conditions.

- a) The control status must be EQUIPMENT OFF-LINE.
- b) ON-LINE/LOCAL or ON-LINE/REMOTE must be specified with *TransitionEvent*.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ControlState	Control State	_sGEM CON- TROL_STA TE	Gives the state of the control state model. Refer to P. A-218 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0400	Input Value Out of Range	The value of <i>TransitionEvent</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Error code	Name	Description	
16#381A	State Transition in Progress	The instruction was executed when waiting for On-Line Data (S1,F2) from the host.	
		This error will not occur when a reply timeout occurs.	
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.	

Precautions for Correct Use

- Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when GEM ServiceStatus is not EQRun, an error will occur and Error will change to TRUE.
- The instruction will end normally if the control state requested with the *TransitionEvent* input variable is the same as the current control state. The control state will not change.
- The instruction will end in an error if it is executed when the control state is ATTEMPT ONLINE. However, if On-Line Data (S1,F2) is received or if a reply timeout occurs, the instruction will end normally.
 If the instruction ends in an error with an error code of 16#381A, wait for the reply timeout time and then execute the instruction again.

Sample Programming

This sample changes the control state to LOCAL, REMOTE, or OFF-LINE. It also confirms that the control state has changed.

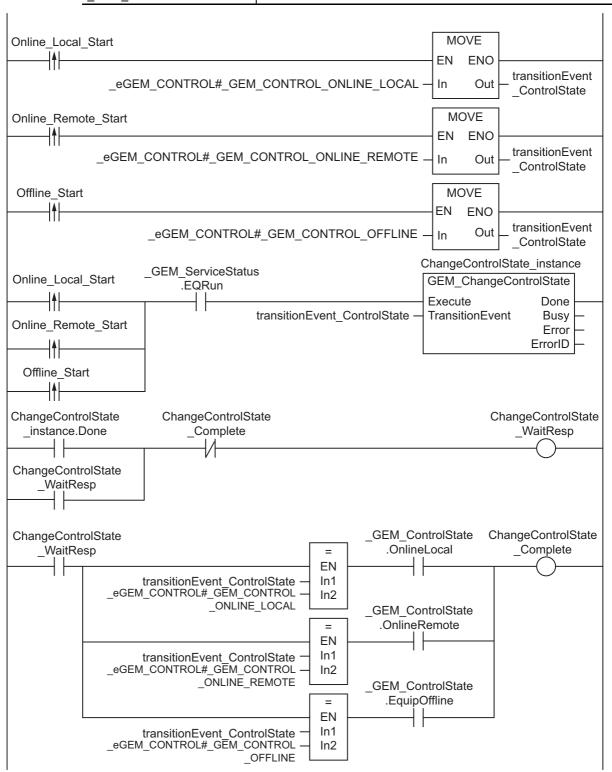
If the GEM Service status is EQRun, the control state is changed for the following changes.

- If the Online_Local_Start internal variable changes from FALSE to TRUE, the control state is changed to LOCAL.
- If the *Online_Remote_Start* internal variable changes from FALSE to TRUE, the control state is changed to REMOTE.
- If the Offline_Start internal variable changes from FALSE to TRUE, the control state is changed to OFF-LINE.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	Online_Local_Start	BOOL	FALSE	Flag to start changing the control state to LOCAL
	Online_Remote_Start	BOOL	FALSE	Flag to start changing the control state to REMOTE
	Offline_Start	BOOL	FALSE	Flag to start changing the control state to OFF-LINE
	transitionEvent_Control State	_eGEM_ CONTROL	_GEM_ CON- TROL_OF- FLINE	Event to request the change
	ChangeControlState_ instance	GEM_Change- ControlState		Instance of GEM_ChangeControl- State instruction
	ChangeControlState_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of state change
	ChangeControlState_ Complete	BOOL	FALSE	State change completion flag

External Variable		Comment		
_GEM_ServiceStatus		GEM Service status		
GEM ControlState		Control state		



ST

Internal Variables	Variable	Data type	Initial value	Comment
	Online_Local_Start	BOOL	FALSE	Flag to start changing the control state to LOCAL
	Online_Remote_Start	BOOL	FALSE	Flag to start changing the control state to REMOTE
	Offline_Start	BOOL	FALSE	Flag to start changing the control state to OFF-LINE
	transitionEvent_Control State	_eGEM_ CONTROL	_GEM_ CON- TROL_OF- FLINE	Event to request the change
	ChangeControlState_ instance	GEM_Change- ControlState		Instance of GEM_ChangeControl- State instruction
	R_TRIG_Local_instance	R_TRIG		Instance of R_TRIG instruction for Online_Local
	R_TRIG_Remote_ instance	R_TRIG		Instance of R_TRIG instruction for Online_Remote
	R_TRIG_Offline_ instance	R_TRIG		Instance of R_TRIG instruction for Offline
	Trigger_Local	BOOL	FALSE	Flag for FALSE to TRUE change in Online_Local_Start
	Trigger_Remote	BOOL	FALSE	Flag for FALSE to TRUE change in Online_Remote_Start
	Trigger_Offline	BOOL	FALSE	Flag for FALSE to TRUE change in Offline_Start
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_ControlState	Control state

```
CASE Stage Of
0: // Start
   R_TRIG_Local_instance( Online_Local_Start, Trigger_Local );
   R_TRIG_Remote_instance( Online_Remote_Start, Trigger_Remote );
    R_TRIG_Offline_instance( Offline_Start, Trigger_Offline );
    IF( Trigger_Local = TRUE ) THEN
        transitionEvent_ControlState := _eGEM_CONTROL#_GEM_CONTROL_ONLINE_LOCAL;
    ELSIF( Trigger_Remote = TRUE ) THEN
       transitionEvent_ControlState := _eGEM_CONTROL#_GEM_CONTROL_ONLINE_REMOTE;
    ELSIF( Trigger Offline = TRUE ) THEN
        transitionEvent_ControlState := _eGEM_CONTROL#_GEM_CONTROL_OFFLINE;
    ELSE
       RETURN;
    END_IF;
    IF (_GEM_ServiceStatus.EQRun = TRUE ) THEN
        // Initialization
        ChangeControlState_instance( Execute:=FALSE, transitionEvent:=transition-
Event_ControlState );
        Stage := 1;
    END_IF;
```

```
1: // Start state change.
    ChangeControlState_instance( Execute:=TRUE, transitionEvent:= transitionEvent_-
ControlState );
    IF( ChangeControlState instance.Done = TRUE ) THEN
        Stage := 2;
    ELSIF( ChangeControlState instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END IF;
2: // Wait for state change.
    IF( (transitionEvent_ControlState = _eGEM_CONTROL#_GEM_CONTROL_ONLINE_LOCAL )
        AND _GEM_ControlState.OnlineLocal = TRUE ) THEN
        Stage := 10;
    ELSIF( (transitionEvent_ControlState = _eGEM_CONTROL#_GEM_CONTROL_ONLINE_REMOTE
)
        AND _GEM_ControlState.OnlineRemote = TRUE ) THEN
        Stage := 10;
    \verb|ELSIF| ( transitionEvent_ControlState = \_eGEM_CONTROL\#\_GEM_CONTROL\_OFFLINE )| \\
        AND GEM ControlState.EquipOffline = TRUE ) THEN
        Stage := 10;
    END IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_InitEvent

The GEM_InitEvent instruction initializes event information.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_InitEvent	Initialize Events	FB	GEM_InitEvent_instance GEM_InitEvent — Execute Busy Error ErrorID	GEM_InitEvent_instance(

Variables

Only common variables are used.

Function

The GEM_InitEvent instruction initializes event information. The event information returns to the values that were set on the SECS/GEM Configurator.

Additional Information

• Events can be dynamically added from the host for acceptance tests. Execute this instruction to initialize these events without using the SECS/GEM Configurator.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description		
16#041D	Exceeded Simultaneous Instruction Exe-	The number of simultaneously executed GEM instructions		
	cuted Resources	exceeded the limit.		
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status		
	GEW Service Status III IIIItializing	was Initializing.		
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status		
10#3011	GEW Service Status III EQStarting	was EQStarting.		

Error code	Name	Description
16#3813	GEM Service Status in EQRun	The instruction was executed when the GEM Service status was EQRun.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Precautions for Correct Use

 Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQInitializing, an error will occur and Error will change to TRUE.

Sample Programming

This sample initializes the event information.

If the GEM Service status is EQInitializing and the *InitEvent_Start* internal variable changes from FALSE to TRUE, the event information is initialized.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	InitEvent_Start	BOOL	FALSE	Flag to start initialization of events in GEM Services
	InitEvent_instance	GEM_InitEvent		Instance of GEM_InitEvent instruction

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status



ST

Internal Variables	Variable	Data type	Initial value	Comment
	InitEvent_Start	BOOL	FALSE	Flag to start initialization of events in GEM Services
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in InitEvent_Start
	InitEvent_instance	GEM_InitEvent		Instance of GEM_InitEvent instruction
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status

```
CASE Stage Of
    R_TRIG_instance( InitEvent_Start, Trigger );
    IF( ( Trigger = TRUE )
       AND ( _GEM_ServiceStatus.EQInitializing = TRUE )) THEN
        // Initialization
            InitEvent_instance( Execute:=FALSE );
            Stage := 1;
   END_IF;
1: // Start send.
    InitEvent_instance( Execute:=TRUE );
    IF( InitEvent_instance.Done = TRUE ) THEN
       Stage := 10;
   ELSIF( InitEvent instance.Error = TRUE ) THEN
        // Add error processing as required.
       Stage := 10;
    END IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_ReportEvent

The GEM_ReportEvent instruction reports events to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
			05M B 45 4 1 1	GEM_ReportEvent_instance(
	Report Event FB		GEM_ReportEvent_instance GEM_ReportEvent	Execute,
		FB	Execute Done	CEID,
GEM_ReportE vent			CEID Busy —	Done,
VCIII			ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
CEID	Event ID	Input	Event ID to report to host	Depends on data type.		*1

^{*1.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean		Bit strings			Integers				Real num- bers		Times, durations, dates, and text strings								
	вооц	ЭТҮВ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	TNIS	INI	TNID	LINIT	REAL	LREAL	JMIT	DATE	DOL	ΤO	STRING
CEID						OK	OK	OK	OK											

Function

The GEM ReportEvent instruction reports the event specified with CEID to the host.

Additional Information

- This instruction uses the Collection Event Occurs on Equipment scenario for the GEM Event Notification capability.
- · The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0419	Incorrect Data Type	The data type specified for <i>CEID</i> was not USINT, UINT, UDINT, or ULINT.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3824	Undefined CEID	A CEID that was not registered on the SECS/GEM Configurator was specified.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQRun, an error will occur and Error will change to TRUE.
- In the following cases, the instruction ends normally and no event is reported to the host.
 - a) The instruction was executed when the communications state was not COMMUNICATING and the control state was not ON-LINE/LOCAL or ON-LINE/REMOTE.
 - b) A CEID that was disabled on the SECS/GEM Configurator was specified by the *CEID* input variable and the instruction was executed.

Sample Programming

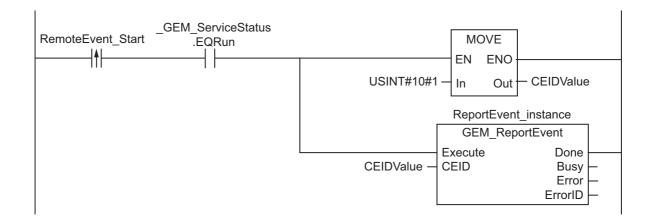
This sample reports a CEID = 1 event to the host.

If the GEM Service status is EQRun and the *ReportEvent_Start* internal variable changes from FALSE to TRUE, event notification is sent.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	ReportEvent_Start	BOOL	FALSE	Flag to start event notification
	DepartSyent instance	GEM_Report		Instance of GEM_ReportEvent
	ReportEvent_instance	Event		instruction
	DEIDValue	UINT	0	Value of CEID

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status



ST

Internal Variables	Variable	Data type	Initial value	Comment
	ReportEvent_Start	BOOL	FALSE	Flag to start event notification
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	CEIDValue	UINT	0	Value of CEID
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in ReportEvent_Start
	ReportEvent_instance	GEM_Report Event		Instance of GEM_ReportEvent instruction
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status

```
CASE Stage Of
    R_TRIG_instance( ReportEvent_Start, Trigger );
    IF( ( Trigger = TRUE )
       AND ( _GEM_ServiceStatus.EQRun = TRUE )) THEN
        // Initialization
        CEIDValue := UINT#1;
        ReportEvent_instance( Execute:=FALSE, CEID:=CEIDValue );
        Stage := 1;
   END_IF;
1: // Start send.
   ReportEvent_instance( Execute:=TRUE, CEID:=CEIDValue );
    IF( ReportEvent_instance.Done = TRUE ) THEN
       Stage := 10;
    ELSIF( ReportEvent_instance.Error = TRUE ) THEN
        // Add error processing as required.
       Stage := 10;
   END IF;
10: // End
   Stage := 0;
END CASE;
```

GEM_ReportAlarm

The GEM ReportAlarm instruction reports alarms and events to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_ReportAlarm_instance(
GEM_ReportAl			GEM_ReportAlarm_instance	Execute,
	Report Alarm		GEM_ReportAlarm	ALID,
		ED	Execute Done — ALID Busy —	AlarmState,
		FB	AlarmState Error —	Done,
			ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
ALID	Alarm ID	Input	Alarm number defined in alarm table	Depends on data type.		*1
AlramState	Alarm state	Input	Alarm state to report	_GEM_ALARM CLEAR, _GEM_ALARM_SET		_GEM_ALARM CLEAR

^{*1.} If you omit an input parameter, the default value is not applied. A building error will occur.

	Bool- ean		Bit strings			Integers					Real Times, durations num- dates, and text bers strings									
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	TNIS	TNI	DINT	LINI	REAL	LREAL	BMIL	DATE	DOL	ID	STRING
ALID						OK	OK	ОК	OK											
AlramState	Refer to	Refer to Function for the enumerators of the enumerated type _eGEM_ALARM_STATE.																		

Function

The GEM_ReportAlarm instruction reports the alarm state *AlarmState* with the specified alarm ID *ALID* to the host. The GEM_ReportAlarm instruction reports the event to the host.

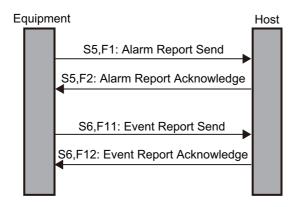
The data type of *AlarmState* is enumerated type _eGEM_ALARM_STATE.

The meanings of the enumerators are as follows:

Enumerator	Meaning
_GEM_ALARM_CLEAR	The alarm was cleared.
_GEM_ALARM_SET	An alarm occurred.

Additional Information

- This instruction uses the Send Alarm Report scenario of the GEM Alarm Management capability.
- The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related Error Codes

Error code	Name	Description
16#0419	Incorrect Data Type	The data type specified for ALID was not USINT, UINT, UDINT,
		or ULINT.
16#0400	Input Value Out of Range	The value of <i>AlarmState</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Exe-	The number of simultaneously executed GEM instructions
10#041D	cuted Resources	exceeded the limit.
16#3825	Undefined ALID	An ALID that was not registered on the SECS/GEM Configura-
10#3023	Olidelilled ALID	tor was specified.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status
10#3010	GEN Service Status III IIIItializing	was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status
10#3011	GEN Service Status III EQStarting	was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status
10#3012	GEN Service Status III EQITILIANZING	was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status
10#3014	GEINI Service Status III Stop	was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status
10#3013	GEIVI GEIVICE GIAIGS III EITOI	was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status
10#3010	GEW Service Status III Shutting Down	was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status
	CENT COLVICE CIGIGS III CHILICOWII	was Shutdown.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of
10#0010	modificant fransaction (Coource	transactions that can be buffered had been reached.

Precautions for Correct Use

- Check _GEM_ServiceStatus before you execute this instruction. If you execute this instruction when _GEM_ServiceStatus is not EQRun, an error will occur and Error will change to TRUE.
- In the following cases, execution of this instruction ends normally, the alarm status is not reported to the host, and only the event is reported.
 - a) The AlarmState input variable specifies the same state as the current alarm state.
 - b) An ALID that was disabled in the SECS/GEM Configurator is specified for the *ALID* input variable.

Sample Programming

This sample reports alarm ALID = 1 alarm status and event to the host.

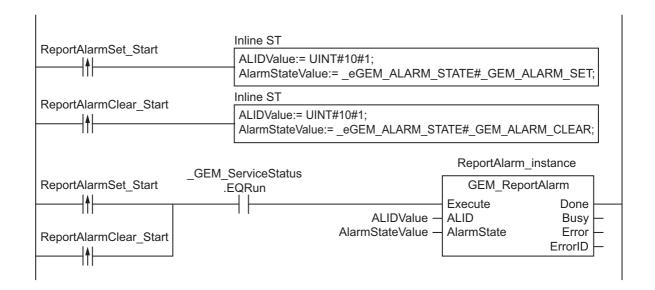
If the GEM Service status is EQRun, each alarm status is reported for the following changes.

- If the ReportAlarmSet_Start internal variable changes from FALSE to TRUE, notification that an alarm occurred is sent.
- If the ReportAlarmClear_Start internal variable changes from FALSE to TRUE, notification that the alarm was cleared is sent.

LD

Internal Variables	Variable	Data type	Initial value	Comment		
	ReportAlarmSet_Start	IBOOL IFALSE I		Flag to start notification that an alarm occurred		
	ReportAlarmClear_Start	r_Start BOOL		Flag to start notification that the alarm was cleared		
	ReportAlarm_instance	GEM_Report Alarm		Instance of GEM_ReportAlarm instruction		
	AlarmStateValue		_GEM_ ALARM CLEAR	Alarm information		
	ALIDValue	LIDValue UINT		ALID of alarm to report		

External Variables	Variable	Comment
·	_GEM_ServiceStatus	GEM Service status



ST

Internal Variables	Variable	Data type	Initial value	Comment
	ReportAlarmSet_Start	BOOL	FALSE	Flag to start notification that an alarm occurred
	ReportAlarmClear_Start	BOOL	FALSE	Flag to start notification that the alarm was cleared
	ALIDValue	UINT	0	ALID of alarm to report
	AlarmStateValue	_eGEM_ ALARM_ STATE	_GEM_ ALARM_ CLEAR	Alarm information
	R_TRIG_AlarmSet_ instance	R_TRIG		Instance of R_TRIG instruction for AlarmSet
	R_TRIG_AlarmClear_ instance	R_TRIG		Instance of R_TRIG instruction for AlarmClear
	Trigger_AlarmSet	BOOL	FALSE	Flag for FALSE to TRUE change in ReportAlarmSet_Start
	Trigger_AlarmClear	BOOL	FALSE	Flag for FALSE to TRUE change in ReportAlarmClear_Start
	ReportAlarm_instance	GEM_Report Alarm		Instance of GEM_ReportAlarm instruction
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status

```
CASE Stage Of
0:
    R_TRIG_AlarmSet_instance( ReportAlarmSet_Start, Trigger_AlarmSet );
    R_TRIG_AlarmClear_instance( ReportAlarmClear_Start, Trigger_AlarmClear );
    IF( Trigger_AlarmSet = TRUE ) THEN
        AlarmStateValue := _eGEM_ALARM_STATE#_GEM_ALARM_SET;
    ELSIF( Trigger_AlarmClear = TRUE ) THEN
        AlarmStateValue := _eGEM_ALARM_STATE#_GEM_ALARM_CLEAR;
    ELSE
```

```
RETURN;
    END_IF;
    IF( _GEM_ServiceStatus.EQRun = TRUE ) THEN
        // Initialization
        ReportAlarm_instance( Execute:=FALSE, ALID:=ALIDValue,AlarmState:=AlarmStat-
eValue );
        Stage := 1;
    END IF;
1: // Start send.
   ReportAlarm instance( Execute:=TRUE, ALID:=ALIDValue,AlarmState:=AlarmStateValue
);
    IF( ReportAlarm_instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( ReportAlarm_instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_AckHostCmd

The GEM_AckHostCmd instruction sends the execution accept/reject result in reply to an execution request for a host command.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_AckHost Cmd	Acknowledge Host Command	FB	GEM_AckHostCmd_instance GEM_AckHostCmd Execute Done RCMD Busy HCACK Error CPErrorNum ErrorID	GEM_AckHostCmd_instance(

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
RCMD	Command name		Received host command name*1	81 bytes max. (includ- ing final NULL)*2		
HCACK	Host com- mand parameter acknowl- edge code	Input	Command accept/reject code 16#00: Acknowledged. Command was executed. 16#01: Command does not exist. 16#02: Cannot perform now. 16#03: At least one parameter is invalid. 16#04: Acknowledged. Command will be performed with completion signaled later. 16#05: Rejected. Already in desired condition. 16#06: No such object exists.	16#00 to 16#3F		16#00
	Number of		16#07 to 16#3F: Reserved.			
CPError- Num	command parameter errors		Number of command parameters deemed in error	Depends on data type.		0

^{*1.} It is not necessary to set an input variable. The PPID from the host command execution request is input automatically.

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

	Bool- ean	ı	Bit st	trings	,				Inte	gers					eal m- ers		dates	, dura s, and tring	d tex	
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINI	REAL	LREAL	TIME	DATE	TOD	TO	STRING
RCMD																				ОК
HCACK		OK																		
CPErrorNum						OK	OK			OK	OK									

Function

The GEM_AckHostCmd instruction sends the execution accept/reject result in reply to an execution request for a host command from the host. The following are required for the reply.

· Host command parameter acknowledge code

The acknowledge tells whether the host command can be executed. The result is based on the following checks.

- a) Is the host command valid?
- b) Can the host command be executed?
- · Number of host command parameter errors

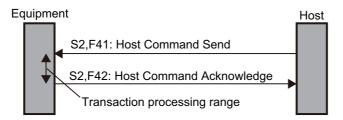
This is the number of CPVAL values deemed in error in the host command.

- The following information on the CPVAL values that were deemed to be in error in the host command
 - a) CPNAME of each CPVAL value
 - b) Acknowledge codes of the CPVAL values that were deemed to be in error

Refer to the application procedure for this instruction for the processing to send a reply with the execution accept/reject result.

Additional Information

- This instruction uses the Host Command scenario of the GEM Remote Control capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyHostCmd			Gives the status of processing a transaction for a
	Host Command Transaction Processing Flag	BOOL	host command from the host.*1
			TRUE: Processing
			FALSE: Not processing.

Name	Meaning	Data type	Description
OFM Interior Id Is at Over		DOO!	Specifies whether to prohibit reception of host commands from the host.
_GEM_InterlockHostCmd	Host Command Interlock	BOOL	TRUE: Prohibited.
			FALSE: Granted
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when Host Command Send (S2,F41) is received. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Variables for Host Command Reception

Name	Description	SECS/GEM Configurator setting
S2,F41: RCMD	Stores the RCMD of the host command received from the host.	Host Command – Opera- tion settings
S2,F41: Number of CPNAMEs S2,F41: CPNAME Table	Stores the number of host command CPNAMEs received from the host. Stores the CPNAMEs of the host command received	, non counge
S2,F41: CPVAL	from the host. Stores the CPVAL of the host command CPNAME received from the host. There is a different variable for each CPNAME.	Host commands – Host command definition

Variables for Host Command Send

Name	Description	SECS/GEM Configurator setting
S2,F42: Error CPNAME	Stores the CPNAMEs of the CPVALs that were	Host Command – Opera-
Table	deemed to be in error.	tion settings
S2,F42: CPACK Table	Stores the acknowledge codes of the CPVAL that were	
	deemed to be in error.	
	16#01: Parameter name CPNAME does not exist.	
	16#02: Illegal value specified for CPVAL.	
	16#03: Illegal format specified for CPVAL.	
	16#04 to 16#3F: Other equipment-specific errors	

Related Error Codes

Error code	Name	Description			
16#3830	HCACK Out of Range	The value of the <i>HCACK</i> input variable is outside of the valid			
10#3030	TIOACK Out of Range	range.			
16#041D Exceeded Simultaneous Instruction Exe		The number of simultaneously executed GEM instructions			
10#041D	cuted Resources	exceeded the limit.			
		The value specified in the CPErrorNum input variable is larger			
16#3821	Invalid Size	than the number of array elements in S2,F42: Error CPNAME			
		Table or S2,F42: CPACK Table.			

Error code	Name	Description
16#382F	Illegal CPNAME	A CPNAME specified in S2,F41: CPNAME Table is different from a received CPNAME.
16#3831	CPACK Out of Range	The value in S2,F42: CPACK Table is outside of the valid range.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when a host command was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) _GEM_BusyHostCmd must be TRUE.
- In the following cases, _GEM_BusyHostCmd does not change to TRUE even if Host Command Send (S2,F41) is received.
 - a) The RCMD received in the host command does not exist in the receivable host commands set on the SECS/GEM Configurator.
 - b) The data type of RCMD, CPNAME, or CPVAL did not agree between the received host command and SECS/GEM Configurator setting.
 - c) The user-defined variable to store RCMD, CPNAME, or CPVA from the received host command does not exist.
 - d) GEM Interlock HostCmd is TRUE.
 - e) Host Command Send (S2,F41) is disabled in the message settings on the SECS/GEM Configurator.
- S2,F41: CPVAL is not updated if Omit Parameters is enabled on the SECS/GEM Configurator.
- Execution of the instruction will not end in an error even if the *RCMD* input variable specifies a command name that is different from the command name in *S2,F41: RCMD*.

Application Procedure

Use the following procedure for this instruction.

1 Detecting Host Command Reception

Confirm that _GEM_BusyHostCmd changes from FALSE to TRUE.

Store the received host command in the following variables.

- S2,F41: RCMD
- S2,F41: Number of CPNAMEs
- S2,F41: CPNAME Table
- S2,F41: CPVAL
- **2** Determining the Validity of the Host Command and Storing Error Information

Determine if the host command is valid.

Examples of the criteria to determine validity are given below.

• Is the value of S2,F41: CPVAL correct?

If all of the CPVAL values meet the above criteria, the host command parameter acknowledge code is 16#00. If even one of the CPVAL values does not meet the above criteria, the host command parameter acknowledge code is 16#03. Store the error information for CPVAL values that do not meet the criteria as follows:

- Store the CPNAME of the CPVAL in S2,F42: Error CPNAME Table.
- Store the acknowledge code as the accept/reject result in S2,F42: CPACK Table.
- **3** Determining If the Host Command Can Be Executed

If the host command is valid, determine if the host command can be executed.

If it can be executed, the host command parameter acknowledge code is 16#00.

If it cannot be executed, the host command parameter acknowledge code is 16#02.

4 Executing Host Command

If the host command can be executed, execute it.

If host command execution completion will be reported as an event to the host after completion of the execution of this instruction, the host command parameter acknowledge code is 16#04.

If a response message will be sent as notification after completion of the execution of this instruction, the host command parameter acknowledge code is 16#00.

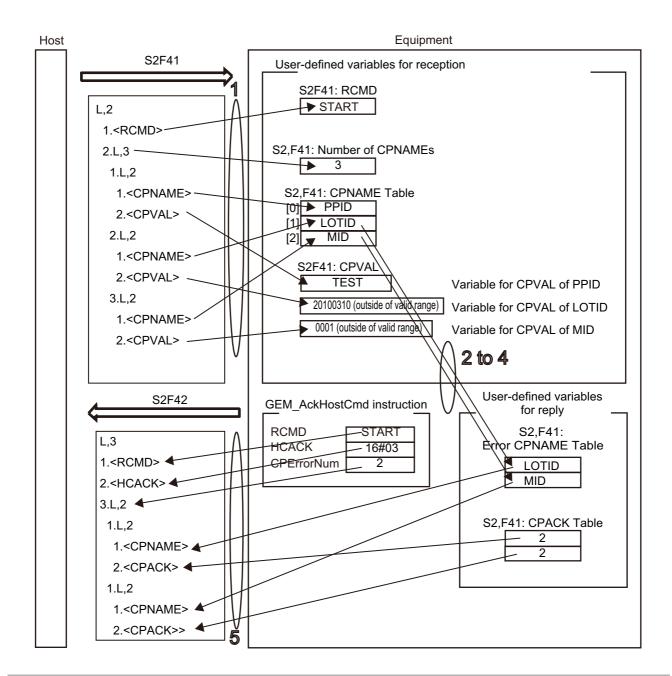
5 Sending the Host Command Execution Accept/Reject Result

Set the host command parameter acknowledge code from steps 2 to 4 for the *HCACK* input variable and execute the instruction. The host command execution accept/reject result is sent to the host.

The following diagram shows the user program processing and data flow for the application procedure. This diagram shows an example in which the host command START that was received from the host contains an invalid parameter. The CPNAME parameter in the host command START contains the following data.

- PPID
- LOTID
- MID

CPNAME is determined to be an invalid parameter because the CPVAL values for LOTID and MID are outside of the valid ranges. Numbers 1 to 5 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the execution accept/reject result in reply to an execution request for a host command from the host.

The START host command is used in this example.

SECS/GEM Configurator

First, the START host command is defined on the SECS/GEM Configurator.

Link variables for the operation settings of the host command are registered.

Name	Link variable
Link variable for S2F41: RCMD	S2F41_RCMD
Max number of CPNAMEs	3
Link variable for S2F41: CPNAMEs list - CPNAME Count	S2F41_CPNAME_NUMBER

Name	Link variable
Link variable for S2F41: CPNAMEs list - CPNAME Table	S2F41_CPNAME_TABLE
Link variable for S2F42: error CPNAME table	S2F42_CPNAME_TABLE
Link variable for S2F42: CPACK table	S2F42_CPACK_TABLE

The settings to register for CPNAME and CPVAL of the START host command on the *Host command definition* Tab Page are given in the following table.

	CPNAME		CPVAL				
Name	Omission	Order fixed	Format	Data size	Link variable		
PPID	ON	OFF	Α	80	S2F41_START_PPID		
LOTID	ON	OFF	Α	16	S2F41_START_LOTID		
MID	ON	OFF	Α	16	S2F41_START_MID		

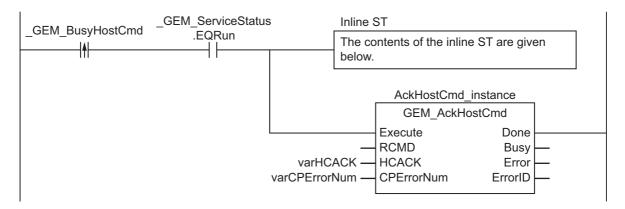
Next, enter the programming on the Sysmac Studio.

An error will occur in the verification if the value of CPVAL for PPID, LOTID, or MID is an empty string.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	varHCACK	BYTE		Result acknowledge code
	varCPErrorNum	UINT	0	Number of errors
	AckHostCmd_instance	GEM_AckHost Cmd		Instance of GEM_AckHostCmd instruction
	varCPACK	BYTE		Host command parameter acknowledge code
	index	INT		

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostCmd	Host Command Transaction Processing Flag
	S2F41_RCMD	Variable for RCMD of the host command received from the host
	S2F41_CPNAME_NUMBER	Variable for number of CPNAMEs of the host command received from the host
	S2F41_CPNAME_TABLE	Variable for CPNAME of the host command received from the host
	S2F41_START_PPID	Variable for CPVAL when CPNAME of START host command is PPID
	S2F41_START_LOTID	Variable for CPVAL when CPNAME of START host command is LOTID
	S2F41_START_MID	Variable for CPVAL when CPNAME of START host command is MID
	S2F42_CPNAME_TABLE	Variable for number of CPNAMEs deemed to be in error
	S2F42_CPACK_TABLE	Variable for number of acknowledge codes deemed to be in error



Contents of Inline ST

```
// Verification
Clear( S2F42_CPNAME_TABLE );
Clear( S2F42 CPACK TABLE );
varCPErrorNum := 0;
varHCACK:=0;
IF( EQascii( S2F41 RCMD, 'START') =TRUE ) THEN
    IF ( S2F41 CPNAME NUMBER <> 0 ) THEN
        // Parameter check for START host command
        FOR index:=INT#0 TO S2F41 CPNAME NUMBER-1 BY INT#1 DO
            varCPACK :=0;
            IF( EQascii(S2F41 CPNAME TABLE[index], 'PPID') = TRUE ) THEN
                IF( EQascii(S2F41 START PPID, '') ) THEN
                                        // Illegal value specified for CPVAL.
                    varCPACK :=2;
                END IF:
            ELSIF( EQascii(S2F41 CPNAME_TABLE[index], 'LOTID') = TRUE ) THEN
                IF( EQascii(S2F41_START_LOTID, '') ) THEN
                    varCPACK :=2;
                                         // Illegal value specified for CPVAL.
                END IF;
            ELSIF( EQascii(S2F41 CPNAME TABLE[index], 'MID') = TRUE ) THEN
                IF( EQascii(S2F41 START MID, '') ) THEN
                    varCPACK :=2;
                                         // Illegal value specified for CPVAL.
                END IF;
            ELSE
                varCPACK := 1;
                                      // Parameter name CPNAME does not exist.
            END_IF;
            IF (varCPACK <> 0 ) THEN
                S2F42_CPNAME_TABLE[ varCPErrorNum ] := S2F41_CPNAME_TABLE[index];
                S2F42 CPACK TABLE[ varCPErrorNum ] := varCPACK;
                varCPErrorNum := varCPErrorNum + 1;
            END IF;
        END FOR;
        IF ( varCPErrorNum <> 0 ) THEN
            varHCACK := 3;
                                  // At least one parameter is invalid.
        END IF;
    END_IF;
ELSE
    varHCACK:=1;
END_IF;
```

ST

Internal Variables	Variable	Data type	Initial value	Comment
	varHCACK	BYTE		Result acknowledge code
	varCPErrorNum	UINT	0	Number of errors
	AckHostCmd_instance	GEM_AckHost Cmd		Instance of GEM_AckHostCmd instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostCmd
	Stage	INT	0	Program execution status
	varCPACK	BYTE		Host command parameter acknowledge code
	index	INT		

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostCmd	Host Command Transaction Processing Flag
	S2F41_RCMD	Variable for RCMD of the host command received from the host
	S2F41_CPNAME_NUMBER	Variable for number of CPNAMEs of the host command received from the host
	S2F41_CPNAME_TABLE	Variable for CPNAME of the host command received from the host
	S2F41_START_PPID	Variable for CPVAL when CPNAME of START host command is PPID
	S2F41_START_LOTID	Variable for CPVAL when CPNAME of START host command is LOTID
	S2F41_START_MID	Variable for CPVAL when CPNAME of START host command is MID
	S2F42_CPNAME_TABLE	Variable for number of CPNAMEs deemed to be in error
	S2F42_CPACK_TABLE	Variable for number of acknowledge codes deemed to be in error

```
CASE Stage Of
0: // Notification of reception from host.
    R_TRIG_instance( _GEM_BusyHostCmd, Trigger );
    IF( Trigger = TRUE )THEN
        // Initialization
       AckHostCmd instance( Execute:=FALSE );
        // Host command verification
        IF( EQascii( S2F41 RCMD, 'START') =TRUE ) THEN
           Stage:=1;
       ELSE
           varHCACK:=1;
           varCPErrorNum := 0;
            Stage:=2;
       END_IF;
   END IF;
1: // Verification
    Clear( S2F42_CPNAME_TABLE );
    Clear( S2F42_CPACK_TABLE );
    varCPErrorNum := 0;
    varHCACK:=0;
    IF ( S2F41_CPNAME_NUMBER <> 0 ) THEN
        // Parameter check for START host command
        FOR index:=INT#0 TO S2F41_CPNAME_NUMBER-1 BY INT#1 DO
            varCPACK :=0;
```

```
IF( EQascii(S2F41 CPNAME TABLE[index], 'PPID') = TRUE ) THEN
                IF( EQascii(S2F41_START_PPID, '') ) THEN
                    varCPACK :=2;
                                        // Illegal value specified for CPVAL.
                END IF;
            ELSIF( EQascii(S2F41 CPNAME TABLE[index], 'LOTID') = TRUE ) THEN
                IF( EQascii(S2F41 START LOTID, '') ) THEN
                    varCPACK :=2;
                                        // Illegal value specified for CPVAL.
                END IF;
            ELSIF( EQascii(S2F41 CPNAME TABLE[index], 'MID') = TRUE ) THEN
                IF( EQascii(S2F41 START MID, '') ) THEN
                   varCPACK :=2;
                                       // Illegal value specified for CPVAL.
                END IF;
            ELSE
                                      // Parameter name CPNAME does not exist.
               varCPACK := 1;
            END IF;
            IF (varCPACK <> 0 ) THEN
                S2F42_CPNAME_TABLE[ varCPErrorNum ] := S2F41_CPNAME_TABLE[index];
                S2F42 CPACK TABLE[ varCPErrorNum ] := varCPACK;
                varCPErrorNum := varCPErrorNum + 1;
            END IF;
        END FOR;
        IF ( varCPErrorNum <> 0 ) THEN
                             // At least one parameter is invalid.
           varHCACK := 3;
        END IF;
    END IF;
    Stage := 2;
2: // Reply to host.
    AckHostCmd instance( Execute:=TRUE, HCACK:=varHCACK, CPErrorNum:=varCPErrorNum
);
    IF( AckHostCmd instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( AckHostCmd instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END IF;
10: // End
    Stage := 0;
END CASE; E
```

GEM_AckEnhancedRmtCmd

The GEM_AckEnhancedRmtCmd instruction sends the execution accept/reject result in reply to an execution request for an enhanced remote command.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Ack EnhancedRmt Cmd	Acknowledge Enhanced Remote Com- mand	FB	GEM_AckEnhancedRmtCmd_instance GEM_AckEnhancedRmtCmd Execute Done — RCMD Busy — HCACK Error — CPErrorNum ErrorID	GEM_AckEnhancedRmtCmd_ instance(Execute, RCMD, HCACK, CPErrorNum, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
RCMD	Command name		Received enhanced remote command name*1	81 bytes max. (including final NULL)*2		
			Command accept/reject code			
	Host command parameter acknowledge code		16#00: Acknowledged. Command was executed.			16#00
		Input	16#01: Command does not exist.			
			16#02: Cannot perform now.			
			16#03: At least one parameter is invalid.	16#00 to		
HCACK			16#04: Acknowledged. Command will be performed with completion signaled later.	16#3F		
			16#05: Rejected. Already in desired condition.			
			16#06: No such object exists.			
			16#07 to 16#3F: Reserved.			
CPErrorNum	Number of com- mand parameter		Number of command parameters	Depends on		0
	errors		deemed in error	data type.		0

^{*1.} It is not necessary to set an input variable. The PPID from the enhanced remote command execution request is input automatically.

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

	Bool- ean	В	it st	rings	3	Integers				Real num- bers		Times, durations, dates, and text strings								
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
RCMD																				OK
HCACK		OK																		
CPError Num						ОК	ОК			ОК	OK									

Function

The GEM_AckEnhancedRmtCmd instruction sends the execution accept/reject result in reply to an execution request for an enhanced remote command from the host. The following are required for the reply.

· Command parameter acknowledge code

This code tells whether the enhanced remote command can be executed. The result is based on the following checks.

- a) Is the enhanced remote command valid?
- b) Can the enhanced remote command be executed?
- · Number of command parameter errors

This is the number of error CEPVALs in the enhanced remote command.

- · Detailed information on error CEPVAL values in the enhanced remote command
 - a) CPNAMEs of the CEPVAL values that were deemed to be in error
 - b) Acknowledge codes of the CEPVAL values that were deemed to be in error

Refer to the application procedure for this instruction for the processing to send a reply with the execution accept/reject result.

Additional Information

- This instruction uses the Enhanced Remote Command scenario of the GEM Remote Control capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
	- ID I O		Gives the status of processing a transaction
_GEM_Busy	Enhanced Remote Com- mand Transaction Pro- cessing Flag	BOOL	for an enhanced remote command.*1
EnhancedRmtCmd		BOOL	TRUE: Processing
	Cocomig ring		FALSE: Not processing

Name	Meaning	Data type	Description
_GEM_Interlock	Enhanced Remote Com-	POOL	Specifies whether to prohibit reception of enhanced remote commands from the host.
EnhancedRmtCmd	mand Interlock	BOOL	TRUE: Prohibited
			FALSE: Granted
GEM ServiceStatus	GEM Service Status	_sGEM_SER-	Gives the GEM Service status.
_GEIVI_Sei vicestatus	GEINI SEI VICE SIAIUS	VICE_STATUS	Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when Enhanced Remote Command Send (S2,F49) is received. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Variables to Receive Enhanced Remote Command Requests

Name	Description	SECS/GEM Configurator setting
S2,F49: RCMD	Stores the RCMD of the enhanced remote command received	Enhanced Remote Com-
	from the host.	mand – Operation settings
S2,F49: OBJSPEC	Stores the OBJSPEC of the enhanced remote command	
	received from the host.	
S2,F49: Number of	Stores the number of enhanced remote command CPNAMEs	
CPNAMEs	received from the host.	
S2,F49: CPNAME Table	Stores the enhanced remote command CPNAMEs received	
	from the host.	
S2,F49: Variable for	Stores the CEPVAL of the enhanced remote command	Enhanced Remote Com-
CEPVAL	CPNAME received from the host. There is a different variable	mand – Host command defini-
	for each CPNAME.	tion

• Variables to Reply to Enhanced Remote Command Requests

Name	Description	SECS/GEM Configurator setting
S2,F50: Error CPNAME	Stores the CPNAMEs of the CEPVALs that were deemed to	Enhanced Remote Com-
Table	be in error.	mand – Operation settings
S2,F50: CEPACK Table	Stores the acknowledge codes of the CEPACKs that were	
	deemed to be in error.	
	16#01: Parameter name CPNAME does not exist.	
	16#02: An illegal value is specified for CEPVAL.	
	16#03: An illegal format is specified for CEPVAL.	
	16#04: Usage of parameter name CPNAME is not valid.	
	16#05 to 16#3F: Reserved.	

Related Error Codes

Error code	Name	Description		
16#3830	HCACK Out of Range	The value of the HCACK input variable is outside of the valid		
		range.		
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.		

Error code	Name	Description
16#3821	Invalid Size	The value specified in the <i>CPErrorNum</i> input variable is larger than the number of array elements in <i>S2,F50: Error CPNAME Table</i> .
16#382F	Illegal CPNAME	A CPNAME specified in <i>S2,F50: Error CPNAME Table</i> is different from the received CPNAME.
16#3832	CEPACK Out of Range	The value in <i>S2,F50: CEPACK Table</i> is outside of the valid range.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when an enhanced remote command was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) GEM BusyEnhancedRmtCmd must be TRUE.
- In the following cases, _GEM_BusyEnhancedRmtCmd does not change to TRUE even if an enhanced remote command is received.
 - a) The RCMD received in the enhanced remote command does not exist in the receivable host commands set on the SECS/GEM Configurator.
 - b) The data type of RCMD, OBJSPEC, CPNAME, or CEPVAL did not agree between the received enhanced host command and the SECS/GEM Configurator setting.
 - c) The user-defined variable to store RCMD, OBJSPEC, CPNAME, or CEPVAL from the received enhanced remote command does not exist.
 - d) _GEM_Interlock_EnhancedRmtCmd is TRUE.
 - e) Enhanced Remote Command (S2,F49) is disabled in the GEM message settings on the SECS/GEM Configurator.
- If the Omit parameter is enabled for the enhanced remote commands on the SECS/GEM Configurator, S2,F49: Variable for CEPVAL is not updated.
- Execution of the instruction will not end in an error even if the *RCMD* input variable specifies a command name that is different from the command name in *S2,F49: RCMD*.

Application Procedure

Use the following procedure for this instruction.

1 Detecting Enhanced Remote Command Reception

Confirm that _GEM_BusyEnhancedRmtCmd changes from FALSE to TRUE.

Store the received enhanced remote command in the following variables.

- S2F49: RCMD
- S2F49: OBJSPEC
- S2,F49: Number of CPNAMEs
- S2,F49: CPNAME Table
- S2,F49: CEPVAL
- **2** Determining the Validity of the Enhanced Remote Command and Storing Error Information Determine if the enhanced remote command is valid.

Examples of the criteria to determine validity are given below.

• Is the value of S2,F41: CPVAL correct?

If all of the CEPVAL values meet the above criteria, the host command parameter acknowledge code is 16#00. If even one of the CEPVAL values does not meet the above criteria, the host command parameter acknowledge code is 16#03. Store the error information for CEPVAL values that do not meet the criteria as follows:

- Store the CPNAME of the CEPVAL in S2,F50: Error CPNAME Table.
- Store the acknowledge code as the accept/reject result in S2,F50: CEPVAL Table.
- 3 Determining If the Enhanced Remote Command Can Be Executed

If the enhanced remote command is valid, determine if the enhanced remote command can be executed.

If it can be executed, the host command parameter acknowledge code is 16#00.

If it cannot be executed, the host command parameter acknowledge code is 16#02.

4 Executing Enhanced Remote Command

If the enhanced remote command can be executed, execute it.

If enhanced remote command execution completion will be reported as an event to the host after completion of the execution of this instructions, the host command parameter acknowledge code is 16#04.

If a response message will be sent as notification after completion of the execution of this instruction, the host command parameter acknowledge code is 16#00.

Sending the Enhanced Remote Command Execution Accept/Reject Result

Set the host command parameter acknowledge code from steps 2 to 4 for the *HCACK* input variable and execute the instruction. The enhanced remote command execution accept/reject result is sent to the host.

Refer to the application procedure for the *GEM_AckHostCmd* on page A-50 for the user program processing and data flow of the application procedure.

Sample Programming

Refer to the sample programming that is provided for the GEM_AckHostCmd on page A-50.

GEM_ChangeECV

The GEM_ChangeECV instruction changes the value of an equipment constant.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
			GEM_ChangeECV_instance	GEM_ChangeECV_instance(Execute,
GEM_Change	Change Equip- ment Constant		GEM_ChangeECV Execute Done	ECID,
		FB	ECID Busy Value Error	Value,
ECV			ErrorID —	Done,
				Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
ECID	Equipment constant ID	Input	Equipment constant ID (ECID) to change	Depends on		*1
Value	Value of equipment constant	прас	New equipment constant value	data type.		

^{*1.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	Bit strings			Integers					Real num- bers		Times, durations, dates, and text strings								
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
ECID						OK	OK	OK	OK	*1	*1	*1	*1							
Value	OK An array	OK y can	*1 also	*1 be sp	*1 ecifie	OK d. ^{*2}	OK	OK	*1	OK	OK	OK	*1	OK	OK	*1	*1	*1	*1	OK

^{*1.} An error will occur when the instruction is executed if this data type is specified for an input parameter.

Function

The GEM_ChangeECV instruction changes the value of the equipment constant specified with *ECID* to *Value*.

Additional Information

- This instruction uses the Operator Changes Equipment Constant scenario for the GEM Equipment Constants capability.
- If the equipment constant is changed successfully, this instruction ends normally.

^{*2.} You can specify only a BYTE array. An error will occur when the instruction is executed if an array of any other data type is specified.

Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

Related User-defined Variables

Name	Description	SECS/GEM Configurator setting
Number of Change Notification ECIDs*1	Stores the number of changed ECIDs.	Event notification – Event definitions
Change Notification ECID Table*1	Stores the changed ECIDs.	

^{*1.} These variables are used to report the Operator Equipment Constant Change collection event to the host.

Related Error Codes

Error code	Name	Description
16#0419	Incorrect Data Type	The data type of the <i>ECID</i> input variable was not USINT, UINT, UDINT, or ULINT.
16#382D	Type Mismatch	The data type of the <i>Value</i> input variable is different from the data type specified on the SECS/GEM Configurator.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#382C	Undefined ECID	The value of the <i>ECID</i> input variable is not registered on the SECS/GEM Configurator.
16#3820	Too Many Characters	The Value input variable has a STRING data type, but a longer text string was specified in Value than the number of characters set on the SECS/GEM Configurator.
16#382E	ECV Out of Range	The value specified for the <i>Value</i> input variable is outside of the range for the upper and lower limits that were set on the SECS/GEM Configurator.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction
 is executed when any of these conditions is not met, an error will occur and *Error* will change to
 TRUE.
 - a) _GEM_ServiceStatus must be EQInitializing or EQRun.
 - b) The value specified for the *ECID* input variable must be an ECID registered on the SECS/GEM Configurator.
 - c) The data type of the *Value* input variable must be the same as the data type specified on the SECS/GEM Configurator.
 - d) If the data type of the *Value* input variable is STRING, the number of characters specified in *Value* must be equal to or less than the number of characters that was set on the SECS/GEM Configurator.
- Use the GEM_ReportEvent instruction to report an Operator Equipment Constant Change collection
 event to the host.

Application Procedure

Use the following procedure for this instruction.

- Changing the Value of the Equipment Constant

 Specify the ID of the equipment constant to change in the *ECID* input variable and the value to change it to in the *Value* input variable, and then execute the instruction.

 Repeat the above step to change more than one equipment constant.
- Reporting the Operator Equipment Constant Change Collection Event to the Host Report the collection event to the host as required. Store the IDs of the equipment constants that were changed in step 1 in *Change Notification ECID Table* and the number of equipment constants that were changed in *Number of Change Notification ECIDs*. Then execute the GEM ReportEvent instruction.

Sample Programming

This sample changes the EstablishCommunicationsTimeout equipment constant to 100.

After the equipment constant change is completed, an Operator Equipment Constant Change collection event is reported to the host. If the GEM Service status is EQRun and the *ChangeECV_Start* internal variable changes from FALSE to TRUE, changing the equipment constant is started.

SECS/GEM Configurator

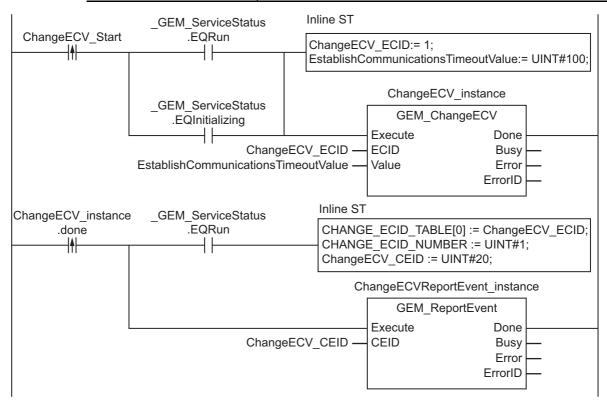
Set the ECID and CEID.

Function	ID	Item	Value
Equipment constant	ECID	EstablishCommunicationsTimeout	1
Event	CEID	Operator Equipment Constant Change	20

LD

Internal Variables	Variable	Data type	Initial value	Comment
	ChangeECV_Start	BOOL	FALSE	Flag to start changing equipment constant
	ChangeECV_ECID	UINT	0	Equipment constant ID
	EstablishCommunications- TimeoutValue	UINT	0	New value for EstablishCommunicationsTimeout equipment constant
	ChangeECV_CEID	UINT	0	Event ID for changing equipment constant by operator
	ChangeECV_instance	GEM_ ChangeECV		Instance of GEM_ChangeECV instruction
	ChangeECVReportEvent_instance	GEM_ ReportEvent		Instance of GEM_ReportEvent instruction

External Variables	Variable	Comment
	CHANGE_ECID_TABLE	Change Notification ECID Table
	CHANGE_ECID_NUMBER	Number of Change Notification ECIDs
	_GEM_ServiceStatus	GEM Service status



ST

Internal Variables	Variable	Data type	Initial value	Comment
	ChangeECV_Start	BOOL	FALSE	Flag to start changing equipment constant
	ChangeECV_ECID	UINT	0	Equipment constant ID
	EstablishCommunications- TimeoutValue	UINT	0	New value for EstablishCommunicationsTimeout equipment constant
	ChangeECV_CEID	instance GEM ChangeECV		Event ID for changing equipment constant by operator
	ChangeECV_instance			Instance of GEM_ChangeECV instruction
	ChangeECVReportEvent_instance			Instance of GEM_ReportEvent instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in ChangeECV_Start
	Stage	INT		Program execution status

External Variables	Variable	Comment
	CHANGE_ECID_TABLE	Change Notification ECID Table
	CHANGE_ECID_NUMBER	Number of Change Notification ECIDs
	_GEM_ServiceStatus	GEM Service status

```
CASE Stage Of
0: // Start
  R_TRIG_instance( ChangeECV_Start, Trigger );
  IF( (Trigger = TRUE)
   AND (( _GEM_ServiceStatus.EQInitializing = TRUE ) OR ( _GEM_ServiceStatus.EQRun =
TRUE ))) THEN
   // Initialization
    ChangeECV CEID:=UINT#1;
    EstablishCommunicationsTimeoutValue := UINT#100;
    ChangeECV instance ( Execute:=FALSE, ECID:=ChangeECV ECID,
    Value:= EstablishCommunicationsTimeoutValue );
    ChangeECV_CEID := UINT#20;
    ChangeECVReportEvent instance( Execute:= FALSE, CEID:=ChangeECV CEID );
    // Record information in event notification table.
    CHANGE_ECID_TABLE[0] := ChangeECV_ECID;
    CHANGE_ECID_NUMBER := UINT#1;
    Stage := 1;
  END_IF;
1: // Change equipment constant.
  ChangeECV_instance( Execute:=TRUE, ECID:=ChangeECV_ECID,
  Value:= EstablishCommunicationsTimeoutValue );
  IF ( ChangeECV_instance.Done = TRUE AND _GEM_ServiceStatus.EQRun = TRUE ) THEN
   Stage := 2;
  ELSIF( ChangeECV instance.Error = TRUE ) THEN
    // Add error processing as required.
    Stage := 10;
  ELSE
    // Do not send event.
   Stage:= 10;
  END_IF;
2: // Notify host of change.
  ChangeECVReportEvent_instance( Execute:=TRUE, CEID:=ChangeECV_CEID );
  IF( ChangeECVReportEvent_instance.Done = TRUE ) THEN
```

```
Stage := 10;
ELSIF( ChangeECVReportEvent_instance.Error = TRUE ) THEN
    // Add error processing as required.
    Stage := 10;
END_IF;
10: // End
Stage := 0;
END_CASE;
```

GEM_AckChangeECV

The GEM_AckChangeECV instruction sends the equipment constant change accept/reject result in reply to an equipment constant change request from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_AckChangeECV_instance(
GEM_AckChan geECV Equ	Acknowledge Equipment Constant Change		GEM_AckChangeECV_instance GEM_AckChangeECV	Execute,
			Execute Done	EAC,
		FB	EAC Busy Error	Done,
		ErrorID	Busy,	
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
			Reply to equipment constant change request 16#00: Acknowledge			
EAC	Equipment acknowledge code	Input	16#01: Denied, at least one constant does not exist.	16#00 to 16#3F		16#00
	code		16#02: Denied, busy. 16#03: Denied, at least one constant is out of range.			
			16#04 to 16#3F: Reserved			

	Bool- ean	Bit strings			Integers				Real num- bers		Times, durations, dates, and text strings									
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
EAC		OK																		

Function

The GEM_AckChangeECV instruction sends the equipment constant change accept/reject result in reply to an equipment constant change request from the host. The following are required for the reply.

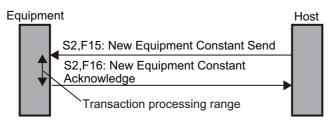
· Equipment acknowledge code

This is the accept/reject result for the equipment constant change request.

Refer to the application procedure for this instruction for the processing to send a reply with the equipment constant change accept/reject result.

Additional Information

- This instruction uses the Host Sends Equipment Constants scenario for the GEM Equipment Constants capability.
- If this instruction is executed and execution ends normally, the equipment constant changes that were requested by the host are completed and a SECS message is sent. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the status of processing a transaction for a
_GEM_BusyHostChan-	Host-initiated Equipment	BOOL	host-initiated equipment constant change.*1
geECV	Constant Change Trans- action Processing Flag	BOOL	TRUE: Processing
	and the second of the second o		FALSE: Not processing
			Specifies whether to prohibit equipment constant
OFM later a slatov	Equipment Constant Interlock	DOOL	changes from the host.
_GEM_InterlockECV		BOOL	TRUE: Prohibited.
			FALSE: Granted
		_sGEM	
_GEM_ServiceStatus	GEM Service Status	SER-	Gives the GEM Service status.
_OLIVI_OCI VIOCOIAIUS	SEW SCIVICE Status	VICE_STAT US	Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when New Equipment Constant Send (S2,F15) is received. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

Name	Description	SECS/GEM Configurator setting
Number of Change Request ECIDs	Stores the number of ECIDs for which a change request was received from the host.	Equipment Constant – Opera-
		tion settings
Change Request ECID	Stores the ECIDs for which a change request was received	
Table	from the host.	

Related Error Codes

Error code	Name	Description
16#3836	EAC Out of Range	The value of the <i>EAC</i> input variable is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when an equipment constant change request was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) _GEM_BusyHostChangeECV must be TRUE.
- In the following cases, _GEM_BusyHostChangeECV does not change to TRUE even if New Equipment Constant Send (S2,F15) is received.
 - a) An equipment constant received from the host was not registered in the SECS/GEM Configurator.
 - b) The data type of the equipment constant is different between the data received from the host and the SECS/GEM Configurator setting.
 - c) An equipment constant value received from the host is outside of the valid range set in the SECS/GEM Configurator.
 - d) GEM Interlock ECV is TRUE.
 - e) New Equipment Constant Acknowledge (S2,F16) is disabled in the message settings on the SECS/GEM Configurator.

Application Procedure

Use the following procedure for this instruction.

Detecting an Equipment Constant Change Request

Confirm that _GEM_BusyHostChangeECV changes from FALSE to TRUE.

Store the IDs of the equipment constants with change requests in the following variables.

- · Change Request ECID Table
- · Number of Change Request ECIDs
- Determining Acceptance/Rejection of Equipment Constant Change Request

 Determine if it is possible to change the ECIDs in Change Request ECID Table. Do this for the

Determine if it is possible to change the ECIDs in Change Request ECID Table. Do this for the number of changes requested in *Number of Change Request ECIDs*. Conclude that changing is possible only if changing all of the equipment constants is possible.

If changing them is possible, the equipment acknowledge code is 16#00.

If changing them is not possible, the equipment acknowledge code is 16#02.

3 Sending the Accept/Reject Result for the Equipment Constant Change Request Specify the equipment acknowledge code from step 2 in the *EAC* input variable and execute the instruction. The equipment constant change accept/reject result is sent to the host.

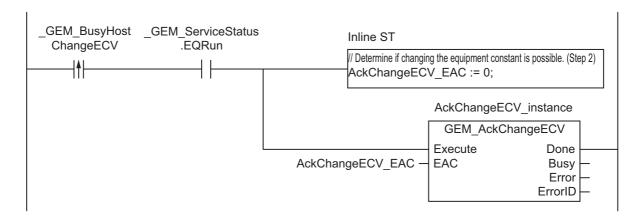
Sample Programming

This sample sends the change accept/reject result in reply to an equipment constant change request.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	AckChangeECV_EAC	BYTE	0	Result acknowledge code
	AckChangeECV_instance	GEM_Ack ChangeECV		Instance of GEM_AckChangeECV instruction

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostChange	Host-initiated Equipment Constant Change Transaction
	ECV	Processing Flag



ST

Internal Variables	Variable	Data type	Initial value	Comment
	AckChangeECV_EAC	BYTE	0	Result acknowledge code
	AckChangeECV_instance	GEM_Ack ChangeECV		Instance of GEM_AckChangeECV instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostChangeECV
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostChange	Host-initiated Equipment Constant Change Transaction
	ECV	Processing Flag

```
CASE Stage Of
0: // Notification of reception from host.
    R_TRIG_instance( _GEM_BusyHostChangeECV, Trigger );
   IF( Trigger = TRUE ) THEN
        // Determine if changing equipment constant is possible. (Step 2)
        AckChangeECV_EAC :=BYTE#0;
        // Initialization
        AckChangeECV_instance( Execute:=FALSE );
        Stage := 1;
   END IF;
1:// Reply to host.
    // Start send.
   AckChangeECV instance( Execute:=TRUE, EAC:=AckChangeECV EAC);
   IF( AckChangeECV instance.Done = TRUE ) THEN
        Stage := 10;
   ELSIF( AckChangeECV_instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
   END IF;
10: // End
   Stage := 0;
END CASE;
```

GEM_AckPPDelete

The GEM_AckPPDelete instruction sends a deletion accept/reject result in reply to a process program deletion request from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_AckPPDelete_instance(
GEM_ACKPPD Pro			GEM_AckPPDelete_instance GEM_AckPPDelete	Execute,
	Acknowledge		Execute Done	ACKC7,
	Process Pro-	FB	ACKC7 Busy Error	Done,
	gram Deletion		ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
ACKC7	Acknowledge code	Input	Result of process program deletion 16#00: Accepted 16#01: Permission not granted 16#02: Length error 16#03: Matrix overflow 16#04: PPID not found 16#05: Mode unsupported 16#06 to 16#3F: Other errors	16#00 to 16#3F		16#00

	Bool- ean	Bit strings			Integers				Real num- bers		Times, durations, dates, and text strings									
	BOOL	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	TO	STRING
ACKC7		OK																		

Function

The GEM_AckPPDelete instruction sends a deletion accept/reject result in reply to a process program deletion request from the host. The following are required for the reply.

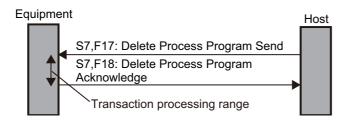
· Acknowledge code

This is the process program deletion accept/reject result for the deletion request from the host.

Refer to the application procedure for this instruction for the processing to send a reply with the deletion accept/reject result.

Additional Information

- This instruction uses the Process Program Deletion by Host scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the status of processing a transaction for
CEM BuoyHeatDDDelete	Host-initiated Process	BOOL	a host-initiated process program deletion.*1
_GEM_BusyHostPPDelete	Program Deletion Trans- action Processing Flag	BOOL	TRUE: Processing
	adulan redddollig riag		FALSE: Not processing
			Specifies whether to prohibit process program
	Process Program Interlock		deletion requests and upload/download
_GEM_InterLock_PP		BOOL	requests from the host.
			TRUE: Prohibited
			FALSE: Granted
		_sGEM_SER-	Gives the GEM Service status.
_GEM_ServiceStatus	GEM Service Status	VICE_STA-	Refer to P. A-212 for details.
		TUS	

^{*1.} This variable changes to TRUE when a Delete Process Program Send (S7,F17) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program – Operation settings

Variable to Receive Deletion Requests

Name	Description	SECS/GEM Configurator setting
Number of Deletion	Stores the number of PPIDs for which a deletion	Process Program – Operation
Request PPIDs	request was received from the host. If the variable	settings
	contains 0, no PPID management information is	
	registered and all process programs are deleted.	
Deletion Request PPID	Stores the PPIDs for which a deletion request was	
Table	received from the host.	

Related Error Codes

Error code	Name	Description
16#3833	ACKC7 Out of Range	The value of ACKC7 is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Exe-	The number of simultaneously executed GEM instructions
10#041D	cuted Resources	exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status
10#3010	OLIVI Service Status III Illitianzing	was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status
10#3011	OLIVI SCIVICE Status III EQStarting	was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status
	SEW Service Status III Equitionizing	was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status
	GEW GETVICE Glatas III Glop	was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status
	GEW GETVICE GLALAS III EITOI	was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status
	CEM CONTROL CICION IN CHARMING DOWN	was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status
	CEM COLVICE CIAIAG III CHAIAGWII	was Shutdown.
16#3818	No Message Received	The instruction was executed when a host command was not
10#0010	140 Message Received	received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) GEM BusyHostPPDelete must be TRUE.
- In the following cases, _GEM_BusyHostPPDelete does not change to TRUE even if Delete Process Program Send (S7,F17) is received.
 - a) The PPID in the request is not in the PPID Management Table.
 - b) _GEM_Interlock_PP is TRUE.
 - c) Delete Process Program Send (S7,F17) is disabled in the message settings on the SECS/GEM Configurator.
- If the value of *Number of Delete Request PPIDs* is 0, all PPIDs registered in the PPID Management Table are deleted.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Process Program Deletion Request

Confirm that _GEM_BusyHostPPDelete changes from FALSE to TRUE.

Store the process program to delete in the following variables.

- · Deletion Request PPID Table
- · Number of Deletion Request PPIDs
- **2** Determining Acceptance/Rejection of Process Program Deletion

Determine if deleting the process programs with the PPIDs stored in *Deletion Request PPID Table* is possible. Do this for the number of deletions specified in *Number of Deletion Request ECIDs*. Conclude that deletion is possible only if deleting all of the equipment constants is possible.

If deleting them is possible, the acknowledge code is 16#00.

If deleting them is not possible, the acknowledge code is 16#05.

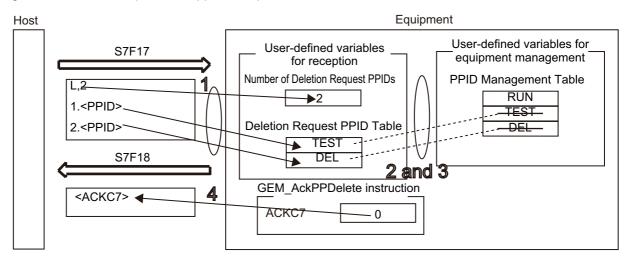
3 Deleting the Process Programs

If deletion is possible, delete the deletion requested PPIDs from *PPID Management Table*. Also delete the process programs with the deletion requested PPIDs that are saved in the equipment.

4 Sending the Result of Process Program Deletion

Specify the acknowledge code from step 2 in the ACKC7 input variable and execute the instruction. The process program deletion accept/reject result is sent to the host.

The following diagram shows the user program processing and data flow for the application procedure. In this example, a process program deletion request is received from the host and the deletion is completed successfully. The PPIDs with deletion requests are TEST and DEL. Numbers 1 to 4 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the deletion accept/reject result in reply to a process program deletion request from the host.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_AckPPDelete instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE
Link variable for deletion requested PPID list - PPID count	DELETE_PP_NUMBER
Link variable for deletion requested PPID list - PPID table	DELETE_PP_TABLE

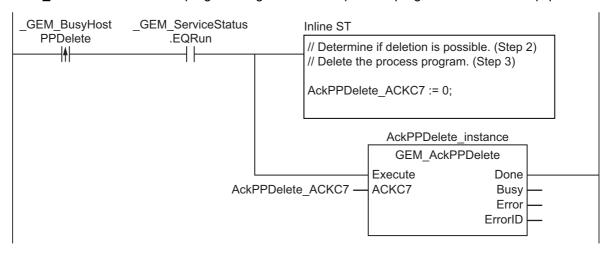
Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment	
	AckPPDelete_ACKC7	BYTE	0	Result acknowledge code	
	AckPPDelete_instance	GEM_AckPPDelete		Instance of GEM_AckPPDelete instruction	

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostPPDelete	Host-initiated Process Program Deletion Transaction Processing Flag
	PPID_TABLE	Link variable for PPID management table
		Link variable for deletion requested PPID list - PPID count
		Link variable for deletion requested PPID list - PPID table

Use the values of the DELETE_PP_NUMBER and DELETE_PP_TABLE variables to determine if deletion is possible in inline ST step 2. In step 3, create the programming to delete the PPID from PPID_TABLE and create the programming to delete the process program saved in the equipment.



ST

Internal Variables	Variable	Data type	Initial value	Comment
	AckPPDelete_ACKC7	BYTE	0	Result acknowledge code
	AckPPDelete instance	GEM_AckPP		Instance of GEM_AckPPDelete
	ACKPP Delete_ITStartce	Delete		instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger		FALSE	Flag for FALSE to TRUE change in
		BOOL	TALOL	_GEM_BusyHostPPDelete
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
GEM BusyHostPPDelete L		Host-initiated Process Program Deletion Transaction Processing Flag

```
CASE Stage Of
0: // Detect reception from host.
   R_TRIG_instance( _GEM_BusyHostPPDelete, Trigger );
   IF( Trigger = TRUE) THEN
        // Determine if deletion is possible. (Step 2)
        // Delete the process program. (Step 3)
        AckPPDelete_ACKC7 :=0;
        // Initialization
        AckPPDelete_instance( Execute:=FALSE );
        Stage:=1;
   END IF;
1: // Reply to host.
    AckPPDelete_instance( Execute:=TRUE, ACKC7:=AckPPDelete_ACKC7 );
    IF( AckPPDelete_instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( AckPPDelete_instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
   END_IF;
10: // End
   Stage := 0;
END_CASE;
```

GEM_RespFormattedPPUpload

The GEM_RespFormattedPPUpload instruction sends the formatted process program in reply to an upload formatted process program request from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Resp FormattedPPU pload	Respond to Formatted Pro- cess Program Upload	FB	GEM_RespFormattedPPUpload_instance GEM_RespFormattedPPUpload Execute Done Rslt Busy PPID Error MDLN ErrorID SOFTREV CCODENum	GEM_RespFormattedPPUp-load_instance(Execute, Rslt, PPID, MDLN, SOFTREV, CCODENum, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
Rslt	Result		Upload accept/reject result	Upload accept/reject result Depends on data type.		TRUE
PPID	Process program		DDID tolog d*1	121 bytes max. (includ-		
FFID	ID		PPID to upload*1 ing final NULL)*2			
MDLN	Equipment		Equipment model type 21 bytes max. (include			
IVIDLIN	model type	Input	final NULL)*2			
SOFTREV	Software revi-		Software revision code	21 bytes max. (including		*3
OOI IILV	sion code		Contware revision code	final NULL)*2		
CCODENum	Number of		Number of process program	Depends on data type.		
	CCODEs		CCODEs to upload	Depends on data type.		

^{*1.} It is not necessary to set an input variable. The PPID from the upload formatted process program request is automatically input

^{*3.} If you omit an input parameter, the default value is not applied. A building error will occur.

	Bool- ean		Bit st	trings	5				Inte	gers				Re num	eal bers		imes es, ar			ns, rings
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	BMIL	DATE	DOL	ΙΠ	STRING
Rslt	OK																			
PPID																				OK
MDLN																				OK
SOFTREV																				OK
CCODE Num						ОК	ОК			ОК	ОК									

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

Function

The GEM_RespFormattedPPUpload instruction sends the formatted process program in reply to an upload formatted process program request from the host. The following are required for the reply.

- · Upload accept/reject result
 - Use the following criteria to determine if uploading the formatted process program is possible.
 - a) The formatted process program with the upload requested PPID exists in the equipment.
- · Equipment model type
- · Software revision code
- · Formatted process program

This is the formatted process program with the PPID for which uploading was requested

Refer to the application procedure for this instruction for the processing to return the formatted process program.

Additional Information

- This instruction uses the Host-initiated Formatted Process Program Upload scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
	Host-initiated Formatted		Gives the status of processing a transaction for a
_GEM_Busy- HostFormattedP-	Process Program	BOOL	host-initiated formatted process program upload.*1
PUpload	Upload Transaction Pro-	BOOL	TRUE: Processing
. Opioda	cessing Flag		FALSE: Not processing
			Specifies whether to prohibit process program dele-
GEM Inter	Process Program Inter- lock		tion requests and upload/download requests from the
_GEM_Inter- Lock PP		BOOL	host.
LOCK_I I			TRUE: Prohibited
			FALSE: Granted
_GEM_ServiceS-	GFM Service Status	_sGEM_	Gives the GEM Service status.
tatus	GEIVI SEIVICE Status	SERVICE_STATUS	Refer to P. A-212 for details.

^{*1.} When a Formatted Process Program Request (S7,F25) is received from the host, this variable changes to TRUE. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program

Variable to Receive Upload Request

Name	Description	SECS/GEM Configurator setting
Host-initiated Upload	Stores the formatted process program PPID for which a host	Process Program
Request Formatted PPID	requested an upload.	

Variables to Acknowledge Upload Request

Name	Description	SECS/GEM Configurator setting
Host-initiated Upload CCODE Table	Stores the formatted process program CCODEs to upload.	Process Program
Host-initiated Upload PPARM	Stores PPARM for the formatted process program to upload.	

Related Error Codes

Error code	Name	Description
16#3820	Too Many Characters	The number of characters in <i>MDLN</i> or <i>SOFTREV</i> exceeded the size set on the SECS/GEM Configurator.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3821	Invalid Size	The value specified in <i>CCODENum</i> is larger than the number of array elements in the <i>Host-initiated CCODE Table</i> user-defined variable.
16#3826	Undefined CCODE	A CCODE that was not defined in the SECS/GEM Configurator was specified in the <i>Host-initiated CCODE Table</i> user-defined variable.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

Error code	Name	Description	
16#3818	I No Message Received	The instruction was executed when a formatted process pro-	
		gram upload request was not received.	

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) GEM BusyHostFormattedPPUpload must be TRUE.
- In the following cases, _GEM_BusyHostFormattedPPUpload does not change to TRUE even if a Formatted Process Program Request (S7,F25) is received.
 - a) The data type of the PPID set on the SECS/GEM Configurator and the data type of the PPID for the process program received from the host are different.
 - b) GEM Interlock PP is TRUE.
 - c) Formatted Process Program Request (S7,F25) is disabled in the message settings on the SECS/GEM Configurator.
- An error does not occur even if you specify a different PPID in PPID from the formatted process program PPID received from the host.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Formatted Process Program Upload Request

Confirm that _GEM_BusyHostFormattedPPUpload changes from FALSE to TRUE.

Store the process program PPID for which uploading was requested in the following variable.

- · Host-initiated Upload Formatted PPID
- 2 Determining Acceptance/Rejection of Formatted Process Program Upload Request

Determine if uploading the formatted process program is possible. Confirm that the PPID stored in the *Host-initiated Upload Request Formatted PPID* variable exists in the *PPID Management Table* variable.

- · If It Exists:
 - Uploading is possible and the upload accept/reject result is TRUE.
- · If It Does Not Exist:
 - Uploading is not possible and the upload accept/reject result is FALSE.
- 3 Storing the Formatted Process Program to Upload

If uploading is possible, store the formatted process program with the requested PPID in the following variables.

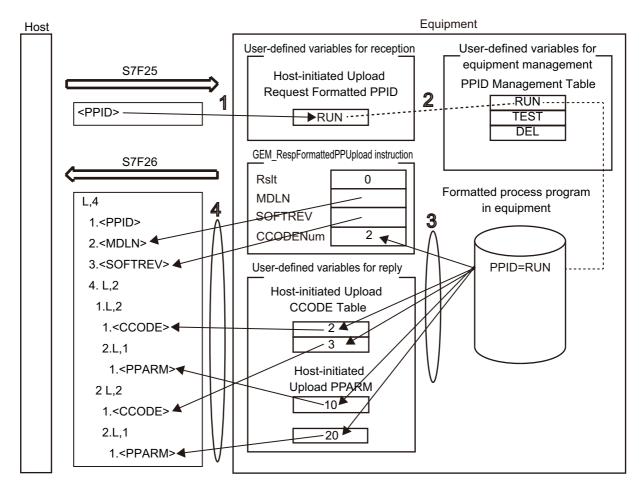
- Store CCODE in Host-initiated CCODE Table.
- · Store PPARM in Host-initiated Upload PPARM.
- 4 Returning the Formatted Process Program

Do the following and then execute the instruction. The formatted process program is sent to the host as the reply.

- Store the upload accept/reject result in the Rslt input variable.
- Store the number of CCODEs in the CCODENum input variable.

The following diagram shows the user program processing and data flow for the application procedure.

The diagram shows an example of a request from the host to upload the formatted process program with a PPID of *RUN*. Numbers 1 to 4 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the formatted process program in reply to an upload formatted process program request from the host.

Destination information is stored in the Sample1 formatted process program.

The structure of PPARM is as follows and is registered for CCODE = 1.

L,3
The structure of PPARM is defined as shown on the left.
X: X coordinate
Y: Y coordinate
X: Z coordinate
Z: Z coordinate

For CCODE = 2, the following is registered.

L,2
1.<U2 LimitMin>
2.<U2 LimitMax>
The structure of PPARM is defined as shown on the left.
LimitMin: Lower limit
LimitMax: Upper limit

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_FormattedRespPPUpload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID TABLE

Process Program – Formatted (1)

The formatted process program for the host-initiated upload is as follows:

CCODE	Descrip- tion	Maximum number of PPARMs	Format	Data size	Link variables		
1	Coordi-	3	12	1	HOST_UPLOAD_FP-	HOST_UPLOAD_FP-	
	nates				P_PPARM1_TABLE	P_PPARM1_NUMBER	
2	Tempera-	2	U2	1	HOST_UPLOAD_FPP	HOST_UPLOAD_FPP	
	ture				_PPARM1_TABLE	_PPARM1_NUMBER	

Process Program - Formatted (2)

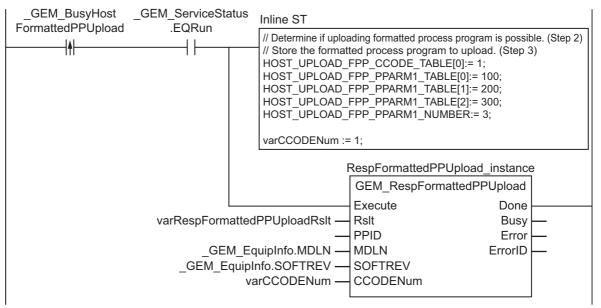
Item	Set value
Link variable for host-initiated upload - CCODE table	HOST_UPLOAD_FPP_CCODE_TABLE
Link variable for host-initiated upload - PPID of upload request	HOST_UPLOADREQ_FPP_PPID

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment		
	varCCODENum	UINT	0	Number of CCODEs for formatted process program to upload		
	varRespFormattedPP UploadRslt	BOOL	FALSE	Upload accept/reject result		
	RespFormattedPP Upload_instance	GEM_Resp FormattedPP Upload		Instance of GEM_RespFormatted PPUpload instruction		

External Variables	Variable	Comment		
	_GEM_ServiceStatus	GEM Service status		
	_GEM_EquipInfo	Equipment information		
	GEM BusyHostFormattedPPUpload	Host-initiated Formatted Process Program		
		Upload Transaction Processing Flag		
	HOST_UPLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1		
	HOST_UPLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE = 1		
	HOST UPLOAD FPP CCODE TABLE	Link variable for host-initiated upload - CCODE		
		table		
	HOST UPLOADREQ FPP PPID	Link variable for host-initiated upload - PPID of		
		upload request		



Note In inline ST step 2, add the programming to determine whether to save the PPID in the PPID Management Table.

Initial Internal **Variable** Data type Comment **Variables** value Number of CCODEs for formatted 0 varCCODENum UINT process program to upload varRespFormattedPP **BOOL FALSE** Upload accept/reject result UploadRsIt GEM Resp RespFormattedPP Instance of GEM_RespFormatted FormattedPP Upload instance PPUpload instruction Upload R TRIG instance R TRIG Instance of R TRIG instruction Flag for FALSE to TRUE change in **FALSE** Trigger **BOOL** _GEM_BusyHostFormattedPP Upload.

INT

External Variables	Variable	Comment			
	_GEM_ServiceStatus	GEM Service status			
	_GEM_EquipInfo	Equipment information			
	_GEM_BusyHostFormattedPPUpload	Host-initiated Formatted Process Program Upload Transaction Processing Flag			
	HOST_UPLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1			
	HOST_UPLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE = 1			
	HOST_UPLOAD_FPP_CCODE_TABLE	Link variable for host-initiated upload - CCODE table			
	HOST_UPLOADREQ_FPP_PPID	Link variable for host-initiated upload - PPID of upload request			

0

Program execution status

```
CASE Stage Of
0: // Detect reception from host.
  R_TRIG_instance( _GEM_BusyHostFormattedPPUpload, Trigger );
  IF(Trigger = TRUE)THEN
    // Determine if formatted process program can be uploaded. (Step 2)
    // Store the formatted process program to upload. (Step 3)
    HOST UPLOAD FPP CCODE TABLE[0]:= 1;
    HOST UPLOAD FPP PPARM1 TABLE[0]:= 100;
    HOST_UPLOAD_FPP_PPARM1_TABLE[1]:= 200;
    HOST UPLOAD FPP PPARM1 TABLE[2]:= 300;
   HOST UPLOAD FPP PPARM1 NUMBER:= 3;
    varCCODENum := 1;
    varRespFormattedPPUploadRslt := TRUE;
    // Initialization
    RespFormattedPPUpload instance( Execute:=FALSE,
      Rslt:=varRespFormattedPPUploadRslt,
     MDLN:= GEM EquipInfo.MDLN,
      SOFTREV:= GEM EquipInfo.SOFTREV,
      CCODENum:= varCCODENum );
    Stage:=1;
 END IF;
1: // Upload process program to host.
 RespFormattedPPUpload instance( Execute:=TRUE,
    Rslt:=varRespFormattedPPUploadRslt,
   MDLN:= _GEM_EquipInfo.MDLN,
    SOFTREV:= _GEM_EquipInfo.SOFTREV,
    CCODENum:= varCCODENum );
  IF( RespFormattedPPUpload_instance.Done = TRUE ) THEN
    Stage := 10;
```

ST

Stage

```
ELSIF(RespFormattedPPUpload_instance.Error = TRUE ) THEN
    Stage := 10;
END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_RespPPUpload

The GEM_RespPPUpload instruction sends the process program in reply to a process program upload request from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_RespPP Upload	Respond to Process Pro- gram Upload	FB	GEM_RespPPUpload_instance GEM_RespPPUpload Execute Done Rsit Busy PPID Error LENGTH	GEM_RespPPUpload_instance(Execute, Rslt, PPID, LENGTH, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
Rslt	Result		Upload accept/reject result	Depends on data type.		TRUE
PPID	Process program ID	Input	PPID to upload*1	121 bytes max. (including final NULL) *2		
LENGTH	Process program byte length		Process program (PPBODY) byte length	Depends on data type.		*3

^{*1.} It is not necessary to set an input variable. The PPID from the upload process program request is automatically input.

^{*3.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	Bit strings				Integers				Real be	num- ers		dates	, dura s, and tring	d text					
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	DOL	ID	STRING
Rslt	OK																			
PPID																				OK
LENGTH						OK	OK	OK		OK	OK	OK								

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

Function

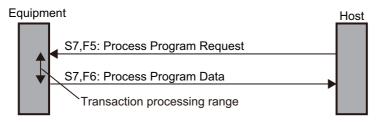
The GEM_RespPPUpload instruction sends the process program in reply to a process program upload request from the host. The following are required for the reply.

- Upload accept/reject result
 - Use the following criteria to determine if uploading the process program is possible.
 - a) The process program with the upload requested PPID exists in the equipment.
- · Process program
 - This is the process program in the equipment with the PPID for which uploading was requested.
- · Process program byte length
 - This is the byte length of the process program.

Refer to the application procedure for this instruction for the processing to return the process program.

Additional Information

- This instruction uses the Host-initiated Process Program Upload scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the status of processing a transaction for a
_GEM_BusyHostPPUp-	Host-initiated Process	BOOL	host-initiated process program upload.*1
load	Program Upload Transaction Processing Flag	BOOL	TRUE: Processing
	a a a a a a a a a a a a a a a a a a a		FALSE: Not processing
			Specifies whether to prohibit process program dele-
	Process Program Interlock	BOOL	tion requests and upload/download requests from
_GEM_InterLock_PP			the host.
			TRUE: Prohibited
			FALSE: Granted
		_sGEM	
GEM ServiceStatus	GEM Service Status	SER-	Gives the GEM Service status.
_GEIVI_Sei VICeStatus	GEIVI GEI VICE GIAIUS	VICE_STAT	Refer to P. A-212 for details.
		US	

^{*1.} This variable changes to TRUE when a Process Program Request (S7,F5) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID informa-	_
	tion is registered.	led

• Variable to Receive Upload Request

Name	Description	SECS/GEM Configurator setting
Host-initiated Upload	Stores the process program PPID for which a host	Process Program – Unformat-
Request PPID	requested an upload.	ted

• Variable to Respond to Upload Request

Name	Description	SECS/GEM Configurator setting		
Host-initiated Upload PP Data	Stores the process program data to upload.	Process Program		

Related Error Codes

Error code	Name	Description
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
		LENGTH that was specified for the Upload PP Data user-defined variable is not correct.
16#3821	Invalid Size	A value that is larger than the data size of <i>Upload PP Data</i> was specified.
		A value that cannot be evenly divided by the size of the data type of <i>Upload PP Data</i> was specified.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when a process program upload request was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) GEM BusyHostPPUpload must be TRUE.
- In the following cases, _GEM_BusyHostPPUpload does not change to TRUE even if a Process Program Request (S7,F5) is received.
 - a) The data types of the PPID set on the SECS/GEM Configurator and the PPID for the process program received from the host are different.
 - b) _GEM_Interlock_PP is TRUE.
 - c) Process Program Request (S7,F5) is disabled in the message settings on the SECS/GEM Configurator.
- Even if you specify a different PPID in the *PPID* input variable from the one that was received, an error end will not occur.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Process Program Upload Request

Confirm that _*GEM_BusyHostPPUpload* changes from FALSE to TRUE.

Store the process program PPID for which uploading was requested in the following variable.

- · Host-initiated Upload Request PPID
- 2 Determining Acceptance/Rejection of Process Program Upload

Determine if uploading the process program is possible. Confirm that the PPID stored in the *Host-initiated Upload Request PPID* variable exists in the *PPID Management Table* variable.

- · If It Exists:
 - Uploading is possible and the upload accept/reject result is TRUE.
- · If It Does Not Exist:
 - Uploading is not possible and the upload accept/reject result is FALSE.
- **3** Storing the Process Program Data to Upload

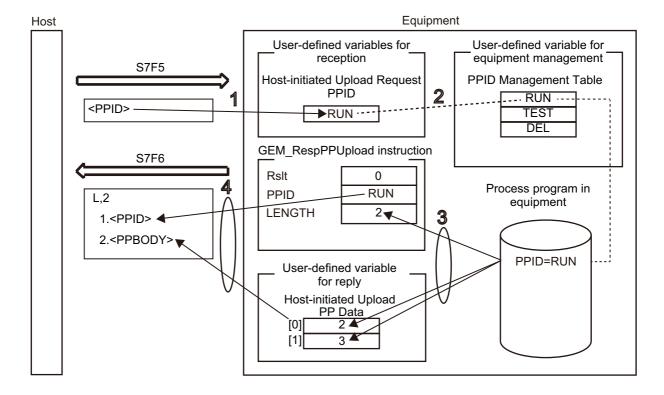
If uploading is possible, store the process program with the requested PPID in the equipment in the following variable.

- · Host-initiated Upload PP Data
- **4** Returning the Process Program

Do the following and then execute the instruction. The process program is sent to the host as the reply.

- Store the upload accept/reject result in the *Rslt* input variable.
- Store the byte length of the process program data to upload in the *LENGTH* input variable.

The following diagram shows the user program processing and data flow for the application procedure. The diagram shows an example of a request from the host to upload the process program with a PPID of *RUN*. Numbers 1 to 4 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the process program in reply to a process program upload request from the host.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_RespPPUpload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Unformatted

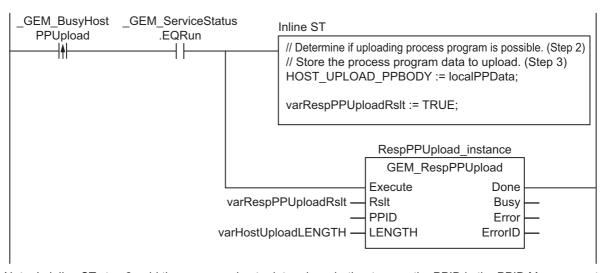
Item	Set value			
PPBODY format	В			
PPBODY data size	10			
Link variable for host-initiated upload - PPBODY	HOST_UPLOAD_PPBODY			
Link variable for host-initiated upload - PPID of upload request	HOST_UPLOADREQ_PPID			

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	varHostUploadLENGTH	UINT	0	Process program byte length
	varRespPPUploadRslt	BOOL	FALSE	Upload accept/reject result
	RespPPUpload_instance	GEM_RespPP Upload		Instance of GEM_RespPPUpload instruction
	localPPData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Process program data to upload

External Variables	Variable Comment					
	_GEM_ServiceStatus	GEM Service status				
	_GEM_BusyHostPPUpload	Host-initiated Process Program Upload Transaction Processing Flag				
	PPID_TABLE	Link variable for PPID management table				
	HOST_UPLOAD_PPBODY	Link variable for host-initiated upload - PPBODY				
	HOST_UPLOADREQ_PPID	Link variable for host-initiated upload - PPID of upload request				



Note In inline ST step 2, add the programming to determine whether to save the PPID in the PPID Management Table.

ST

Internal Variables	Variable	Data type	Initial value	Comment			
	varHostUploadLENGTH	UINT	0	Process program byte length			
	varRespPPUploadRslt	BOOL	FALSE	Upload accept/reject result			
	RespPPUpload_instance	GEM_RespPP Upload		Instance of GEM_RespPPUpload instruction			
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction			
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostPPUpload.			
	Stage	INT	0	Program execution status			
	localPPData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Process program data to upload			

External Variables	Variable Comment					
	_GEM_ServiceStatus	GEM Service status				
	_GEM_BusyHostPPUpload	Host-initiated Process Program Upload Transaction Processing Flag				
	PPID_TABLE	Link variable for PPID management table				
	HOST_UPLOAD_PPBODY	Link variable for host-initiated upload - PPBODY				
HOST_UPLOADREQ_PPID		Link variable for host-initiated upload - PPID of upload request				

```
CASE Stage Of
0: // Detect reception from host.
  R_TRIG_instance( _GEM_BusyHostPPUpload, Trigger );
  IF(Trigger = TRUE)THEN
    // Determine if uploading process program is possible. (Step 2)
    // Store the process program data to upload. (Step 3)
   HOST UPLOAD PPBODY := localPPData;
    // Initialization
    RespPPUpload instance( Execute:=FALSE, Rslt:=varRespPPUploadRslt,LENGTH:=varHos-
tUploadLENGTH );
   Stage:=1;
  END IF;
1: // Upload process program to host.
 RespPPUpload_instance( Execute:=TRUE, Rslt:=varRespPPUploadRslt,LENGTH:=varHostUp-
loadLENGTH );
 IF( RespPPUpload_instance.Done = TRUE ) THEN
   Stage := 10;
  ELSIF( RespPPUpload_instance.Error = TRUE ) THEN
   // Add error processing as required.
   Stage := 10;
 END IF;
10: // End
  Stage := 0;
END_CASE;
```

GEM_UploadFormattedPP

The GEM_UploadFormattedPP instruction uploads a formatted process program to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_UploadF ormattedPP	Upload Format- ted Process Program	FB	GEM_UploadFormattedPP_instance GEM_UploadFormattedPP Execute Done PPID Busy MDLN Error SOFTREV ErrorID CCODENum	GEM_UploadFormattedPP_ instance(Execute, PPID, MDLN, SOFTREV, CCODENum, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program		PPID to upload	121 bytes max. (including final NULL) *1		
MDLN	Equipment model type	Input	Equipment model type	21 bytes max. (including final		*2
SOFTREV	Software revision code		Software revision code	NULL)*1		
CCODENum	Number of CCODEs		Number of process program CCODEs to upload	Depends on data type.		

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

^{*2.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	ı	Bit strings			Integers					Real num- bers		Times, durations, dates, and text strings							
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	TNI	TNID	LINT	REAL	LREAL	HIME	DATE	DOL	ID	STRING
PPID																				OK
MDLN																				OK
SOFTREV																				OK
CCODE Num						ОК	ОК			OK	OK									

Function

The GEM_UploadFormattedPP instruction uploads a formatted process program to the host.

The following are required for the upload.

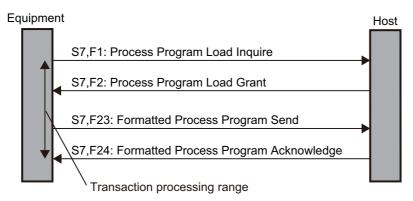
- Process program ID
 This is the PPID of the formatted process program to upload.
- · Equipment model type
- Software revision code
- Formatted process program
 This is the formatted process program to upload.
- Number of CCODEs

This is the number of CCODEs for the formatted process program to upload.

Refer to the application procedure for this instruction for the processing to upload the formatted process program.

Additional Information

- This instruction uses the Equipment-initiated Formatted Process Program Upload scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyEquipFormat-tedPPUpload	Equipment-initiated For- matted Process Program Upload Transaction Pro- cessing Flag	BOOL	Gives the status of processing a transaction for an equipment-initiated formatted process program upload.*1 TRUE: Processing FALSE: Not processing
_GEM_EquipFormattedP- PUploadRslt	Equipment-initiated For- matted Process Program Upload Results	_sGEM_RSLT	Gives the results of processing an equipment-initiated formatted process program upload. Refer to P. A-220 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM_ SERVICE_ STATUS	Gives the GEM Service status. Refer to P. A-212 for details.

*1. This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing is completed.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the	Process Program
	table contains NULL, no PPID information is registered.	

Variables to Send Upload Request

Name	Description	SECS/GEM Configurator setting
Equipment-initiated Upload CCODE Table	Stores the formatted process program CCODEs to upload.	Process Program
Equipment-initiated Upload PPARM	Stores PPARM for the formatted process program to upload.	

Related Error Codes

Error code	Name	Description
16#3820	Too Many Characters	The value of <i>PPID</i> , <i>MDLN</i> , or <i>SOFTREV</i> is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.
16#3821	Invalid Size	The value specified in <i>CCODENum</i> is larger than the number of array elements in the <i>Equipment-initiated Upload CCODE Table</i> user-defined variable.
16#3826	Undefined CCODE	A CCODE that was not defined in the SECS/GEM Configurator was specified.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.

Error code	Name	Description
16#381B	I Insufficient Transaction Resource	When the instruction was executed, the limit to the number of
		transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipFormattedPPUpload must be TRUE.
- Access _GEM_EquipFormattedPPUploadRslt after _GEM_BusyEquipFormattedPPUpload changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

- **1** Storing the Formatted Process Program to Upload
 - Store the formatted process program in the equipment to upload in the following variables.
 - Store the CCODEs in Equipment-initiated Upload CCODE Table.
 - Store the PPARM in Equipment-initiated Upload PPARM.
- 2 Executing the Formatted Process Program Upload

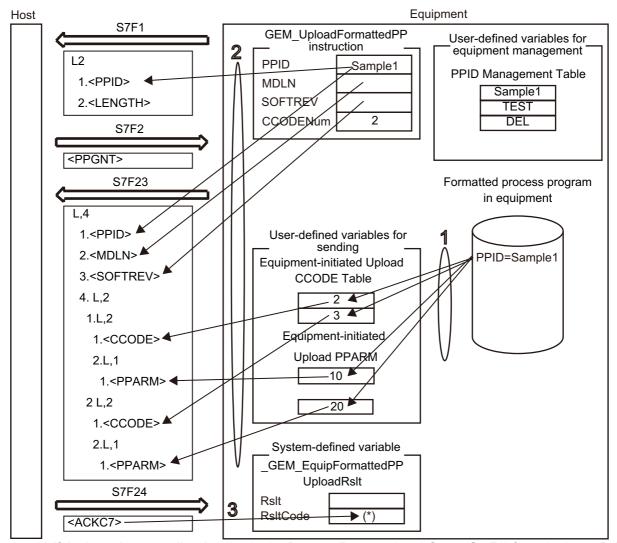
Do the following and then execute the instruction. The formatted process program will be uploaded to the host.

- Store the PPARM for the formatted process program to upload in the *PPID* input variable.
- Store the number of CCODEs in the formatted process program to upload in the *CCODENum* input variable.
- 3 Confirming the Result of the Formatted Process Program Upload

 Check the result of the upload in _GEM_EquipFormattedPPUploadRslt after _GEM_BusyEquipFormattedPPUpload changes to FALSE.

The following diagram shows the user program processing and data flow for the application procedure.

The diagram shows an example of uploading the formatted process program with a PPID of Sample1 to the host. Numbers 1 to 3 in the diagram indicate the steps in the application procedure.



(*) If the host does not allow loading in the Process Program Load Grant (S7,F2) from the host, *Rslt-Code* will contain PPGNT.

Sample Programming

This sample uploads a formatted process program with a PPID of Sample1 to the host.

If the GEM Service status is EQRun and the *UploadFormattedPP_Start* internal variable changes from FALSE to TRUE, the formatted process program is uploaded.

Destination information is stored in the Sample1 formatted process program.

The structure of PPARM is as follows and is registered for CCODE = 1.

L,3
1.<|2 X>
2.<|2 Y>
3.<|2 Z>
The structure of PPARM is defined as shown on the left.
X: X coordinate
Y: Y coordinate
Z: Z coordinate

For CCODE = 2, register the following.

L,2
1.<U2 LimitMin>
2.<U2 LimitMax>
The structure of PPARM is defined as shown on the left.
LimitMin: Lower limit
LimitMax: Upper limit

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_UploadFormattedPP instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Formatted (1)

The formatted process program for the equipment-initiated upload is as follows:

CCODE	Descrip- tion	Maximum number of PPARMs	Format	Data size	Link va	ariables
1	Coordi-	3	12	1	EQUIP_UPLOAD_FP-	EQUIP_UPLOAD_FP-
	nates				P_PPARM1_TABLE	P_PPARM1_NUMBER
2	Tempera-	2	U2	1	EQUIP_UPLOAD_FP-	EQUIP_UPLOAD_FP-
	ture				P_PPARM1_TABLE	P_PPARM1_NUMBER

Process Program - Formatted (2)

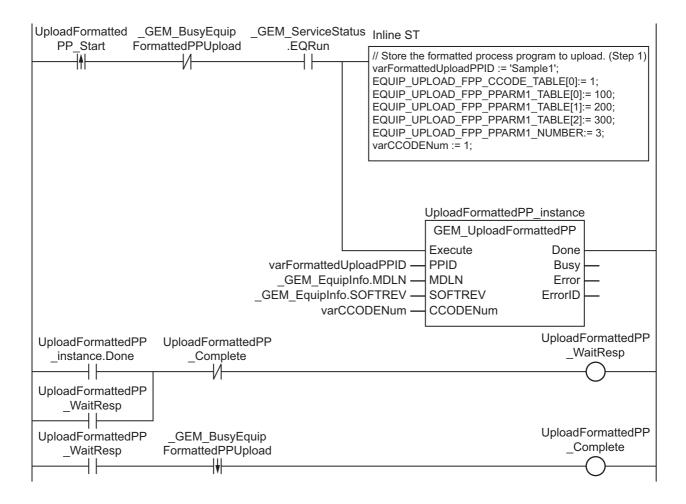
Item	Set value
Link variable for equipment-initiated upload - CCODE table	EQUIP_UPLOAD_FPP_CCODE_TABLE

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	UploadFormattedPP_Start	BOOL	FALSE	Flag to start upload
	UploadFormattedPP_	GEM_Upload-		Instance of GEM_UploadFormat-
	instance	FormattedPP		tedPP instruction
	UploadFormattedPP_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of upload
	UploadFormattedPP_ Complete	BOOL	FALSE	Flag that indicates completion of upload
	varFormattedUploadPPID	STRING[41]		ID of process program to upload
	varCCODENum	UINT	0	Number of CCODEs for formatted process program to upload

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipFormattedPPUpload	Equipment-initiated Formatted Process Program
		Upload Transaction Processing Flag
	_GEM_EquipInfo	Equipment information
	EQUIP_UPLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1
	EQUIP_UPLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE = 1
	EQUIP_UPLOAD_FPP_CCODE_TABLE	Link variable for equipment-initiated upload - CCODE table



ST

Internal Variables	Variable	Data type	Initial value	Comment
	UploadFormattedPP_Start	BOOL	FALSE	Flag to start upload
	UploadFormattedPP	GEM_Upload-		Instance of GEM_UploadFormat-
	_instance	FormattedPP		tedPP instruction
	UploadFormattedPP_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of upload
	UploadFormattedPP_ Complete	BOOL	FALSE	Flag that indicates completion of upload
	varFormattedUploadPPID	STRING[41]		ID of process program to upload
	varCCODENum	UINT	0	Number of CCODEs for formatted
	VAICEOBLINGIII	OINT	U	process program to upload
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction
				Flag for FALSE to TRUE change in UploadPP_Start
	Trigger	BOOL	FALSE	Flag for TRUE to FALSE change in _GEM_BusyEquipFormattedPP Upload
	Stage	INT	0	Program execution status

External Variables	Variable	Comment		
	_GEM_ServiceStatus	GEM Service status		
	GEM_BusyEquipFormattedPPUpload	Equipment-initiated Formatted Process Program		
	_GEM_BusyEquipFormattedFFOpload	Upload Transaction Processing Flag		
	_GEM_EquipInfo	Equipment information		
	EQUIP_UPLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1		
	EQUIP_UPLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE = 1		
	EQUIP_UPLOAD_FPP_CCODE_TABLE	Link variable for equipment-initiated upload - CCODE table		

```
CASE Stage Of
0: // Start
  R_TRIG_instance( UploadFormattedPP_Start, Trigger );
  IF((Trigger = TRUE)
    AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
    \ensuremath{//} Store the formatted process program to upload. (Step 1)
    varFormattedUploadPPID := 'Sample1';
    EQUIP UPLOAD FPP CCODE TABLE[0]:= 1;
    EQUIP UPLOAD FPP PPARM1 TABLE[0]:= 100;
    EQUIP UPLOAD FPP PPARM1 TABLE[1]:= 200;
    EQUIP UPLOAD FPP PPARM1 TABLE[2]:= 300;
    EQUIP UPLOAD FPP PPARM1 NUMBER:= 3;
    varCCODENum := 1;
    // Initialization
    UploadFormattedPP_instance( Execute:=FALSE,
      PPID:=varFormattedUploadPPID,
      MDLN:= _GEM_EquipInfo.MDLN,
      SOFTREV:= _GEM_EquipInfo.SOFTREV,
      CCODENum:=varCCODENum );
    Stage := 1;
  END IF;
```

```
1: // Upload process program to host.
 UploadFormattedPP_instance( Execute:=TRUE,
   PPID:=varFormattedUploadPPID,
   MDLN:= GEM EquipInfo.MDLN,
   SOFTREV:= _GEM_EquipInfo.SOFTREV,
   CCODENum:=varCCODENum );
 IF(UploadFormattedPP instance.Done = TRUE ) THEN
   Stage := 2;
 ELSIF(UploadFormattedPP_instance.Error = TRUE ) THEN
   Stage := 10;
 END_IF;
2:
 F_TRIG_instance( _GEM_BusyEquipFormattedPPUpload, Trigger );
 IF( Trigger = TRUE)THEN
   Stage := 10;
 END IF;
10: // End
 Stage := 0;
END CASE;
```

GEM_UploadPP

The GEM_UploadPP instruction uploads a process program to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_UploadPP_instance(
GEM_UploadP			0514 !! ! !! !! !!	Execute,
	Upload Pro- cess Program		GEM_UploadPP_instance GEM_UploadPP	PPID,
		-D	Execute Done	LENGTH
Р		FB	PPID Busy LENGTH Error	Done,
			ErrorID	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program ID	Input	PPID to upload	121 bytes max. (including final NULL)*1		*2
LENGTH	Process program byte length	Прис	Process program (PPBODY) byte length	Depends on data type.		

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

^{*2.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	Bit strings				Integers				Real numbers Times, durations dates, and text stri										
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
PPID																				OK
LENGTH						OK	OK	OK		OK	OK	OK								

Function

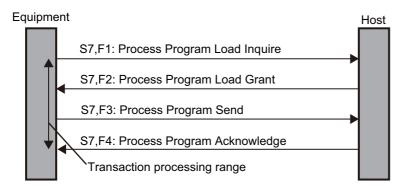
The GEM_UploadPP instruction uploads a process program to the host. The following are required for the upload.

- Process program ID
 - This is the PPID of the process program to upload.
- · Process program byte length
 - This is the byte length of the process program to upload.
- · Process program
 - This is the process program to upload.

Refer to the application procedure for this instruction for the processing to upload the process program.

Additional Information

- This instruction uses the Equipment-initiated Process Program Upload scenario for the GEM Process Program Management capability.
- The message exchange between the equipment and host is given below. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
	Equipment-initiated Pro-		Gives the status of processing a transaction for an
_GEM_BusyEquipPPUp-	cess Program Upload	BOOL	equipment-initiated process program upload.*1
load	Transaction Processing	BOOL	TRUE: Processing
	Flag		FALSE: Not processing
CEM EquipPPUp	Equipment-initiated Pro-	sGEM RS	Gives the status of processing an equipment-initi-
_GEM_EquipPPUp- loadRslt	cess Program Upload	LT	ated process program upload.
ioaursit	Result		Refer to P. A-221 for details.
		_sGEM	0
GEM ServiceStatus	GEM Service Status	SER-	Gives the GEM Service status.
_02111_0011100010100	CEM CONTICO Clatas	VICE_STAT	Refer to P. A-212 for details.
		US	

^{*1.} This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing for the equipment-initiated process program upload is completed.

Related User-defined Variables

Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program

Variable to Send Upload Request

Name	Description	SECS/GEM Configurator setting
Equipment-initiated Upload PP Data	Stores the process program data to upload.	Process Program – Unformat- ted

Related Error Codes

Error code	Name	Description		
16#3820	Too Many Characters	The value of the <i>PPID</i> input variable exceeded the size set on the SECS/GEM Configurator.		
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.		
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.		
		LENGTH that was specified for the Upload PP Data user-defined variable is not correct.		
16#3821	Invalid Size	 A value that is larger than the data size of Upload PP Data was specified. 		
		 A value that cannot be evenly divided by the size of the datype of Upload PP Data was specified. 		
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.		
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.		
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.		
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.		
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.		
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.		
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.		
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.		
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.		

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipPPUpload must be FALSE.
- Access _GEM_EquipPPUploadRslt after _GEM_BusyEquipPPUpload changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

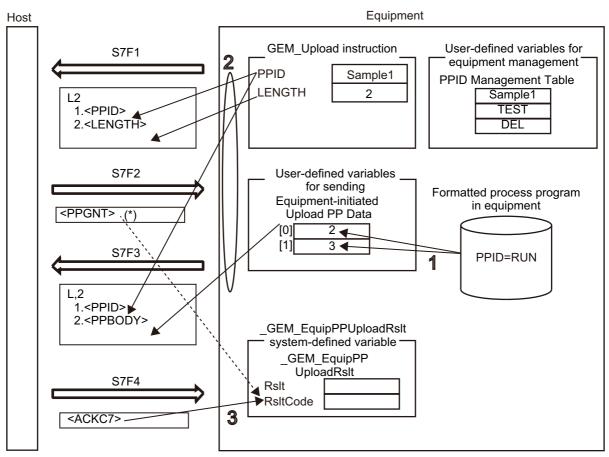
- **1** Storing the Process Program to Upload

 Store the process program to upload in the equipment in *Equipment-initiated Upload PP Data*.
- 2 Executing the Process Program Upload

 Do the following and then execute the instruction. The process program will be uploaded to the host.
 - Store the PPID of the process program to upload in the *PPID* input variable.
 - Store the byte length of the process program to upload in the *LENGTH* input variable.
- **3** Confirming the Upload Result

 Check the result of the upload in _GEM_EquipPPUploadRslt after _GEM_BusyEquipPPUpload changes from TRUE to FALSE.

The following diagram shows the user program processing and data flow for the application procedure. The diagram shows an example of uploading to the host a process program with a PPID of *Sample1*. Numbers 1 to 3 in the diagram indicate the steps in the application procedure.



*1. If the host does not allow loading in the Process Program Load Grant (S7,F2) from the host, *RsltCode* will contain PPGNT.

Sample Programming

This sample uploads the process program with a PPID of Sample1 to the host.

If the GEM Service status is EQRun and the *UploadPP_Start* internal variable changes from FALSE to TRUE, the process program is uploaded.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_UploadPP instruction are given in the following table.

• Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Unformatted

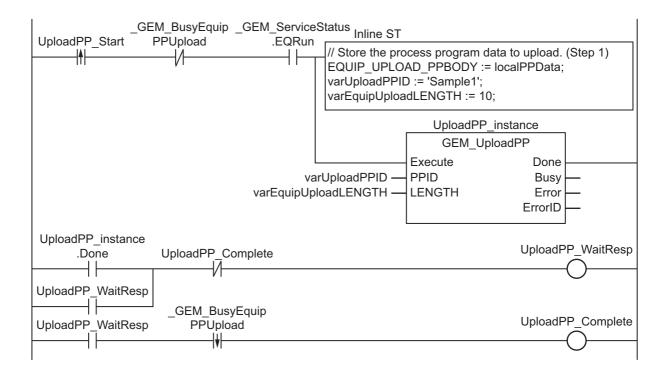
Item	Set value
PPBODY format	В
PPBODY data size	10
Link variable for equipment-initiated upload - PPBODY	EQUIP_UPLOAD_PPBODY

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	UploadPP_Start	BOOL	FALSE	Flag to start upload
	UploadPP_instance	GEM_UploadPP		Instance of GEM_UploadPP instruction
	UpdatePP_WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of upload
	UpdatePP_Complete	BOOL	FALSE	Flag that indicates completion of upload
	varUploadPPID	STRING[41]	NULL	PPID to upload
	varEquipUpload LENGTH	UINT	0	Process program byte length
	localPPData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Process program data to upload

External Variables	Variable	Comment						
	_GEM_ServiceStatus	GEM Service status						
	_GEM_BusyEquipPPUpload	Equipment-initiated Process Program Upload Transaction Processing Flag						
	PPID_TABLE	Link variable for PPID management table						
	EQUIP_UPLOAD_PPBODY	Link variable for equipment-initiated upload - PPBODY						



ST

Internal Variables	Variable	Data type	Initial value	Comment
	UploadPP_Start	BOOL	FALSE	Flag to start upload
	UploadPP_instance	GEM_UploadPP		Instance of GEM_UploadPP instruction
	varUploadPPID	STRING[41]	NULL	PPID to upload
	varEquipUpload LENGTH	UINT	0	Process program byte length
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in UploadPP_Start
		BOOL	TALOL	Flag for TRUE to FALSE change in _GEM_BusyEquipPPUpload
	Stage	INT	0	Program execution status
	localPPData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Process program data to upload

External Variables	Variable	Comment						
	_GEM_ServiceStatus	GEM Service status						
	_GEM_BusyEquipPPUpload	Equipment-initiated Process Program Upload Transaction Processing Flag						
	PPID_TABLE	Link variable for PPID management table						
	EQUIP_UPLOAD_PPBODY	Link variable for equipment-initiated upload - PPBODY						

```
CASE Stage Of
0: // Start
  R TRIG instance( UploadPP Start, Trigger );
  IF((Trigger = TRUE) AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
    // Store the process program data to upload. (Step 1)
   EQUIP UPLOAD PPBODY := localPPData;
   varUploadPPID := 'Sample1';
   // Initialization
   UploadPP instance( Execute:=FALSE, PPID:=varUploadPPID, LENGTH:=varEquipUp-
loadLENGTH );
   Stage := 1;
 END IF;
1: // Upload process program to host.
 UploadPP instance( Execute:=TRUE, PPID:=varUploadPPID, LENGTH:=varEquipUp-
loadLENGTH );
 IF( UploadPP_instance.Done = TRUE ) THEN
   Stage := 2;
 ELSIF( UploadPP_instance.Error = TRUE ) THEN
    // Add error processing as required.
   Stage := 10;
 END IF;
  F_TRIG_instance( _GEM_BusyEquipPPUpload, Trigger );
```

```
IF( Trigger = TRUE)THEN
    Stage := 10;
END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_AckFormattedPPDownload

The GEM_AckFormattedPPDownload instruction sends the accept/reject result in reply to a request for a formatted process program download from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Ack FormattedPPD ownload	Acknowledge Formatted Pro- cess Program Download	FB	GEM_AckFormattedPPDownload_instance GEM_AckFormattedPPDownload Execute PPID Busy ACKC7 Error ErrorID	GEM_AckFormattedPP Download_instance(

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
	Process program			121 bytes max.		
PPID	ID		PPID that was downloaded*1	(including final		
				NULL) *2		
			Accept/reject result			
	Acknowledge Code	Input	16#00: Accepted			16#00
			16#01: Permission not granted			
ACKC7			16#02: Length error	16#00 to 16#3F		
ACKC7			16#03: Matrix overflow	16#00 10 16#3F		
			16#04: PPID not found			
			16#05: Mode unsupported			
			16#06 to 16#3F: Other errors			

^{*1.} It is not necessary to set an input variable. The PPID of the downloaded formatted process program is automatically input.

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

	Bool- ean	Bit strings					Integers				Real num- bers		Times, durations, dates, and text strings							
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINI	REAL	LREAL	TIME	DATE	TOD	DT	STRING
PPID																				OK
ACKC7		OK																		

Function

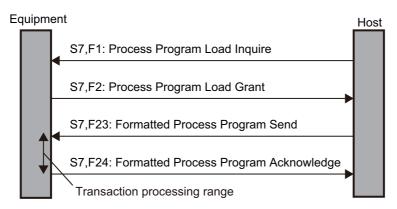
The GEM_AckFormattedPPDownload instruction sends the accept/reject result in reply to a request for a formatted process program download from the host. The following are required for the reply.

- Acknowledge code
 Use the following criteria to determine if the downloaded formatted process program is accepted or rejected.
- (a) Can the formatted process program be accepted?
- (b) Is the formatted process program valid?
- (c) Was the formatted process program saved?

Refer to the application procedure for this instruction for the processing to send a reply with the accept/reject result.

Additional Information

- This instruction uses the Host-initiated Formatted Process Program Download scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyHostFormat-tedPPDownload	Host-initiated Formatted Process Program Down- load Transaction Process-	BOOL	Gives the status of processing a transaction for a host-initiated formatted process program download.*1 TRUE: Processing
	ing Flag		FALSE: Not processing
_GEM_Interlock_PP	Process Program Interlock	BOOL	Specifies whether to prohibit process program deletion requests and upload/download requests from the host. TRUE: Prohibited
			FALSE: Granted
_GEM_ServiceStatus	GEM Service Status	_sGEM_ SER- VICE_STA- TUS	Gives the GEM Service status. Refer to P. A-212 for details.

*1. When a Formatted Process Program Send (S7,F23) is received from the host, this variable changes to TRUE. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program

Variables to Receive Download Request

Name	Description	SECS/GEM Configurator setting
Host-initiated Download For- matted PPID	Stores the PPID for the formatted process program downloaded from the host.	Process Program
Host-initiated Download MDLN	Stores the MDLN for the formatted process program downloaded from the host.	
Host-initiated Download SOF- TREV	Stores the SOFTREV for the formatted process program downloaded from the host.	
Host-initiated Download Number of CCODEs	Stores the number of CCODEs for the formatted process program downloaded from the host.	
Host-initiated Download CCODE Table	Stores the CCODEs for the formatted process program downloaded from the host.	
Host-initiated Download PPARM Value	Stores the PPARM for the formatted process program downloaded from the host.	

Related Error Codes

Error code	Name	Description
16#3833	ACKC7 Out of Range	The value of the <i>ACKC7</i> input variable is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when a formatted process program download was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - a) The value specified in the ACKC7 input variable must be within the valid range.
 - b) _GEM_BusyHostFormattedPPDownload must be TRUE.
- In the following cases, _GEM_BusyHostFormattedPPDownload does not change to TRUE even if a Formatted Process Program Send (S7,F23) is received.
 - a) The data type of the PPID set for the process program on the SECS/GEM Configurator and the data type of the PPID for the formatted process program received from the host are different.
 - b) *LENGTH* in the Process Program Load Inquire (S7,F1) received from the host is larger than the size that the GEM Service can receive.
 - c) The PPID of the downloaded formatted process program is new and there is no space in *PPID Management Table*.
 - d) GEM Interlock PP is TRUE.
 - e) Formatted Process Program Send (S7,F23) is disabled in the GEM message settings on the SECS/GEM Configurator.
- An error does not occur when you execute the instruction even if you specify a PPID in the *PPID* input variable that is different from the formatted process program PPID received from the host.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Formatted Process Program Download

Confirm that _GEM_BusyHostFormattedPPDownload changes from FALSE to TRUE.

The downloaded formatted process program is stored in the following variables.

- Host-initiated Download Formatted PPID
- Host-initiated Download MDLN
- · Host-initiated Download SOFTREV
- · Host-initiated Download Number of CCODEs
- · Host-initiated Download CCODE Table
- · Host-initiated Download PPARM Value
- **2** Determining Acceptance/Rejection of Formatted Process Program

If the download can be accepted, the acknowledge code is 16#00.

If the download cannot be accepted, the acknowledge code is 16#05.

3 Determining the Validity of the Formatted Process Program

If the download can be accepted, determine the validity of the formatted process program that was downloaded. Examples of the criteria to determine validity are given below.

- Are the values in *Host-initiated Download MDLN* and *_GEM_EquipInfo.MDLN* the same?
- Are the values in Host-initiated Download SOFTREV and _GEM_EquipInfo.SOFTREV the same?
- Is the value of Host-initiated Download PPARM inside of the valid range?

If the criteria are met, the acknowledge code is 16#00.

If the criteria are not met, the acknowledge code is 16#01.

If the validity determination result is to be sent to the host, you must store the values in the required user-defined variables to execute the GEM SendPPVerify instruction in step 6.

Refer to the related user-defined variables for the *GEM_SendPPVerify* on page A-151 for details on the required user-defined variables.

4 Saving the Formatted Process Program

If the formatted process program is valid, save the formatted process program that was downloaded in the equipment. If required, confirm that the formatted process program was saved.

If it was saved, the acknowledge code is 16#00.

If it was not saved, the acknowledge code is 16#01.

If it was saved and the PPID in *Host-initiated Download Formatted PPID* is not in *PPID Management Table*, add it to *PPID Management Table*. If it is already in *PPID Management Table*, it does not need to be added.

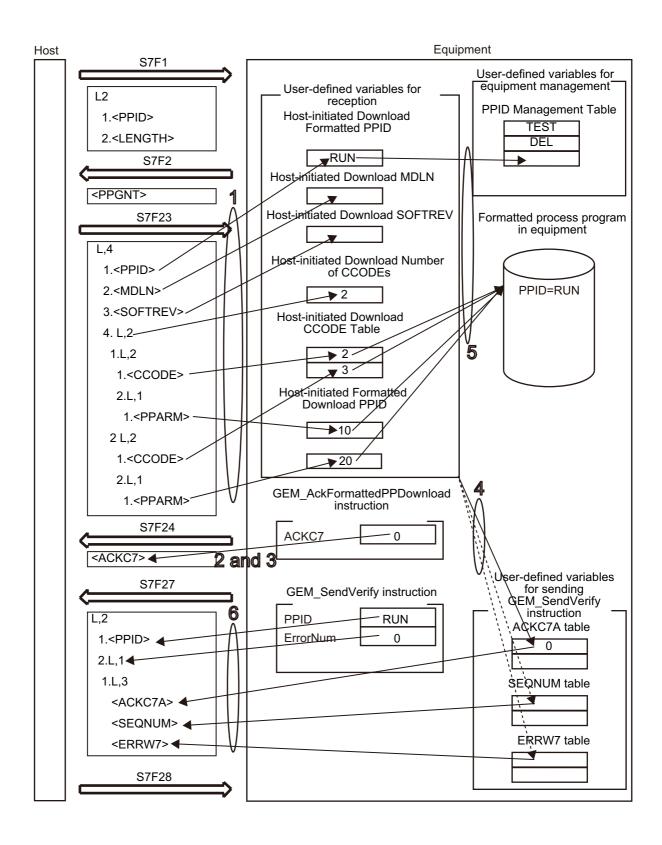
- Sending the Accept/Reject Result for the Formatted Process Program
 Specify the acknowledge code from steps 2 to 4 in the ACKC7 input variable and execute the instruction. The accept/reject result for the formatted process program is sent to the host as the reply.
- Sending the Result of Confirming the Validity of the Formatted Process Program

 Store the number of invalid PPARM values from the validity confirmation results in step 3 in the

 ErrorNum input variable and execute the GEM_SendPPVerify instruction. The formatted process program verification results are sent to the host.

The following diagram shows the user program processing and data flow for the application procedure.

The diagram shows an example of a request from the host to download the formatted process program with a PPID of *RUN*. Numbers 1 to 6 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the accept/reject result in reply to a request for a formatted process program download from the host.

The downloaded formatted process program that is downloaded from the host is Sample1.

Destination information is stored in the Sample1 formatted process program.

The structure of PPARM is as follows and is registered for CCODE = 1.

L,3 1.<|2 X> 2.<|2 Y> 3.<|2 Z> The structure of PPARM is defined as shown on the left.

X: X coordinate Y: Y coordinate Z: Z coordinate

For CCODE = 2, register the following.

L,2 1.<U2 LimitMin> 2.<U2 LimitMax> The structure of PPARM is defined as shown on the left.

LimitMin: Lower limit LimitMax: Upper limit

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_AckFormattedPPDownload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Formatted (1)

The formatted process program for the host-initiated upload is as follows:

CCODE	Descrip- tion	Maximum number of PPARMs	Format	Data size	Link variables			
1	Coordi-	3	12	1	HOST_DOWN-	HOST_DOWN-		
	nates				LOAD_FPP_P-	LOAD_FPP_P-		
					PARM1_TABLE	PARM1_NUMBER		
2	Tempera-	2	U2	1	HOST_DOWN-	HOST_DOWN-		
	ture				LOAD_FPP_PPARM2	LOAD_FPP_PPARM2		
					_TABLE	_NUMBER		

Process Programs – Formatted (2)

Item	Set value
Link variable for host-initiated download - PPID	HOST_DOWNLOAD_FPP_PPID
Link variable for host-initiated download - MDLN	HOST_DOWNLOAD_FPP_MDLN
Link variable for host-initiated download - SOFTREV	HOST_DOWNLOAD_FPP_SOFTREV
Link variable for host-initiated download - CCODE count	HOST_DOWNLOAD_FPP_CCODE_NUMBER
Link variable for host-initiated download - CCODE table	HOST_DOWNLOAD_FPP_CCODE_TABLE

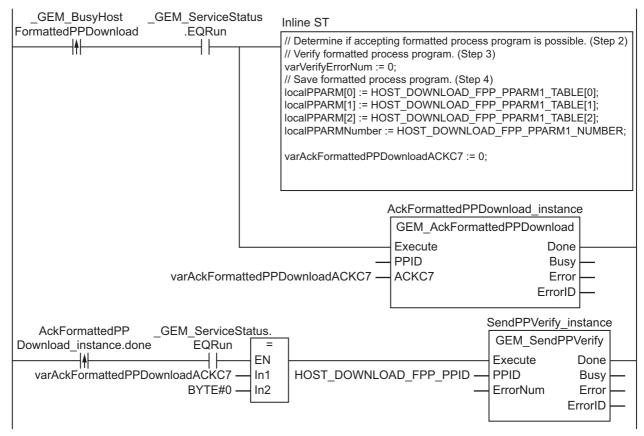
Item	Set value
Link variable for verification result- ACKC7A table	FPP_VERIFY_ACKC7A_TABLE
Link variable for verification result - SEQNUM table	FPP_VERIFY_SEQNUM_TABLE
Link variable for verification result - ERRW7 table	FPP_VERIFY_ERRW7_TABLE

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	varAckFormattedPPDownloa-dACKC7	BYTE	FALSE	Download accept/reject result
	AckFormattedPPDown-load_instance	GEM_Ack FormattedP- PDownload		Instance of GEM_AckFormattedP-PDownload instruction
	SendPPVerify_instance	GEM_SendP- PVerify		Instance of GEM_SendPPVerify instruction
	varVerifyErrorNum	UINT	0	Number of errors in verification results
	localPPARM	ARRAY[02] OF INT		PPARM value of formatted process program to save in equipment
	localPPARMNumber	INT	0	Number of PPARMs for formatted process program to save in equipment

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostFormattedPPDownload	Host-initiated Formatted Process Program Download Transaction Processing Flag
	HOST_DOWNLOAD_FPP_PPID	Link variable for host-initiated download - PPID
	HOST_DOWNLOAD_FPP_PPARM1_ TABLE	Link variable for PPARM table for CCODE = 1
	HOST_DOWNLOAD_FPP_PPARM1_ NUMBER	Link variable for PPARM count for CCODE = 1



Note In inline ST step 3, add the programming to verify the formatted process program as required.

Note In inline ST step 4, add the programming to add the PPID to the PPID Management Table.

ST

Internal Variables	Variable	Data type	Initial value	Comment
	varAckFormattedPP DownloadACKC7	BYTE	0	Download accept/reject result
	AckFormattedPPDown-load_instance	GEM_Ack FormattedP- PDownload		Instance of GEM_AckFormattedP-PDownload instruction
	SendPPVerify_instance	GEM_SendP- PVerify		Instance of GEM_SendPPVerify instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostFormattedPP Download
	Stage	INT	0	Program execution status
	varVerifyErrorNum	UINT	0	Number of errors in verification results
	localPPARM	ARRAY[02] OF INT		PPARM value of formatted process program to save in equipment
	localPPARMNumber	INT	0	Number of PPARMs for formatted process program to save in equipment

External Variables	Variable	Comment			
	_GEM_ServiceStatus	GEM Service status			
	GEM_BusyHostFormattedPPDownload	Host-initiated Formatted Process Program			
	_GEM_Busyriostroffiatteur Fbowilload	Download Transaction Processing Flag			
	HOST_DOWNLOAD_FPP_PPID	Link variable for host-initiated download - PPID			
	HOST_DOWNLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1			
	HOST_DOWNLOAD_FPP_PPARM1_NUM- BER	Link variable for PPARM count for CCODE = 1			

```
CASE Stage Of
0: // Detect reception of formatted process program download. (Step 1)
 R_TRIG_instance( _GEM_BusyHostFormattedPPDownload, Trigger );
 IF( Trigger = TRUE )THEN
    // Determine if accepting formatted process program is possible. (Step 2)
    // Verify formatted process program. (Step 3)
   varVerifyErrorNum := 0;
    // Save formatted process program. (Step 4)
    localPPARM[0] := HOST_DOWNLOAD_FPP_PPARM1_TABLE[0];
    localPPARM[1] := HOST_DOWNLOAD_FPP_PPARM1_TABLE[1];
    localPPARM[2] := HOST_DOWNLOAD_FPP_PPARM1_TABLE[2];
    localPPARMNumber := HOST_DOWNLOAD_FPP_PPARM1_NUMBER;
    varAckFormattedPPDownloadACKC7:=BYTE#0;
    varVerifyErrorNum:=0;
    // Initialization
   AckFormattedPPDownload_instance( Execute:=FALSE, ACKC7:= varAckFormattedPPDown-
loadACKC7);
    SendPPVerify_instance( PPID:= HOST_DOWNLOAD_FPP_PPID, ErrorNum:=varVerifyError-
Num );
   Stage:=1;
 END IF;
1: // Send accept/reject result for formatted process program. (Step 5)
 AckFormattedPPDownload_instance( Execute:=TRUE, ACKC7:= varAckFormattedPPDownload-
ACKC7);
 IF( AckFormattedPPDownload_instance.Done = TRUE ) THEN
    Stage := 2;
 ELSIF( AckFormattedPPDownload instance.Error = TRUE ) THEN
    Stage := 10;
2: // Send result of verifying formatted process program. (Step 6)
 SendPPVerify_instance( PPID:= HOST_DOWNLOAD_FPP_PPID, ErrorNum:=varVerifyErrorNum
);
 IF( SendPPVerify instance.Done = TRUE ) THEN
   Stage := 10;
 ELSIF( SendPPVerify instance.Error = TRUE ) THEN
   Stage := 10;
 END IF;
10: // End
 Stage := 0;
END CASE;
```

GEM_AckPPDownload

The GEM_AckPPDownload instruction sends the accept/reject result in reply to a request for a process program download from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_AckPPDownload_instance(
			GEM_AckPPDownload_instance	Execute,
Acknowlege GEM_AckPPD Process Pro-		GEM_AckPPDownload —Execute Done	PPID,	
		— PPID Busy —	ACKC7,	
ownload	gram Down-	wn- FB	ACKC7 Error ErrorID	Done,
	load			Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program ID		PPID that was downloaded*1	121 bytes max. (including final NULL)*2		
			Accept/reject result			
			16#00: Accepted			
		Input	16#0401: Permission not granted			
ACKC7	Acknowledge code		16#02: Length error	16#00 to 16#3F		16#00
	code		16#03: Matrix overflow			
			16#04: PPID not found			
			16#05: Mode unsupported			
			16#06 to 16#3F: Other errors			

^{*1.} It is not necessary to set an input variable. The PPID of the downloaded process program is automatically input.

^{*2.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

	Bool- ean	Bit strings				Integers					Real be		Times, durations, dates, and text strings							
	воог	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
PPID																				OK
ACKC7		OK																		

Function

The GEM_AckPPDownload instruction sends the accept/reject result in reply to a request for a process program download from the host. The following are required for the reply.

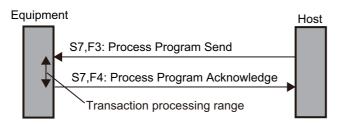
· Acknowledge Code

This is the accept/reject result for the downloaded formatted process program.

Refer to the application procedure for this instruction for the processing to send a reply with the accept/reject result.

Additional Information

- This instruction uses the Host-initiated Process Program Download scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the status of processing a transaction for
_GEM_BusyHostP-	Host-initiated Process	DOO!	a host-initiated process program download. *1
PDownload	Program Download Trans- action Processing Flag	BOOL	TRUE: Processing
	action in recessing in ag		FALSE: Not processing
GEM Interlock PP	Process Program Interlock	BOOL	Specifies whether to prohibit process program deletion requests and upload/download requests from the host.
	3		TRUE: Prohibited
			FALSE: Granted
_GEM_ServiceStatus	GEM Service Status	_sGEM_SER- VICE_STA- TUS	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when a Process Program Send (S7,F3) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configura- tor setting
PPID Management Table	Used to manage PPID information inside the equipment.	Process Program
	If the table contains NULL, no PPID information is regis-	
	tered.	

• Variables to Receive Download Request

Name	Description	SECS/GEM Configurator setting
Host-initiated Download	Stores the process program PPID for the host-initi-	Process Program – Unformat-
PPID	ated download.	ted
Host-initiated Download	Stores the LENGTH of the process program for the	
LENGTH	host-initiated download.	
Host-initiated Download	Stores the PPBODY of the process program for the	
PPBODY	host-initiated download.	

Related Error Codes

Error code	Name	Description
16#3833	ACKC7 Out of Range	The value of the <i>ACKC7</i> input variable is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when a process program download request was not received.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) GEM BusyHostPPDownload must be TRUE.
- In the following cases, _GEM_BusyHostPPDownload does not change to TRUE even if a Process Program Send (S7,F3) is received.
 - a) The data types of the PPID set on the SECS/GEM Configurator and the PPID for the process program received from the host are different.
 - b) The LENGTH of the process program received from the host is larger than the size of PPBODY set on the SECS/GEM Configurator.
 - c) The PPID of the downloaded process program is new and there is no space in PPID Management Table.
 - d) _GEM_Interlock_PP is TRUE.
 - e) Process Program Send (S7,F3) is disabled in the message settings on the SECS/GEM Configurator.
- An error does not occur even if you specify a different PPID in the PPID input variable from the one that was received.
- An error does not occur when you execute the instruction even if you specify a different PPID in the *PPID* input variable compared with the Host-initiated Download PPID.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Process Program Download

Confirm that _GEM_BusyHostPPDownload changes from FALSE to TRUE.

The downloaded process program is stored in the following variables.

- · Host-initiated Download PPID
- · Host-initiated Download LENGTH
- Host-initiated Download PPBODY
- 2 Determining Acceptance/Rejection of Downloaded Process Program

If the download can be accepted, the acknowledge code is 16#00.

If the download cannot be accepted, the acknowledge code is 16#05.

3 Saving the Process Program

If the download can be accepted, save the downloaded process program in the equipment. If required, confirm that the process program was saved.

If it was saved, the acknowledge code is 16#00.

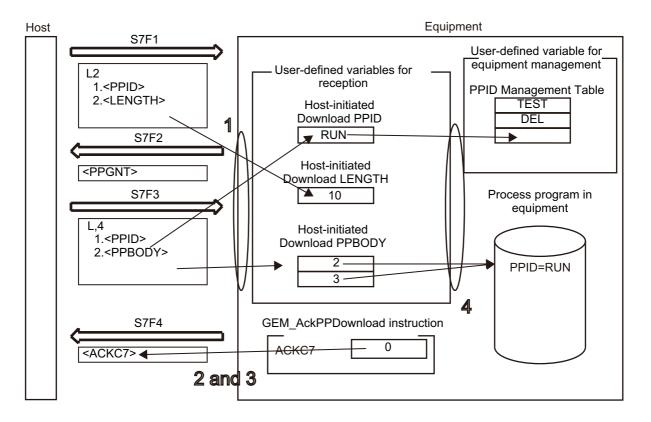
If it was not saved, the acknowledge code is 16#01.

If it was saved and the PPID in *Host-initiated Download PPID* is not in *PPID Management Table*, add it to *PPID Management Table*. If it is already in *PPID Management Table*, it does not need to be added.

4 Sending the Accept/Reject Result for the Process Program

Specify the acknowledge code from steps 2 and 3 in the *ACKC7* input variable and execute the instruction. The process program accept/reject result is sent to the host.

The following diagram shows the user program processing and data flow for the application procedure. The diagram shows an example of a request from the host to download the process program with a PPID of *RUN*. Numbers 1 to 4 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample sends the accept/reject result in reply to a request for a process program download from the host.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM AckPPDownload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Unformatted

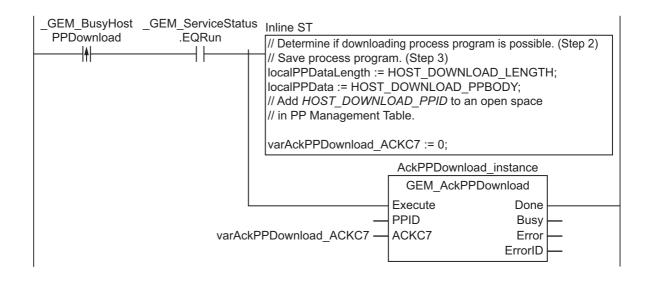
Item	Set value
PPBODY format	В
PPBODY data size	10
Link variable for host-initiated download - PPID	HOST_DOWNLOAD_PPID
Link variable for host-initiated download - LENGTH	HOST_DOWNLOAD_LENGTH
Link variable for host-initiated download - PPBODY	HOST_DOWNLOAD_PPBODY

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	varAckPPDownloadACKC7	BYTE	0	Download accept/reject result
	AckPPDownload instance	GEM_AckPP		Instance of GEM_AckPPDownload
	ACKPPDOWIIIOau_IIIstance	Download		instruction
	localPPData	ARRAY[09]		Process program data to save in
	localFFData	OF BYTE		equipment
	Jacol DDD atal anath	INT	0	Data size of process program data
	localPPDataLength	IINI	U	to save in equipment

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostPPDownload	Host-initiated Process Program Download Transaction Processing Flag
	PPID_TABLE	Link variable for PPID management table
	HOST_DOWNLOAD_PPID	Link variable for host-initiated download - PPID
	HOST_DOWNLOAD_LENGTH	Link variable for host-initiated download - LENGTH
	HOST_DOWNLOAD_PPBODY	Link variable for host-initiated download - PPBODY



ST

Internal Variables	Variable	Data type Initial value		Comment		
	varAckPPDownloadACKC7	BYTE	0	Download accept/reject result		
	AckPPDownload instance	GEM_AckPP		Instance of GEM_AckPPDownload		
	Acki i Download_instance	Download		instruction		
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction		
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostPPDownload		
	Stage	INT	0	Program execution status		
	localPPData	ARRAY[09] OF BYTE		Process program data to save in equipment		
	localPPDataLength		0	Data size of process program data to save in equipment		

External Variables	Variable Comment						
	_GEM_ServiceStatus	GEM Service status					
	_GEM_BusyHostPPDownload	Host-initiated Process Program Download Transaction Processing Flag					
	PPID_TABLE	Link variable for PPID management table					
	HOST_DOWNLOAD_PPID	Link variable for host-initiated download - PPID					
	HOST_DOWNLOAD_LENGTH	Link variable for host-initiated download - LENGTH					
	HOST_DOWNLOAD_PPBODY	Link variable for host-initiated download - PPBODY					

```
CASE Stage Of
0: // Notification of reception from host
 R_TRIG_instance( _GEM_BusyHostPPDownload, Trigger );
 IF( Trigger = TRUE )THEN
   // Perform processing to save process program as required.
   varAckPPDownloadACKC7:=BYTE#0;
                                     // Accepted.
   // Initialization
   AckPPDownload_instance( Execute:=FALSE, ACKC7:= varAckPPDownloadACKC7);
   Stage:=1;
 END_IF;
1: // Reply to host.
 AckPPDownload_instance( Execute:=TRUE, ACKC7:= varAckPPDownloadACKC7);
 IF( AckPPDownload_instance.Done = TRUE ) THEN
   Stage := 10;
 ELSIF( AckPPDownload_instance.Error = TRUE ) THEN
   // Add error processing as required.
   Stage := 10;
 END IF;
10: // End
 Stage := 0;
END_CASE;
```

GEM_RequestFormattedPPDown-load

The GEM_RequestFormattedPPDownload instruction sends a request for a formatted process program download to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_ Request FormattedPPD ownload	Request For- matted Process Program Download	FB	GEM_RequestFormattedPPDownload_instance GEM_RequestFormattedPPDownload Execute Done PPID Busy Error ErrorID	GEM_RequestFormattedPP Download_instance(

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program	Input	PPID for download request	121 bytes max. (including final NULL) *1		*2

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

^{*2.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	Bit strings				Integers						Real num- bers		Times, durations, dates, and text strings						
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INI	DINT	LINT	REAL	LREAL	HIME	DATE	TOD	DT	STRING
PPID																				OK

Function

The GEM_RequestFormattedPPDownload instruction sends a request for a formatted process program download to the host. The following are required for the download request.

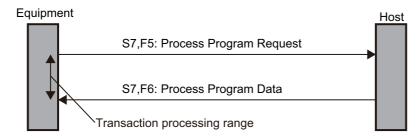
Process program ID

This is the PPID of the formatted process program for the download request.

Refer to the application procedure for this instruction for the processing for the download request.

Additional Information

- This instruction uses the Equipment-initiated Formatted Process Program Download scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyEquip FormattedPPDownload	Equipment-initiated For- matted Process Program Download Transaction Processing Flag	BOOL	Gives the status of processing a transaction for an equipment-initiated formatted process program download.*1 TRUE: Processing FALSE: Not processing
_GEM_EquipFormatted PPDownloadRslt	Equipment-initiated For- matted Process Program Download Result	_sGEM_RSLT	Gives the status of processing an equipment-initiated formatted process program download. Refer to P. A-222 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM_SER- VICE_STATUS	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing is completed.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program

Variables to Receive Download Request Results

Name	Description	SECS/GEM Configurator setting
Equipment-initiated Down-	Stores the PPID for the formatted process program	Process Program
load Formatted PPID	downloaded from the host.	
Equipment-initiated Down-	Stores the MDLN for the formatted process program	
load MDLN	downloaded from the host.	
Equipment-initiated Down-	Stores the SOFTREV for the formatted process pro-	
load SOFTREV	gram downloaded from the host.	
Equipment-initiated Down-	Stores the number of CCODEs for the formatted pro-	
load Number of CCODEs	cess program downloaded from the host.	
Equipment-initiated Down-	Stores the CCODEs for the formatted process pro-	
load CCODE Table	gram downloaded from the host.	
Equipment-initiated Down-	Stores the PPARM for the formatted process pro-	
load PPARM Value	gram downloaded from the host.	

Related Error Codes

Error code	Name	Description	
16#3820	Too Many Characters	The value of <i>PPID</i> exceeded the size set on the SECS/GEM Configurator.	
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.	
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.	
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.	
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.	
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.	
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.	
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.	
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.	
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.	
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.	
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.	

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipFormattedPPDownload must be TRUE.
- Access _GEM_EquipFormattedPPDownloadRsIt, after _GEM_BusyEquipFormattedPPDownload changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

1 Requesting the Formatted Process Program Download

Specify the PPID for which to request a download in the *PPID* input variable and execute the instruction. A request for a formatted process program download is sent to the host.

2 Detecting the Reply to the Download Request

Confirm that _GEM_BusyEquipFormattedPPDownload changes from TRUE to FALSE. The download result is stored in _GEM_EquipFormattedPPDownloadRsIt as the download request reply.

3 Confirming the Download Result

If the download was successful, the formatted process program is stored in the following variables.

- · Equipment-initiated Download Formatted PPID
- · Equipment-initiated Download MDLN
- · Equipment-initiated Download SOFTREV
- Equipment-initiated Download Number of CCODEs
- Equipment-initiated Download CCODE Table
- · Equipment-initiated Download PPARM Value
- **4** Determining the Validity of the Formatted Process Program

If the download was successful, determine the validity of the formatted process program that was downloaded. Examples of the criteria to determine validity are given below.

- Are the values in Host-initiated Download MDLN and _GEM_EquipInfo.MDLN the same?
- Are the values in Host-initiated Download SOFTREV and _GEM_EquipInfo.SOFTREV the same?
- Is the value of Host-initiated Download PPARM inside of the valid range?

If the validity determination result is to be sent to the host, you must execute the GEM_SendP-PVerify instruction in step 6 to store the required items in user-defined variables. Refer to the related user-defined variables for the *GEM_SendPPVerify* on page A-151 for details on the user-defined variables.

5 Saving the Formatted Process Program

If the formatted process program is valid, store the formatted process program that was downloaded in the equipment. If required, confirm that the process program was saved.

If the formatted process program was saved and if the PPID in *Host-initiated Download Formatted PPID* is not in *PPID Management Table*, add it to *PPID Management Table*. If it is already in *PPID Management Table*, it does not need to be added.

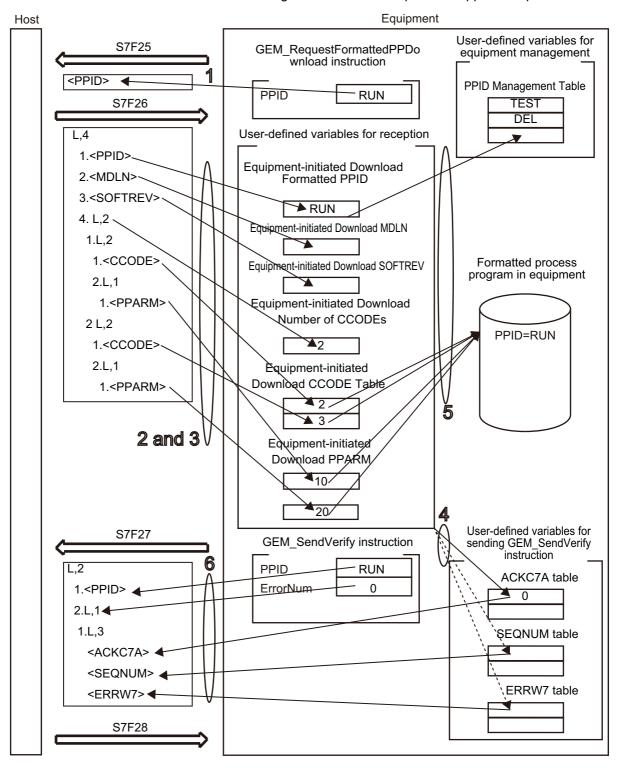
6 Sending the Result of Confirming the Validity of the Formatted Process Program

Store the number of invalid PPARM values from the validity confirmation result in step 4 in the *ErrorNum* input variable and execute the GEM SendPPVerify instruction.

The formatted process program verification result is sent to the host.

The following diagram shows the user program processing and data flow for the application procedure.

The diagram shows an example of a request to the host to download the formatted process program with a PPID of *RUN*. Numbers 1 to 6 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample requests downloading a formatted process program with a PPID of Sample1 to the host. This sample sends the verification result for the downloaded formatted process program to the host.

If the GEM Service status is EQRun and the *RequestFormattedPPDownload_Start* internal variable changes from FALSE to TRUE, a download request is made.

The downloaded formatted process program that is downloaded from the host is Sample1.

Destination information is stored in the Sample1 formatted process program.

The structure of PPARM is as follows and is registered for CCODE = 1.

L,3 1.<|2 X> 2.<|2 Y> 3.<|2 Z> The structure of PPARM is defined as shown on the left.

X: X coordinate

Y: Y coordinate

Z: Z coordinate

For CCODE = 2, register the following.

L,2 1.<U2 LimitMin> 2.<U2 LimitMax> The structure of PPARM is defined as shown on the left.

LimitMin: Lower limit LimitMax: Upper limit

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_RequestFormattedPPDownload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Formatted (1)

The formatted process program for the equipment-initiated download is as follows:

CCODE	Descrip- tion	Maximum number of PPARMs	Format	Data size	Link variables	
1	Coordi-	3	12	1	EQUIP_DOWN-	EQUIP_DOWN-
	nates				LOAD_FPP_P-	LOAD_FPP_P-
					PARM1_TABLE	PARM1_NUMBER
2	Tempera-	2	U2	1	EQUIP_DOWN-	EQUIP_DOWNLOAD
	ture				LOAD_FPP_PPARM1	_FPP_PPARM1
					_TABLE	_NUMBER

• Process Program – Formatted (2)

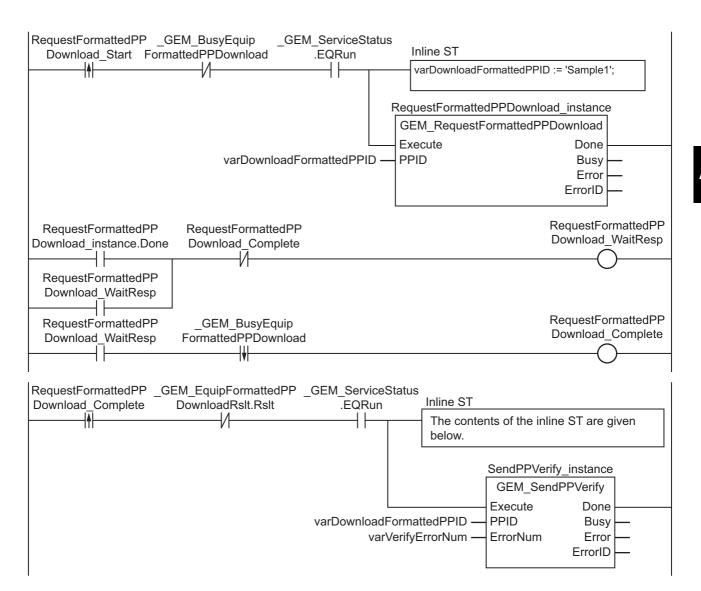
Item	Set value
Link variable for equipment-initiated download - PPID	EQUIP_DOWNLOAD_FPP_PPID
Link variable for equipment-initiated download - MDLN	EQUIP_DOWNLOAD_FPP_MDLN
Link variable for equipment-initiated download - SOFTREV	EQUIP_DOWNLOAD_FPP_SOFTREV
Link variable for equipment-initiated download - CCODE count	EQUIP_DOWNLOAD_FPP_CCODE_NUMBER
Link variable for equipment-initiated download - CCODE table	EQUIP_DOWNLOAD_FPP_CCODE_TABLE
Link variable for verification result - ACKC7A table	FPP_VERIFY_ACKC7A_TBALE
Link variable for verification result - SEQNUM table	FPP_VERIFY_SEQNUM_TABLE
Link variable for verification result - ERRW7 table	FPP_VERIFY_ERRW7_TABLE

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	RequestFormattedPP Download_Start	BOOL	FALSE	Flag to start download request
	RequestFormattedPP Download_instance	GEM_Request- FormattedP- PDownload		Instance of GEM_RequestFormat- tedPPDownload instruction
	SendPPVerify_instance	GEM_SendP- PVerify		Instance of GEM_SendPPVerify instruction
	RequestFormattedPP Download_WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of download request
	RequestFormattedPP Download_Complete	BOOL	FALSE	Flag that indicates completion of download request
	varDownloadFormatted PPID	STRING[41]	NULL	PPID for download request
	varVerifyErrorNum	UINT	0	Number of errors in verification results
	localPPARM	ARRAY[02] OF INT		PPARM value of formatted process program to save in equipment
	localPPARMNumber	INT	0	Number of PPARMs for formatted process program to save in equipment

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipFormattedPPDownload	Equipment-initiated Formatted Process
		Program Download Transaction Processing
		Flag
	_GEM_EquipFormattedPPDownloadRslt	Equipment-initiated Formatted Process
		Program Download Results
	EQUIP_DOWNLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE =
		1
	EQUIP_DOWNLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE =
		1



Contents of Inline ST

```
// Verify formatted process program. (Step 4)

varVerifyErrorNum := 0;

// Save formatted process program. (Step 5)

localPPARM[0] := EQUIP_DOWNLOAD_FPP_PPARM1_TABLE[0];

localPPARM[1] := EQUIP_DOWNLOAD_FPP_PPARM1_TABLE[1];

localPPARM[2] := EQUIP_DOWNLOAD_FPP_PPARM1_TABLE[2];

localPPARMNumber := EQUIP_DOWNLOAD_FPP_PPARM1_NUMBER;
```

- Note 1. In step 4, above, add the programming to verify the formatted process program as required.
 - 2. In step 5, above, add the programming to add the PPID to the PPID Management Table.

ST

Internal Variables	Variable	Data type	Initial value	Comment
	RequestFormattedPP Download_Start	BOOL	FALSE	Flag to start download request
	RequestFormattedPP Download_instance	GEM_Request- FormattedP- PDownload		Instance of GEM_RequestFormat- tedPPDownload instruction
	SendPPVerify_instance	GEM_SendP- PVerify		Instance of GEM_SendPPVerify instruction
	varDownloadFormattedPPID	STRING[41]	NULL	PPID for download request
	varVerifyErrorNum	UINT	0	Number of errors in verification results
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction
	Trigger	BOOL	FAI SF	Flag for FALSE to TRUE change in RequestFormattedPP Download_Start
	mggei	BOOL	TALGE	Flag for TRUE to FALSE change in _GEM_BusyEquipFormattedPP Download
	localPPARM	ARRAY[02] OF INT		PPARM value of formatted process program to save in equipment
	localPPARMNumber	INT	0	Number of PPARMs for formatted process program to save in equipment

External Variables	Variable	Comment	
	_GEM_ServiceStatus	GEM Service status	
	_GEM_BusyEquipFormattedPPDownload	Equipment-initiated Formatted Process Program Download Transaction Processing Flag	
	_GEM_EquipFormattedPPDownloadRslt	Equipment-initiated Formatted Process Program Download Results	
	EQUIP_DOWNLOAD_FPP_PPARM1_TABLE	Link variable for PPARM table for CCODE = 1	
	EQUIP_DOWNLOAD_FPP_PPARM1_NUMBER	Link variable for PPARM count for CCODE = 1	

```
CASE Stage Of
0: // Start
    R_TRIG_instance( RequestFormattedPPDownload_Start, Trigger );
    IF( (Trigger = TRUE)
        AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
        varDownloadFormattedPPID := 'Sample1';
        RequestFormattedPPDownload_instance( Execute:=FALSE, PPID:=varDownloadFormat-tedPPID );
        SendPPVerify_instance( PPID:= varDownloadFormattedPPID, ErrorNum:=varVerifyErrorNum );
        Stage := 1;
        END_IF;
```

```
1: // Request formatted process program download. (Step 1)
 {\tt RequestFormattedPPDownload\_instance(Execute:=TRUE, PPID:=varDownloadFormattedPPID)} \\
) ;
  IF( RequestFormattedPPDownload instance.Done = TRUE ) THEN
    Stage := 2;
  ELSIF( RequestFormattedPPDownload instance.Error = TRUE ) THEN
    Stage := 10;
  END IF;
2: // Detect reply to download request. (Step 2)
  F TRIG instance ( GEM BusyEquipFormattedPPDownload, Trigger);
  IF( Trigger =TRUE ) THEN
    // Confirm download results. (Step 3)
    IF( GEM EquipFormattedPPDownloadRslt.Rslt = TRUE ) THEN
      Stage := 3;
    ELSE
      Stage := 10;
    END IF;
  END IF;
3: // Verify the formatted process program. (Step 4)
    varVerifyErrorNum := 0;
    //Save formatted process program. (Step 5)
    localPPARM[0] := EQUIP DOWNLOAD FPP PPARM1 TABLE[0];
    localPPARM[1] := EQUIP_DOWNLOAD_FPP_PPARM1_TABLE[1];
    localPPARM[2] := EQUIP DOWNLOAD FPP PPARM1 TABLE[2];
    localPPARMNumber := EQUIP DOWNLOAD FPP PPARM1 NUMBER;
    Stage := 4;
4: // Send result of verifying formatted process program. (Step 6)
  SendPPVerify instance( PPID:= varDownloadFormattedPPID, ErrorNum:=varVerifyError-
Num );
  IF( SendPPVerify_instance.Done = TRUE ) THEN
    Stage := 10;
  ELSIF( SendPPVerify instance.Error = TRUE ) THEN
  END IF;
10: // End
  Stage := 0;
END CASE;
```

GEM_RequestPPDownload

The GEM RequestPPDownload instruction sends a process program download request to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Request PPDownload	Request Process Program Download	FB	GEM_RequestPPDownload_instance GEM_RequestPPDownload Execute PPID Busy Error ErrorID	GEM_RequestPPDownload_instance(Execute, PPID, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program ID	Input	PPID for download request	121 bytes max. (including final NULL)*1		*2

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

^{*2.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	Bit strings				Integers				Real num- bers		Times, durations, dates, and text strings								
	вооц	ВҮТЕ	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINI	REAL	LREAL	TIME	DATE	DOL	Ια	STRING
PPID																				OK

Function

The GEM_RequestPPDownload instruction sends a process program download request to the host. The following are required for the download request.

Process program ID

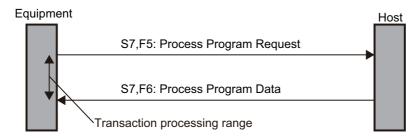
This is the BBID of the appropriate for the second sec

This is the PPID of the process program for the download request.

Refer to the application procedure for this instruction for the processing for the download request.

Additional Information

- This instruction uses the Equipment-initiated Process Program Download scenario for the GEM Process Program Management capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_Busy- EquipPPDownload	Equipment-initiated Process Program Download Transaction Processing Flag	BOOL	Gives the status of processing a transaction for an equipment-initiated process program download. *1 TRUE: Processing FALSE: Not processing
_GEM_EquipPPDown- loadRslt	Equipment-initiated Process Program Download Result _sGEM_I _IT		Gives the result of processing an equipment-initiated process program download. Refer to P. A-223 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing for the equipment-initiated process program download is completed.

Related User-defined Variables

• Equipment Management Variable

Name	Description	SECS/GEM Configurator setting
PPID Management Table	Used to manage PPID information inside the equipment. If the table contains NULL, no PPID information is registered.	Process Program

Variable to Receive Download Request

Name	Description	SECS/GEM Configurator setting
Equipment-initiated Down-	Stores the process program PPID for the equip-	Process Program – Unformat-
load PPID	ment-initiated download.	ted
Equipment-initiated Down-	Stores the LENGTH of the process program for the	
load LENGTH	equipment-initiated download.	
Equipment-initiated Down-	Stores the PPBODY of the process program for the	
load PPBODY	equipment-initiated download.	

Related Error Codes

Error code	Name	Description
16#3820	Too Many Characters	The value of <i>PPID</i> exceeded the size set on the SECS/GEM Configurator.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipPPDownload must be FALSE.
- Access _GEM_EquipPPDownloadRslt after _GEM_BusyEquipPPDownload changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

- **1** Requesting the Process Program Download

 Specify the process program ID for which to request a download in the *PPID* input variable and execute the instruction. A request is made to the host to download a process program.
- Detecting the Reply to the Download Request Confirm that _GEM_BusyEquipPPDownload changes from TRUE to FALSE. The process program download result is stored in _GEM_EquipPPDownloadRslt as the download request reply.
- 3 Confirming the Download Request Result

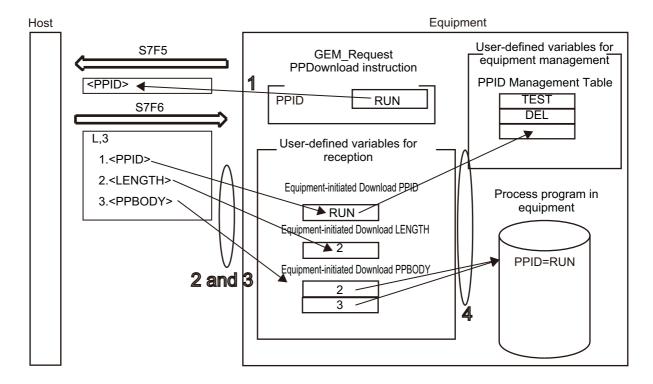
If the process program download was successful, the process program is stored in the following variables. If the download failed, nothing is stored in the following variables.

- · Equipment-initiated Download PPID
- Equipment-initiated Download LENGTH
- · Equipment-initiated Download PPBODY

4 Updating Process Program

If the process program download was successful, the downloaded process program is saved. If required, confirm that the process program was saved. If it was saved and the PPID in Host-initiated Download Formatted PPID is not in PPID Management Table, add it to PPID Management Table. If it is already in PPID Management Table, it does not need to be added.

The following diagram shows the user program processing and data flow for the application procedure. The diagram shows an example of a request to the host to download the process program with a PPID of *RUN*. Numbers 1 to 4 in the diagram indicate the steps in the application procedure.



Sample Programming

This sample requests downloading a process program to the host.

If the GEM Service status is EQRun and the *RequestPPDownload_Start* internal variable changes from FALSE to TRUE, a download request is made.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_RequestPPDownload instruction are given in the following table.

Process Program – Operation Settings

Item	Set value
Number of saved process programs	5
Link variable for PPID management table	PPID_TABLE

Process Program – Unformatted

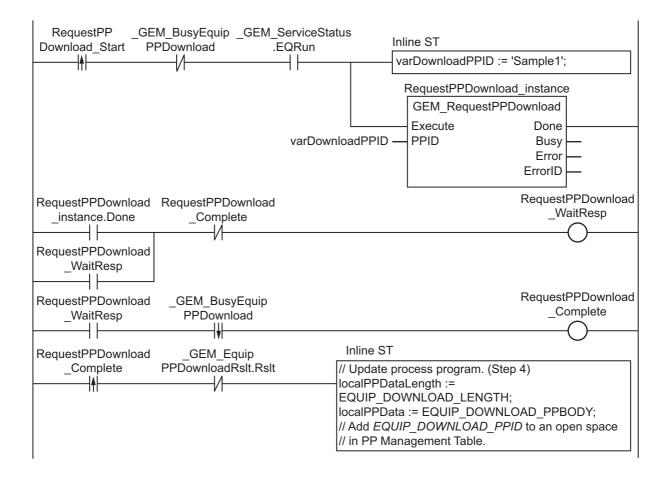
Item	Set value
PPBODY format	В
PPBODY data size	10
Link variable for equipment-initiated download - PPID	EQUIP_DOWNLOAD_PPID
Link variable for equipment-initiated download - LENGTH	EQUIP_DOWNLOAD_LENGTH
Link variable for equipment-initiated download - PPBODY	EQUIP_DOWNLOAD_PPBODY

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	RequestPPDownload_ Start	BOOL	FALSE	Flag to start download request
	RequestPPDownload_ instance	GEM_Re- questPPDown- load		Instance of GEM_RequestPP Download instruction
	RequestPPDownload_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of download request
	RequestPPDownload_ Complete	BOOL	FALSE	Flag that indicates completion of download request
	varDownloadPPID	STRING[41]	NULL	PPID for download request
	localPPData	ARRAY[09] OF BYTE		Process program data to save in equipment
	localPPDataLength	INT	0	Data size of process program data to save in equipment

External Variables	Name	Comment				
	_GEM_ServiceStatus	GEM Service status				
	_GEM_BusyEquipPPDownload	Equipment-initiated Process Program Download Transaction Processing Flag				
	_GEM_EquipPPDownloadRslt	Equipment-initiated Formatted Process Program Download Results				
	PPID_TABLE	Link variable for PPID management table				
	EQUIP_DOWNLOAD_PPID	Link variable for equipment-initiated download - PPID				
	EQUIP_DOWNLOAD_LENGTH	Link variable for equipment-initiated download - LENGTH				
	EQUIP_DOWNLOAD_PPBODY	Link variable for equipment-initiated download - PPBODY				



ST

Internal Variables	Variable	Data type	Initial value	Comment
	RequestPPDownload_Start	BOOL		Flag to start download request
	RequestPPDownload_ instance	GEM_Re- questPPDown- load		Instance of GEM_RequestP- PDownload instruction
	varDownloadPPID	STRING[41]		PPID for download request
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in RequestPPDownload_Start Flag for TRUE to FALSE change in
	Stage	INT	0	_GEM_BusyEquipPPDownload Program execution status
	localPPData	ARRAY[09] OF BYTE		Process program data to save in equipment
	localPPDataLength	INT	0	Data size of process program data to save in equipment

External Variables	Variable	Comment					
	_GEM_ServiceStatus	GEM Service status					
	GEM BusyEquipPPDownload	Equipment-initiated Process Program Download Transaction					
	_GEM_BusyEquipFFDownload	Processing Flag					
	_GEM_EquipPPDownloadRslt	Equipment-initiated Process Program Download Results					
	PPID_TABLE	Link variable for PPID management table					
	EQUIP_DOWNLOAD_PPID	Link variable for equipment-initiated download - PPID					
	EQUIP_DOWNLOAD_LENGTH	Link variable for equipment-initiated download - LENGTH					
	EQUIP_DOWNLOAD_PPBODY	Link variable for equipment-initiated download - PPBODY					

```
CASE Stage Of
0: // Start
 R TRIG instance ( RequestPPDownload Start, Trigger );
 IF( (Trigger = TRUE)
   AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
   varDownloadPPID := 'Sample1';
   RequestPPDownload_instance( Execute:=FALSE, PPID:=varDownloadPPID );
   Stage := 1;
 END_IF;
1: // Request download to host.
 RequestPPDownload_instance( Execute:=TRUE, PPID:=varDownloadPPID );
 IF( RequestPPDownload instance.Done = TRUE ) THEN
   Stage := 2;
 ELSIF( RequestPPDownload instance.Error = TRUE ) THEN
   Stage := 10;
 END_IF;
2: // Detect reception of download.
  F_TRIG_instance( _GEM_BusyEquipPPDownload, Trigger);
  IF( Trigger =TRUE ) THEN
    IF( GEM EquipPPDownloadRslt.Rslt = TRUE ) THEN
      // Update process program. (Step 4)
      localPPDataLength := EQUIP_DOWNLOAD_LENGTH;
      localPPData := EQUIP DOWNLOAD PPBODY;
      // Add EQUIP_DOWNLOAD_PPID to an open space in PP Management Table.
      Stage := 10;
    ELSE
```

```
Stage := 10;
    END_IF;
    END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_SendPPVerify

The GEM_SendPPVerify instruction sends the formatted process program verification result to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
				GEM_SendPPVerify_instance(
		GEM SendPPVerify instance	Execute,	
		GEM_SendPPVerify	PPID,	
GEM_SendPP	Send Process	n Verifi- FB	Execute Done PPID Busy	ErrorNum,
Verify	Program Verifi- cation Result		— ErrorNum Error —	Done,
			ErrorID —	Busy,
				Error,
				ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
PPID	Process program	Input	Verified PPID	121 bytes max. (including final NULL)*1		*2
ErrorNum	Number of errors		Number of errors in verification results	Depends on data type.		0

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

^{*2.} If you omit the input parameter, the default value is not applied. A building error will occur.

	Bool- ean	ı	Bit strings			Integers							Re num		Times, durations, dates, and text strings					
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
PPID																				OK
ErrorNum						OK	OK			OK	OK									

Function

The GEM_SendPPVerify instruction sends to the host, the verification result for the formatted process program downloaded from the host.

The PPID of the verified formatted process program is specified with *PPID*. The number of parameter errors in the formatted process program is specified in *ErrorNum*.

Additional Information

A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_ServiceStatus	GEM Service Status	_sGEM_SER-	Gives the GEM Service status.
	GEM Service Status	VICE_STATUS	Refer to P. A-212 for details.

Related User-defined Variables

Name	Description	SECS/GEM Configurator set- ting
ACKC7A Table	Stores the acknowledge codes (ACKC7A) for the parameters that were verified.	Process Program
	16#00 = Acknowledged.	
	16#01 = MDLN does not match.	
	16#02 = SOFTREV does not match.	
	16#03 = Invalid CCODE.	
	16#04 = Invalid PPARM value	
	16#05 = Other error (indicated by ERRW7)	
	16#06 to 16#3F = Reserved.	
SEQNUM Table	Store the numbers that give the positions in CCODE.*1	
ERRW7 Table	Stores a text string that indicates the error.	

^{*1.} If ACKC7A Table contains 16#01 or 16#02, 0 is stored. If it contains 16#03, 16#04, or 16#05, 1 or higher is stored.

An example in which there is an error in a value in the PPARM for the formatted process program that was downloaded from the host is provided in the following diagram.

If there are more than 14 PPARM values, the text string OVER is sent as the verification result to indicate an error.

In the following diagram, an error occurs because the PPARM value for CCODE = 3 in CCODE Table [1] is 20. Therefore, the following data is stored in the user-defined variables.

ACKC7A Table

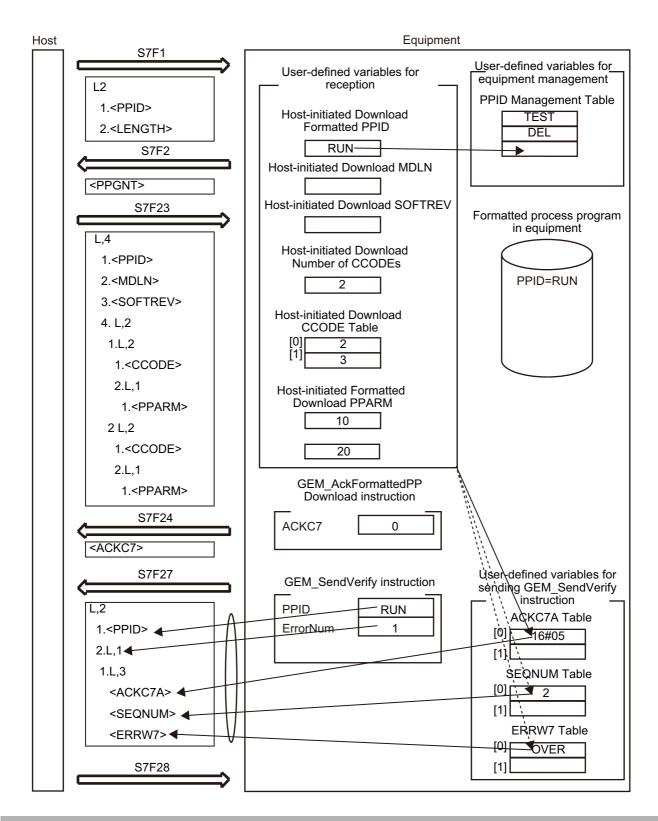
When returning a text string that indicates an error, the acknowledge code is for "other errors" and 16#05 is stored in ACKC7A Table [0].

SEQNUM Table

The value that is one higher than the array element number in CCODE Table with the error is stored in SEQNUM Table. The error is in CCODE Table [1], so 2 is stored in SEQNUM Table [0].

· ERRW7 Table

The text string OVER is stored in ERRW7 Table [0].



Related Error Codes

Error code	Name	Description
16#3820	Too Many Characters	The data size of <i>PPID</i> exceeded the size set on the SECS/GEM Configurator.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.

Error code	Name	Description
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.
16#3821	Invalid Size	The value specified in <i>ErrorNum</i> is larger than the number of array elements in the <i>ACKC7A Table</i> , <i>SEQNUM Table</i> , or <i>ERRW7 Table</i> user-defined variable.
16#3834	ACKC7A Out of Range	The value of ACKC7A is outside of the valid range.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed when a formatted process program download data was not received.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) The values of ACKC7A specified in ACKC7 Table must be within the valid range.
 - c) The value specified for *ErrorNum* must be equal to or less than the number of array elements in *ACKC7A Table*, *SEQNUM Table*, and *ERRW7 Table*.
- An error does not occur when you execute the instruction even if you specify a different PPID in the PPID input variable compared with the PPID of the downloaded formatted process program.

Sample Programming

Refer to the sample programming that is provided for the GEM_UploadFormattedPP on page A-98.

GEM_SendTerminalMsg

The GEM_SendTerminalMsg instruction sends an equipment terminal message to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_SendTer minalMsg	Send Equip- ment Terminal Message	FB	GEM_SendTerminalMsg_instance GEM_SendTerminalMsg Execute Done TID Busy TerminalTEXT Error ErrorID	GEM_SendTerminalMsg_ instance(Execute, TID, TerminalTEXT, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
TID	Terminal number		Equipment terminal number	16#00 to 16#01		16#00
TerminalTEXT	Send text string	Input	Equipment terminal service data (text string) to send to host	241 bytes max. (including final NULL)*1		"

^{*1.} The maximum number of characters is set on the SECS/GEM Configurator. The maximum number of bytes is the maximum number of characters including the final NULL character plus 1.

	Bool- ean	E	Bit strings			Integers					Real be	num- rs	Times, durations, dates, and text strings							
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	ΤO	STRING
TID		OK																		
Terminal TEXT																		·	·	OK

Function

The GEM_SendTerminalMsg instruction sends an equipment terminal message to the host to display the message specified with send text string *TerminalTEXT* at the terminal specified with terminal number *TID*.

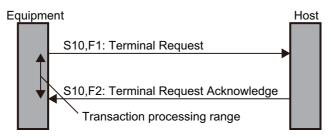
The meanings of the values of *TID* are given in the following table.

Value of TID	Meaning
16#00	Main terminal
16#01	Additional terminal

The result of sending the equipment terminal message to the host is stored in the _GEM_EquipTerminalMsgRslt system-defined variable.

Additional Information

- This instruction uses the Operator Sends Information to Host scenario for the GEM Equipment Terminal Services capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the processing status of an equip-
_GEM_BusyEquip TerminalMsg	Equipment-initiated Termi-	BOOL	ment-initiated terminal message transaction.*1
	nal Message Transaction Processing Flag	BOOL	TRUE: Processing
	T Toobboning T lag		FALSE: Not processing
CEM EquipTerminal	Equipment initiated Termi		Gives the results of an equipment-initiated ter-
_GEM_EquipTerminal MsqRslt	Equipment-initiated Terminal Message Results	_sGEM_RSLT	minal message.
wisgrisit	That iviessage results		Refer to P. A-224 for details.
CEM SonviceStatus	GEM Service Status	_sGEM_SER-	Gives the GEM Service status.
_GEM_ServiceStatus	GEIVI SEI VICE Status	VICE_STATUS	Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing is completed.

Related Error Codes

Error code	Name	Description
16#3829	TID Out of Range	The value of <i>TID</i> is outside of the valid range.
16#3820	Too Many Characters	The number of characters stored in <i>TerminalTEXT</i> exceeded the size set on the SECS/GEM Configurator.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3822	Set to Disable	The instruction was executed when it was disabled on the SECS/GEM Configurator.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.

Error code	Name	Description
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) The value specified in the *TID* input variable must be within the valid range.
 - c) The number of characters specified in the *TerminalTEXT* input variable must be equal or less than the number of characters that was set on the SECS/GEM Configurator.
- Access _GEM_EquipTerminalMsgRslt after _GEMBusyEquipTerminalMsg changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

1 Sending the Equipment Terminal Message

Do the following and then execute the instruction. The equipment terminal message is sent to

- Store the equipment terminal number in the *TID* input variable.
- Store the message to display on the terminal in the *TerminalTEXT* input variable.
- 2 Confirming the Result of Sending the Equipment Terminal Message

 Check the result of sending the equipment terminal message in GEM_EquipTerminalMsgRslt after _GEM_BusyEquipTerminalMsg changes to FALSE.

Sample Programming

This sample sends an equipment terminal message to the host.

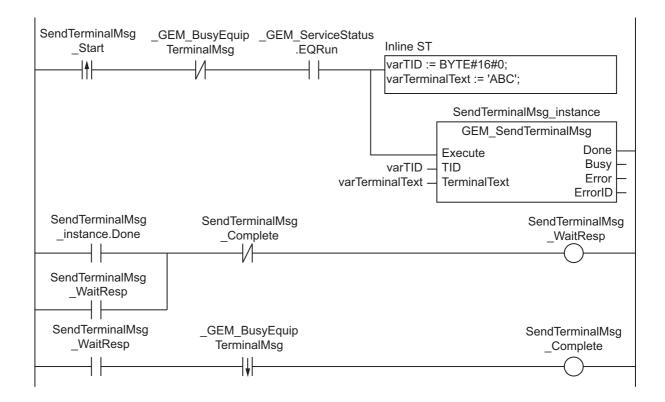
The equipment terminal message is to display "ABC" on the equipment with terminal number 0.

If the GEM Service status is EQRun and the *SendTerminalMsg_Start* internal variable changes from FALSE to TRUE, the equipment terminal message is sent.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	SendTerminalMsg_Start	BOOL	FALSE	Flag to start sending the equipment terminal message
	SendTerminalMsg_ instance	GEM_Send TerminalMsg		Instance of GEM_SendTerminalMsg instruction
	SendTerminalMsg_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of equipment terminal message send
	SendTerminalMsg_ Complete		FALSE	Flag that indicates completion of equipment terminal message send
	varTID	BYTE	0	Terminal number
	varTerminalText	STRING[241]	NULL	Text to send to host

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipTerminal	Equipment-initiated Terminal Message Transaction Processing
	Msg	Flag



ST

Internal Variables	Variable	Variable Data type		Comment
	SendTerminalMsg_Start	BOOL	FALSE	Flag to start sending the equipment terminal message
	SendTerminalMsg_ instance	GEM_Send TerminalMsg		Instance of GEM_SendTerminalMsg instruction
	varTID	BYTE	0	Terminal number
	varTerminalText	STRING[241]	NULL	Text to send to host
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in SendTerminalMsg_Start
	inggei	BOOL	TALSE	Flag for TRUE to FALSE change in _GEM_BusyEquipTerminalMsg
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipTerminal	Equipment-initiated Terminal Message Transaction Processing
	Msg	Flag

```
CASE Stage Of
    R_TRIG_instance( SendTerminalMsg_Start, Trigger );
    IF( (Trigger = TRUE) AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
        // Initialization
        varTerminalText:='ABC';
        varTID := BYTE#0;
        SendTerminalMsg_instance( Execute:=FALSE );
        Stage := 1;
    END IF;
1: // Start send.
    SendTerminalMsg_instance( Execute:=TRUE, TID :=varTID, TerminalTEXT:=varTermin-
alText );
    IF( SendTerminalMsg_instance.Done = TRUE ) THEN
        Stage := 2;
    ELSIF( SendTerminalMsg_instance.Error = TRUE ) THEN
        \ensuremath{//} Add error processing as required.
        Stage := 10;
    END IF;
2: // Wait for completion of send.
    F TRIG instance ( GEM BusyEquipTerminalMsg, Trigger );
    IF( Trigger = TRUE) THEN
       Stage := 10;
    END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_AckTerminalMsgSB

The GEM_AckTerminalMsgSB instruction sends the terminal message display result for a single-block equipment terminal message received from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Ack Termi- nalMsgSB	Acknowledge Single-block Equipment Ter- minal Message	FB	GEM_AckTerminalMsgSB_instance GEM_AckTerminalMsgSB Execute Done ACKC10 Busy Error ErrorID	GEM_AckTerminalMsgSB_ instance(Execute, ACKC10, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
ACKC10	Acknowledge code	Input	Display terminal acknowledge code. 16#00: Display acknowledged. 16#01: Message will not be displayed. 16#02: Cannot be used by terminal. 16#03 to 16#3F: Reserved.	16#00 to 16#3F		16#00

	Bool- ean	ı	Bit st	rings	,	Integers						Real num- bers		Times, durations, dates, and text strings						
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
ACKC10		OK																		

Function

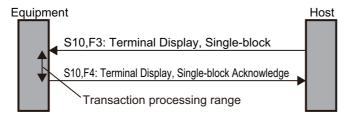
The GEM_AckTerminalMsgSB instruction sends the result of displaying a message on the specified terminal for a single-block equipment terminal message from the host. The following are required for the reply.

Acknowledge code
 This is the result of determining whether equipment terminal message display is possible.

Refer to the application procedure for this instruction for the processing to return the message display result to the specified terminal.

Additional Information

- This instruction uses the Host Sends Information to Equipment Display Device scenario for the GEM Equipment Terminal Services capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyHostTeri- nalMsgSB	Host-initiated Sin- gle-block Terminal Mes- sage Transaction	BOOL	Gives the processing status of a host-initiated single-block terminal message transaction.*1 TRUE: Processing
	Processing Flag Host-initiated Sin-		FALSE: Not processing Gives the receiving terminal number for a
_GEM_HostTermi- nalMsgSB_TID	gle-block Terminal Mes- sage Receiving Terminal	BYTE	host-initiated single-block terminal message. 0: Main terminal, 1: Additional terminal
GEM_ServiceStatus	Number GEM Service Status	_sGEM_SER- VICE_STATUS	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when Terminal Display, Single-block (S10,F3) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

Name	Description	SECS/GEM Configurator set- ting			
Single-block Terminal Mes-	Stores the single-block terminal message display text	Equipment Terminal Service			
sage Display Text	received from the host.				

Related Error Codes

Error code	Name	Description
16#3835	ACKC10 Out of Range	The value of ACKC10 is outside of the valid range.
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.

Error code	Name	Description
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed without receiving a single-block equipment terminal message.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) The value specified in the ACKC10 input variable must be within the valid range.
 - c) GEM BusyHostTerminalMsgSB must be TRUE.
- In the following cases, the _GEM_BusyHostTerminalMsgSB system-defined variable does not change to TRUE even if a Terminal Display, Single-block (S10,F3) is received.
 - a) Terminal Display, Single-block (S10,F3) is disabled in the GEM message settings on the SECS/GEM Configurator.

Application Procedure

Use the following procedure for this instruction.

1 Detecting the Equipment Terminal Message from Host

Confirm that GEM BusyHostTerminalMsgSB changes from FALSE to TRUE.

The message to the terminal is stored in the following variables.

- · Single-block Terminal Message Display Text
- · GEM HostTerminalMsgSB TID
- **2** Determining Whether Equipment Terminal Message Display Is Possible

Determine if it is possible to display an equipment terminal message on the terminal with the terminal number specified by _GEM_HostTerminalMsgSB_TID. Examples of the criteria are given below.

- Can a message be displayed on the terminal?
 If the message cannot be displayed, the acknowledge code is 16#01.
- Can the terminal be used?
 If the terminal cannot be used, the acknowledge code is 16#02.

If a message can be displayed and the terminal can be used, the acknowledge code is 16#00.

- 3 Sending the Display Result for the Equipment Terminal Message Display Request Specify the acknowledge code for the above result in the *ACKC10* input variable and execute the instruction. The equipment terminal message display result is sent to the host as the reply.
- 4 Displaying the Equipment Terminal Message

If the message can be displayed at the specified terminal, perform processing to display the message in *Single-block Terminal Message Display Text* at the specified terminal.

Sample Programming

This sample determines if displaying a message is possible for a single-block equipment terminal message from the host and sends the terminal message display result to the host.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_AckTerminalMsgSB instruction are given in the following table.

• Equipment Terminal Service - Operation Settings

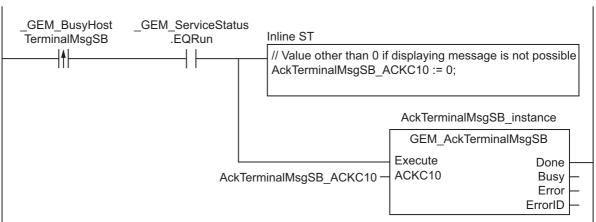
Item	Set value
Number of terminals	1
Link variable for displayed TEXT of single-block terminal	TERMINAL_MSG_SB_TEXT
messages - Displayed TEXT	

Next, enter the programming on the Sysmac Studio.

LD

	Internal Variables	Variable	Data type	Initial value	Comment		
_		AckTerminalMsgSB_ ACKC10	BYTE 0		Acknowledge code		
	AckTerminalMsgSB_		GEM_Ack		Instance of GEM_AckTermi-		
		instance	TerminalMsgSB		nalMsgSB instruction		

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostTerminalMsg	Host-initiated Single-block Terminal Message Transaction
	SB	Processing Flag
	TERMINAL_MSG_SB_TEXT	Link variable for displayed TEXT of single-block terminal messages - Displayed TEXT



ST

Internal Variables	Variable	Data type	Initial value	Comment	
	AckTerminalMsgSB_ ACKC10	BYTE	0	Acknowledge code	
	AckTerminalMsgSB_	GEM_Ack		Instance of GEM_AckTermi-	
	instance	TerminalMsgSB		nalMsgSB instruction	
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction	
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostTerminalMsgSB	
	Stage	INT	0	Program execution status	

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostTerminalMsg	Host-initiated Single-block Terminal Message Transaction
	SB	Processing Flag

```
CASE Stage Of
0: // Notification of reception from host
    R_TRIG_instance( _GEM_BusyHostTerminalMsgSB, Trigger );
    IF( Trigger = TRUE ) THEN
        // Judgement
       AckTerminalMsgSB_ACKC10:=BYTE#0;
        // Initialization
       AckTerminalMsgSB_instance( Execute:=FALSE );
       Stage := 1;
   END_IF;
1:// Reply to host.
    AckTerminalMsgSB_instance( Execute:=TRUE, ACKC10:=AckTerminalMsgSB_ACKC10 );
    IF( AckTerminalMsgSB_instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( AckTerminalMsgSB instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_AckTerminalMsgMB

The GEM_AckTerminalMsgMB instruction sends the terminal message display result for a multi-block equipment terminal message received from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Ack Termi- nalMsgMB	Acknowledge Multi-block Equipment Ter- minal Message	FB	GEM_AckTerminalMsgMB_instance GEM_AckTerminalMsgMB Execute Done ACKC10 Busy Error ErrorID	GEM_AckTerminalMsgMB_ instance(Execute, ACKC10, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
			Display terminal acknowledge code.			
			16#00: Display acknowledged.			
ACKC10	Acknowledge Code	Input	Input 16#01: Message will not be displayed.			16#00
			16#02: Cannot be used by terminal.			
			16#03 to 16#3F: Reserved.			

	Bool- ean	ı	Bit strings			Integers						Real num- bers		Times, durations, dates, and text strings						
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	DINT	LINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
ACKC10		OK																		

Function

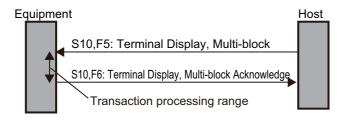
The GEM_AckTerminalMsgMB instruction sends the result of displaying a message on the specified terminal for a multi-block equipment terminal message from the host. The following are required for the reply.

Acknowledge code
 This is the result of determining whether equipment terminal message display is possible.

Refer to the application procedure for this instruction for the processing to return the message display result to the specified terminal.

Additional Information

- This instruction uses the Host Sends a Multi-block Display Message scenario for the GEM Equipment Terminal Services capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
			Gives the processing status of a host-initiated
_GEM_BusyHostTeri-	Host-initiated Multi-block Terminal Message Trans-	BOOL	multi-block terminal message transaction.*1
nalMsgMB	action Processing Flag	BOOL	TRUE: Processing
	autom vice com gring		FALSE: Not processing
_GEM_HostTerminalMs-	Host-initiated Multi-block		Gives the receiving terminal number for a host-initi-
gMB TID	Terminal Message Receiv-	BYTE	ated multi-block terminal message.
	ing Terminal Number		0: Main terminal, 1: Additional terminal
		sGEM	
_GEM_ServiceStatus	GEM Service Status	SER-	Gives the GEM Service status.
_GEW_GETVICEGRAGS	OLIVI COI VICO Clatas	VICE_STA-	Refer to P. A-212 for details.
		TUS	

^{*1.} This variable changes to TRUE when Terminal Display, Multi-block (S10,F5) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related User-defined Variables

Name	Description	SECS/GEM Configurator set- ting
Multi-block Terminal Mes- sage Display Number of Text Strings	Contains the number of message text strings to display on the terminal.	Equipment Terminal Service
Multi-block Terminal Mes- sage Display Text Table	Stores the multi-block terminal message display text received from the host.	

Related Error Codes

Error code	Name	Description	
16#3835	ACKC10 Out of Range	The value of ACKC10 is outside of the valid range.	
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.	

Error code	Name	Description
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3818	No Message Received	The instruction was executed without receiving a multi-block equipment terminal message.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and Error will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) The value specified in the ACKC10 input variable must be within the valid range.
 - c) GEM BusyHostTerminalMsgMB must be TRUE.
- In the following cases, the _GEM_BusyHostTerminalMsgMB system-defined variable does not change to TRUE even if a Terminal Display, Multi-block (S10,F5) is received.
 - a) Terminal Display, Multi-block (S10,F5) is disabled in the GEM message settings on the SECS/GEM Configurator.

Application Procedure

Use the following procedure for this instruction.

Detecting the Equipment Terminal Message from Host Confirm that GEM BusyHostTerminalMsgMB changes from FALSE to TRUE.

The message to the terminal is stored in the following variables.

- · Multi-block Terminal Message Display Text Table
- · Multi-block Terminal Message Display Number of Text Strings
- _GEM_HostTerminalMsgSB_TID
- **2** Determining Whether Equipment Terminal Message Display Is Possible

Determine if it is possible to display an equipment terminal message on the terminal with the terminal number specified by _GEM_HostTerminalMsgMB_TID. Examples of the criteria are given below.

- Can a message be displayed on the terminal?
 If the message cannot be displayed, the acknowledge code is 16#01.
- Can the terminal be used?
 If the terminal cannot be used, the acknowledge code is 16#02.

If a message can be displayed and the terminal can be used, the acknowledge code is 16#00.

- **3** Returning the Equipment Terminal Message Display Result Specify the acknowledge code from step 2 in the *ACKC10* input variable and execute the instruction. The equipment terminal message display result is sent to the host as the reply.
- 4 Displaying the Equipment Terminal Message

 If the message can be displayed on the specified terminal, perform processing to display the messages in *Multi-block Terminal Message Display Text Table* for the number of strings specified in *Multi-block Terminal Message Display Number of Text Strings* on the terminal with the specified terminal number.

Sample Programming

This sample determines if displaying a message is possible for a multi-block equipment terminal message from the host and sends the terminal message display result to the host.

SECS/GEM Configurator

First, the relevant variables are registered on the SECS/GEM Configurator.

Only the items that are related to the GEM_AckTerminalMsgMB instruction are given in the following table.

Equipment Terminal Service – Operation Settings

Item	Set value
Number of terminals	1
Number of messages displayed on terminals	10
Link variable for displayed TEXT of multi-block terminal	TERMINAL_MSG_MB_NUMBER
messages – Displayed TEXT Count	
Link variable for displayed TEXT of multi-block terminal	TERMINAL_MSG_MB_TABLE
messages – Displayed TEXT Table	

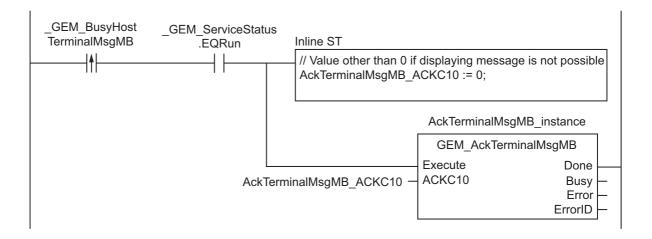
Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	AckTerminalMsgM- B_ACKC10	вуте	0	Acknowledge code
	AckTerminalMsgMB_in- stance	GEM_AckTer- minalMsgMB		Instance of GEM_AckTerminalMs- gMB instruction

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyHostTerminalMsg	Host-initiated Multi-block Terminal Message Transaction
	MB	Processing Flag
	TERMINAL_MSG_MB	Link variable for displayed TEXT of multi-block terminal
	_NUMBER	messages – Displayed TEXT Count

External Variables	Variable	Comment
	TERMINAL_MSG_MB TABLE	Link variable for displayed TEXT of multi-block terminal messages – Displayed TEXT Table
	_IADLE	sages - Displayed TEXT Table



ST

Internal Variables	Variable	Data type	Initial value	Comment
	AckTerminalMsgMB_ ACKC10		0	Acknowledge code
	AckTerminalMsgMB_ instance	GEM_Ack TerminalMsgMB		Instance of GEM_AckTerminalMs- gMB instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in _GEM_BusyHostTerminalMsgMB
	Stage	INT	0	Program execution status

External Variables	Variable	Comment
GEM BusyHostTerminalMsgMB I		Host-initiated Multi-block Terminal Message Transaction Processing Flag

```
CASE Stage Of
0: // Notification of reception from host
    R_TRIG_instance( _GEM_BusyHostTerminalMsgMB, Trigger );
    IF( Trigger = TRUE ) THEN
        // Judgement
        AckTerminalMsgMB ACKC10:=BYTE#0;
        // Initialization
        AckTerminalMsgMB instance( Execute:=FALSE );
        Stage := 1;
    END_IF;
1:// Reply to host.
    AckTerminalMsgMB_instance( Execute:=TRUE, ACKC10:=AckTerminalMsgMB_ACKC10 );
    IF( AckTerminalMsgMB_instance.Done = TRUE ) THEN
        Stage := 10;
    ELSIF( AckTerminalMsgMB_instance.Error = TRUE ) THEN
        \ensuremath{//} Add error processing as required.
```

Appendices

```
Stage := 10;
    END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_RequestChangeTime

The GEM_RequestChangeTime instruction gets the time from the host and changes the controller time.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Request ChangeTime	Request Time Change	FB	GEM_RequestChangeTime_instance GEM_RequestChangeTime Done Execute Busy Error ErrorID	GEM_RequestChangeTime_instance(Execute, Done, Busy, Error, ErrorID);

Variables

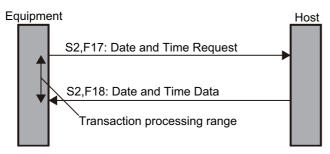
Only common variables are used.

Function

The GEM_RequestChangeTime instruction gets the time from the host and changes the controller time. The result of the time change is stored in the _GEM_EquipChangeTimeRslt system-defined variable.

Additional Information

- · This instruction uses the Equipment Requests Time scenario for the GEM Clock capability.
- A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
		BOOL	Gives the processing status of an equipment-initi-
_GEM_BusyEquipChan- geTime	Equipment-initiated Time Change Request Transaction Processing Flag		ated time change request transaction.*1
			TRUE: Processing
	activities controlling in lag		FALSE: Not processing

Name	Meaning	Data type	Description
_GEM_EquipChangeTim- eRslt	Equipment-initiated Time Change Result	_sGEM_RS LT	Gives the results of an equipment-initiated time change.
			Refer to P. A-227 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM SER- VICE_STAT US	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE if the instruction ends normally. This variable changes to FALSE when the equipment-initiated time change transaction is completed.

Related Error Codes

Error code	Name	Description
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipChangeTime must be FALSE.
- Access _GEM_EquipChangeTimeRslt after _GEM_BusyEquipChangeTime changes from TRUE to FALSE.

Sample Programming

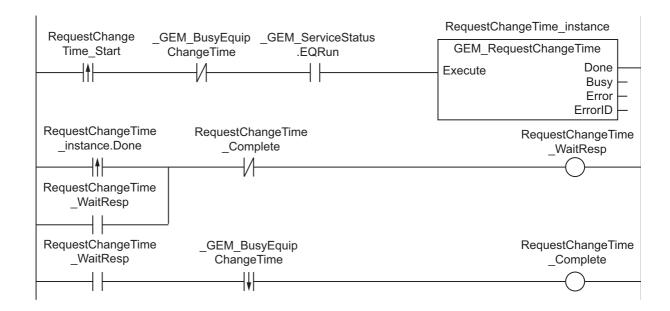
This sample gets the time from the host and changes the controller time.

If the GEM Service status is EQRun and the *RequestChangeTime_Start* internal variable changes from FALSE to TRUE, the controller time is changed.

LD

Internal Variables	Variable	Data type	Initial value	Comment		
	RequestChangeTime_Start	BOOL	FALSE	Flag to start time change		
	RequestChangeTime_	GEM_Request-		Instance of GEM_RequestChange		
	instance	ChangeTime		Time instruction		
	RequestChangeTime_ WaitResp	BOOL	FALSE	Flag that indicates waiting for completion of time change		
	RequestChangeTime_ Complete	BOOL	FALSE	Flag that indicates completion of time change		

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
_GEM_BusyEquipChange		Equipment-initiated Time Change Request Transaction
	Time	Processing Flag



ST

Internal Variables	Variable	Data type Initia		Comment		
	RequestChangeTime_Start	BOOL	FALSE	Flag to start time change		
	RequestChangeTime_	GEM_Request-		Instance of GEM_RequestChange-		
	instance	ChangeTime		Time instruction		
	R_TRIG_instance			Instance of R_TRIG instruction		
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction		
	Triange		FALSE	Flag for FALSE to TRUE change in RequestChangeTime_Start		
	Trigger	BOOL	FALSE	Flag for TRUE to FALSE change in _GEM_BusyEquipChangeTime		
	Stage	INT	0	Program execution status		

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipChange	Equipment-initiated Time Change Request Transaction
	Time	Processing Flag

```
CASE Stage Of
0: // Start
    R TRIG instance( RequestChangeTime Start, Trigger );
    IF( (Trigger = TRUE) AND ( GEM ServiceStatus.EQRun = TRUE ) ) THEN
        // Initialization
       RequestChangeTime_instance( Execute:=FALSE );
       Stage := 1;
    END IF;
1: // Request time change.
    RequestChangeTime_instance( Execute:=TRUE );
    IF( RequestChangeTime_instance.Done = TRUE ) THEN
        Stage := 2;
    ELSIF( RequestChangeTime instance.Error = TRUE ) THEN
        // Add error processing as required.
        Stage := 10;
    END IF;
2: // Wait for completion of change.
    F_TRIG_instance( _GEM_BusyEquipChangeTime, Trigger );
    IF( Trigger = TRUE) THEN
       Stage := 10;
   END_IF;
10: // End
    Stage := 0;
END_CASE;
```

GEM_SendEquipUserMsg

The GEM_SendEquipUserMsg sends a user-defined message to the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_Send EquipUser Msg	Send Equip- ment-initiated User-defined Message	FB	GEM_SendEquipUserMsg_instance GEM_SendEquipUserMsg Execute Done MsgNo Busy Error ErrorID	GEM_SendEquipUserMsg_ instance(Execute, MsgNo, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
MsgNo	Message number	Input	User-defined message number	Depends on data type.		*1

^{*1.} If you omit an input parameter, the default value is not applied. A building error will occur.

	Bool- ean		Bit s	trings	5	Integers				Real be	num- ers	Times, durations, dates, and text strings								
	вооц	вүте	WORD	DWORD	LWORD	USINT	UINT	UDINT	ULINT	SINT	INT	TNID	LINT	REAL	LREAL	HIME	DATE	DOL	Ια	STRING
MsgNo						OK	OK			OK	OK									

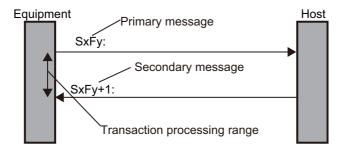
Function

The GEM_SendEquipUserMsg instruction sends the user-defined message specified with message number *MsgNo* to the host.

The result of sending the user-defined message is stored in _GEM_EquipUserMsgRslt.

Additional Information

A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyEquipUs- erMsq	Equipment-initiated User-defined Message Transaction Processing	BOOL	Gives the processing status of an equipment-initiated user-defined message transaction.*1 *2
envisg	Flag		TRUE: Processing
	1.05		FALSE: Not processing
_GEM_EquipUser MsgNo	Equipment-initiated User-defined Message Number	UINT	Gives the number of a received equipment-initiated user-defined message.
_GEM_EquipUser MsgRslt	Equipment-initiated User-defined Message Results	_sGEM_RSLT	Gives the results of an equipment-initiated user-defined message. Refer to P. A-228 for details.
_GEM_ServiceStatus	GEM Service Status	_sGEM_ SERVICE_ STATUS	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when the instruction ends normally. It changes to FALSE when transaction processing is completed.

Related Error Codes

Error code	Name	Description
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3822	Set to Disable	A message number that was disabled on the SECS/GEM Configurator was specified in <i>MsgNo</i> .
16#3827	Undefined Message Number	A message number that was not defined in user-defined messages on the SECS/GEM Configurator was specified in <i>MsgNo</i> .
16#3838	Illegal SECS Message	A message number for which an even function number is registered was specified in <i>MsgNo</i> .
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.
16#3819	Multi-execution of Instructions	Transaction processing is not completed for a previous execution of the same instruction.

^{*2.} If you specify on the SECS/GEM Configurator that a reply for the primary message is not necessary and then execute the instruction with the *MsgNo* input variable set to 0, this variable changes to FALSE.

Error code	Name	Description
16#381B	Insufficient Transaction Resource	When the instruction was executed, the limit to the number of
10#3010	Insuncient transaction Resource	transactions that can be buffered had been reached.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) _GEM_ServiceStatus must be EQRun.
 - b) _GEM_BusyEquipUserMsg must be FALSE.
- Access _GEM_EquipUserMsgRslt after _GEM_BusyEquipUserMsg changes from TRUE to FALSE.

Application Procedure

Use the following procedure for this instruction.

- Storing the Data to Send
 Store the required information in user-defined variables for the message number to send.
- 2 Sending the User-defined Message

 Specify the message number to send in the *MsgNo* input variable and execute the instruction.

 The user-defined message is sent to the host.
- **3** Confirming the Result of Sending the User-defined Message

 Check the result of sending the user-defined message in GEM_EquipUserMsgRslt after

 _GEM_BusyEquipUserMsg changes to FALSE.

Sample Programming

This sample sends a user-defined message.

Loopback Diagnostic Request (S2,F25) is used in this example.

A loopback message is sent and the reply data is checked.

If the GEM Service status is EQRun and the <code>SendEquipUserMsg_Start</code> internal variable changes from FALSE to TRUE, a user-defined message is sent.

SECS/GEM Configurator

First, the following user-defined messages are created on the SECS/GEM Configurator.

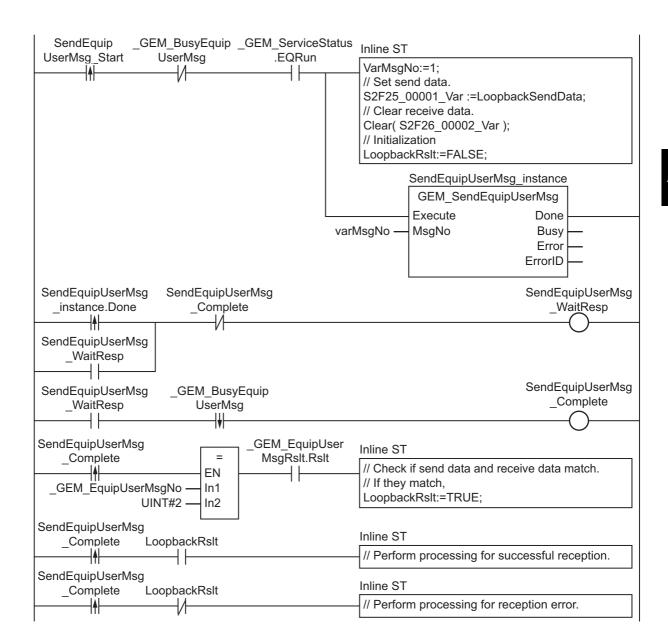
Message number	S/F	Branch num- ber	Enabled/ disabled	Direc- tion	Reply	Abbre via-tion	Message name	Message structure	Link variable
1	S2F25	1	Enabled	H←E	Yes	LDR	Loopback Diagnostic Request		S2F25 _00001_Var
2	S2F26	1	Enabled	H→E		LDD	Loopback Diagnostic Data		S2F26 _00002_Var

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	SendEquipUserMsg_Start	BOOL	FALSE	Flag to start sending equip- ment-initiated user-defined mes- sage
	SendEquipUserMsg _in- stance	GEM_Send EquipUserMsg		Instance of GEM_SendEquipUs- erMsg instruction
	SendEquipUserMsg _Wait- Resp	BOOL	FALSE	Flag that indicates waiting for completion of sending equipment-initiated user-defined message
	SendEquipUserMsg _Complete	BOOL	FALSE	Flag that indicates completion of sending equipment-initiated user-defined message
	varMsgNo	UINT	0	Message number
	LoopbackRslt	BOOL	FALSE	Loopback check result
	LoopbackSendData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Loopback send data

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	_GEM_BusyEquipUserMsg	Equipment-initiated User-defined Message Transaction Processing Flag
	_GEM_EquipUserMsgRslt	Send Equipment-initiated User-defined Message Result
	_GEM_EquipUserMsgNo	Equipment-initiated User-defined Message Number
	S2F25_00001_Var	Link variable for message to send for loopback diagnosis
	S2F26_00002_Var	Link variable for message to receive for loopback diagnosis



ST

Internal Variables	Variable	Data type	Initial value	Comment			
	SendEquipUserMsg_Start	BOOL	FALSE	Flag to start sending the equip- ment-initiated user-defined mes- sage			
	SendEquipUserMsg _in- stance	GEM_Send EquipUserMsg		Instance of GEM_SendEquipUs- erMsg instruction			
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction			
	F_TRIG_instance	F_TRIG		Instance of F_TRIG instruction			
	Trigger	BOOL	FALSE	Flag for FALSE to TRUE change in SendEquipUserMsg_Start			
	mgger	BOOL	TALOL	Flag for TRUE to FALSE change in _GEM_BusyEquipUserMsg			
	Stage	INT	0	Program execution status			
	varMsgNo	UINT	0	Message number			
	LoopbackRslt	BOOL	FALSE	Loopback check result			
	LoopbackSendData	ARRAY[09] OF BYTE	[16#01, 16#23, 16#45, 16#67, 16#89, 16#01, 16#23, 16#45, 16#67, 16#89]	Loopback send data			

External Variables	Variable	Comment
	_GEM_ServiceStatus	GEM Service status
	GEM_BusyEquipUserMsg	Equipment-initiated User-defined Message Transaction Process-
	OEM_BusyEquiposermsg	ing Flag
	_GEM_EquipUserMsgRslt	Send Equipment-initiated User-defined Message Result
	_GEM_EquipUserMsgNo	Equipment-initiated User-defined Message Number
	S2F25_00001_Var	Link variable for message to send for loopback diagnosis
	S2F26_00002_Var	Link variable for message to receive for loopback diagnosis
	_GEM_EquipUserMsgNo S2F25_00001_Var	Equipment-initiated User-defined Message Number Link variable for message to send for loopback diagnosis

```
CASE Stage Of
 R_TRIG_instance( SendEquipUserMsg_Start, Trigger );
 IF( (Trigger = TRUE)
   AND ( _GEM_ServiceStatus.EQRun = TRUE ) ) THEN
   VarMsgNo:=1;
   // Set send data.
   S2F25_00001_Var :=LoopbackSendData;
    // Clear receive data.
   Clear( S2F26_00002_Var );
    // Initialization
    LoopbackRslt:=FALSE;
    SendEquipUserMsg_instance( Execute:=FALSE, MsgNo:=VarMsgNo );
   Stage := 1;
 END_IF;
1: // Start send.
 SendEquipUserMsg_instance( Execute:=TRUE, MsgNo:=VarMsgNo );
 IF( SendEquipUserMsg_instance.Done = TRUE ) THEN
```

```
Stage := 2;
 ELSIF( SendEquipUserMsg_instance.Error = TRUE ) THEN
   // Add error processing as required.
   Stage := 10;
 END IF;
2: // Wait for completion of send.
  F TRIG instance( GEM BusyEquipUserMsg, Trigger );
  IF( Trigger = TRUE) THEN
    IF( GEM EquipUserMsqRslt.Rslt = TRUE AND GEM EquipUserMsqNo = 2 )THEN
      // Check if send data and receive data match.
      // If they match,
     Stage := 3;
     // If they do not match,
     Stage := 4;
   ELSE
     Stage := 4;
   END IF;
 END_IF;
3: // Perform processing for successful loopback process.
 Stage := 10;
4: // Perform processing for failed loopback process.
 Stage := 10;
10: // End
 Stage := 0;
END CASE;
```

GEM_RespHostUserMsg

The GEM_RespHostUserMsg instruction returns the user-defined message with the specified message number as the reply for a user-defined message received from the host.

Instruction	Name	FB/ FUN	Graphic expression	ST expression
GEM_RespHo stUserMsg	Respond to Host-initiated User-defined Message	FB	GEM_RespHostUserMsg_instance GEM_RespHostUserMsg Execute Done MsgNo Busy Error ErrorID	GEM_RespHostUserMsg_ instance(Execute, MsgNo, Done, Busy, Error, ErrorID);

Variables

Name	Meaning	I/O	Description	Valid range	Unit	Default
MsgNo	Message number	Input	User-defined message number	Depends on data type.		*1

^{*1.} If you omit an input parameter, the default value is not applied. A building error will occur.

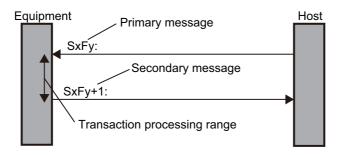
	Bool- ean		Bit s	trings	\$	Integers				Real be	num- ers	Times, durations, dates, and text strings								
	вооц	вүте	WORD	DWORD	LWORD	USINT	LINT DINT INT ULINT UDINT					REAL	LREAL	TIME	DATE	TOD	TO	STRING		
MsgNo						OK	OK			OK	OK									

Function

The GEM_RespHostUserMsg instruction sends the user-defined secondary message with the message number specified in *MsgNo* as the reply for a user-defined primary message received from the host.

Additional Information

A SECS message is sent if this instruction is executed and execution ends normally. The SECS message exchange between the equipment and host is given below.



Related System-defined Variables

Name	Meaning	Data type	Description
_GEM_BusyHostUser Msg	Host-initiated User-defined Message Transaction Processing Flag	BOOL	Gives the processing status of a host-initiated user-defined message transaction.*1 *2 TRUE: Processing FALSE: Not processing
_GEM_HostUserMsgNo	Host-initiated User-defined Message Number	UINT	Gives the number of the received host-initiated user-defined message.
_GEM_ServiceStatus	GEM Service Status	_sGEM_SER- VICE_STATUS	Gives the GEM Service status. Refer to P. A-212 for details.

^{*1.} This variable changes to TRUE when a user-defined primary message (Sx,Fy) is received from the host. It will change to FALSE when execution of the instruction is completed normally.

Related Error Codes

Error code	Name	Description
16#041D	Exceeded Simultaneous Instruction Executed Resources	The number of simultaneously executed GEM instructions exceeded the limit.
16#3822	Set to Disable	A message number that was disabled on the SECS/GEM Configurator was specified in <i>MsgNo</i> .
16#3827	Undefined Message Number	A value that was not defined in user-defined messages on the SECS/GEM Configurator was specified in <i>MsgNo</i> .
16#3838	Illegal SECS Message	The received SECS message (Sx,Fy) was set to a message that was not (Sx,Fy+1).
16#3810	GEM Service Status in Initializing	The instruction was executed when the GEM Service status was Initializing.
16#3811	GEM Service Status in EQStarting	The instruction was executed when the GEM Service status was EQStarting.
16#3812	GEM Service Status in EQInitializing	The instruction was executed when the GEM Service status was EQInitializing.
16#3814	GEM Service Status in Stop	The instruction was executed when the GEM Service status was Stop.
16#3815	GEM Service Status in Error	The instruction was executed when the GEM Service status was Error.
16#3816	GEM Service Status in ShuttingDown	The instruction was executed when the GEM Service status was ShuttingDown.
16#3817	GEM Service Status in Shutdown	The instruction was executed when the GEM Service status was Shutdown.

^{*2.} If the W bit of the primary message is set to OFF on the SECS/GEM Configurator, this variable changes to FALSE after sending the primary message is completed.

Error code	Name	Description
16#3818	No Message Received	The instruction was executed without receiving a user-defined
	-	message from the host.

Precautions for Correct Use

- Before executing the instruction, confirm that all of the following conditions are met. If the instruction is executed when any of these conditions is not met, an error will occur and *Error* will change to TRUE.
 - a) GEM ServiceStatus must be EQRun.
 - b) _GEM_BusyHostUserMsg must be FALSE.
- In the following cases, the _GEM_BusyHostUserMsg does not change to TRUE even if a user-defined primary message (Sx,Fy) is received.
 - a) The SECS message (S,F) registered on the SECS/GEM Configurator does not match its items.

Application Procedure

Use the following procedure for this instruction.

- 1 Detecting the User-defined Message from Host Confirm that _*GEM_BusyHostUserMsg* changes from FALSE to TRUE.
- **2** Confirming the Received Data for the User-defined Message

 Check the received message number that was stored in _GEM_HostUserMsgNo. Check the user-defined variables for the message number and perform required processing.
- **3** Returning the User-defined Message

 Specify the message number for which to send a reply in the *MsgNo* input variable and execute the instruction. The user-defined message is sent to the host as the reply.

Sample Programming

This sample sends the user-defined message with message number 4 as the reply for the user-defined message with message number 3 from the host.

SECS/GEM Configurator

First, the following user-defined messages are created on the SECS/GEM Configurator.

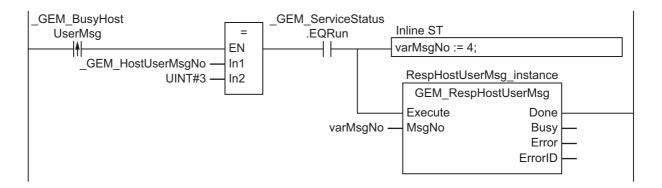
Message number	S/F	Branch number	Enabled/ disabled	Direction	Reply	Abbre- viation	Message name	Message structure	Link variable
3		1	Enabled	$H \rightarrow E$	Yes	TEST1	Sample Request		
4		1	Enabled	H←E		TEST2	Sample		
							Data		

Next, enter the programming on the Sysmac Studio.

LD

Internal Variables	Variable	Data type	Initial value	Comment
	varMsgNo		0	Message number
	RespHostUserMsg _instance	GEM_Resp		Instance of GEM_RespHostUs-
Resphosioserwisg_instance		HostUserMsg		erMsg instruction

External Variable		Comment				
_GEM_ServiceStatus		GEM Service status				
	GEM_BusyHostUserMsg	Host-initiated User-defined Message Transaction Processing				
	_GEINI_BUSYHOSIOSEINISG	Flag				
	_GEM_HostUserMsgNo	Host-initiated User-defined Message Number				



ST

Internal Variables	Variable	Data type	Initial value	Comment
	RespHostUserMsg _instance	GEM_Resp HostUserMsg		Instance of GEM_RespHostUs- erMsg instruction
	R_TRIG_instance	R_TRIG		Instance of R_TRIG instruction
	Trigger	BOOL	FALSE	Flag for TRUE to FALSE change in _GEM_BusyHostUserMsg
	Stage		0	Program execution status
	varMsgNo	UINT	0	Message number

External Variables	Variable	Comment					
	_GEM_ServiceStatus	GEM Service status					
	_GEM_BusyHostUserMsg	Host-initiated User-defined Message Transaction Processing Flag					
	_GEM_HostUserMsgNo	Host-initiated User-defined Message Number					

```
CASE Stage Of
0: // Notification of reception from host
   R_TRIG_instance(_GEM_BusyHostUserMsg, Trigger );
   If( Trigger = TRUE ) THEN
        // Judgement
        If(_GEM_HostUserMsgNo = 3 ) THEN
            VarMsgNo:= UINT#4;
        END_IF;
```

```
// Initialization
  RespHostUserMsg_instance ( Execute:=FALSE, MsgNo := VarMsgNo );
  Stage:=1;
  END_IF;
1:// Reply to host.
  RespHostUserMsg_instance( Execute:=TRUE, MsgNo := VarMsgNo );
  IF(RespHostUserMsg_instance.Done = TRUE ) THEN
     Stage := 10;
  ELSIF(RespHostUserMsg_instance.Error = TRUE ) THEN
     // Add error processing as required.
     Stage := 10;
  END_IF;
10: // End
  Stage := 0;
END_CASE;
```

A-1-7 Events That Occur for GEM Instruction Execution

This section provides a table of errors (events) that occur for GEM instructions and detailed information on those errors (events).

Event Code List

This section provides a table of errors (events) that occur for GEM instructions.

Errors are given as event codes that use the error code as the lower four digits. For descriptions of the error codes, refer to the descriptions of the corresponding event codes. For example, if the error code of the instruction is 16#0400, refer to the description of the event with event code 54010400 hex. The number 16#5401 in the upper four digits is the error that occurs for instruction execution.

Event levels are given in the table as follows:

Maj: Major fault level
Prt: Partial fault level
Min: Minor fault level
Obs: Observation
Info: Information

Refer to the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503) for error (event) concepts and for all of the event codes that may occur for an NJ-series Controller.

Event code	Event name	Mooning	Assumed cause			Leve	I		Refer-
Event code	Event name	Meaning	Assumed cause	Maj	Prt	Min	Obs	Info	ence
54010400 hex	Input Value	An input parameter	An input parameter				✓		*1
	Out of Range	for an instruction	for an instruction						
		exceeded the valid	exceeded the valid						
		range for an input	range for an input						
		variable. Or, division	variable. Or, division						
		by an integer of 0	by an integer of 0						
		occurred in division	occurred in division or						
		or remainder calcu-	remainder calcula-						
		lations.	tions.						
54010419 hex	Incorrect Data	A data type that can-	 A data type that can- 				✓		*1
	Type	not be used for an	not be used for an						
		instruction is speci-	instruction is specified						
		fied for an input or	for an input or in-out						
		in-out variable.	variable.						
5401041D hex	Exceeded	The maximum	 More than the maxi- 				✓		*1
	Simultaneous	resources that you	mum number of rele-						
	Instruction	can use for the rele-	vant instructions were						
	Executed	vant instruction	executed at the same						
	Resources	group at the same	time.						
		time was exceeded.							

Event code	Event name	Meaning	Assumed cause			Leve	I		Refer-	
Event code	Event name	Wearing	Assumed cause	Maj	Prt	Min	Obs	Info	ence	
54013810 hex	GEM Service Status in Ini- tializing	An instruction was executed when the GEM Service status was Initializing.	The relevant instruc- tion was executed when the GEM Ser- vice status was Initial- izing.				✓		P. A-193	
54013811 hex	GEM Service Status in EQStarting	An instruction was executed when the GEM Service status was EQStarting.	The relevant instruc- tion was executed when the GEM Ser- vice status was EQStarting.				√		P. A-193	
54013812 hex	GEM Service Status in EQInitializing	An instruction was executed when the GEM Service status was EQInitializing.	The relevant instruc- tion was executed when the GEM Ser- vice status was EQIni- tializing.				✓		P. A-194	
54013813 hex	GEM Service Status in EQRun	An instruction was executed when the GEM Service status was EQRun.	The relevant instruc- tion was executed when the GEM Ser- vice status was EQRun.				✓		P. A-194	
54013814 hex	GEM Service Status in Stop	An instruction was executed when the GEM Service status was Stop.	The relevant instruc- tion was executed when the GEM Ser- vice status was Stop.				✓		P. A-195	
54013815 hex	GEM Service Status in Error	An instruction was executed when the GEM Service status was Error.	The relevant instruc- tion was executed when the GEM Ser- vice status was Error.				√		P. A-195	
54013816 hex	GEM Service Status in Shut- tingDown	An instruction was executed when the GEM Service status was ShuttingDown.	The relevant instruction was executed when the GEM Service status was ShuttingDown.				✓		P. A-196	
54013817 hex	GEM Service Status in Shut- down	An instruction was executed when the GEM Service status was Shutdown.	The relevant instruc- tion was executed when the GEM Ser- vice status was Shut- down.				✓		P. A-196	
54013818 hex	No Message Received	An instruction was executed without receiving a SECS message from the host.	The relevant instruction was executed without receiving the relevant SECS message from the host.				√		P. A-197	
54013819 hex	Multi-execu- tion of Instruc- tions	Processing of a transaction for a different instance of the same instruction that was executed before this instruction is not completed.	This instruction was executed before com- pleting processing for a transaction for a dif- ferent instance of the same instruction.				√		P. A-198	

						Leve			Refer-	
Event code	Event name	Meaning	Assumed cause	Maj	Prt	Min	Obs	Info	ence	
5401381A hex	State Transition in Progress	A state transition for a different instance of the same instruc- tion that was exe- cuted before this instruction is not completed.	This instruction was executed for a different instance of the GEM_ChangeCommState instruction in EnabledNotComm state. This instruction was executed for a different instance of the GEM_ChangeControlState instruction in AttemptOnline state.				*		P. A-199	
5401381B hex	Insufficient Transaction Resource	The instruction was executed while the number of transactions that can be buffered exceeds the upper limit.	The instruction was executed while the number of transactions that can be buffered exceeds the upper limit.				✓		P. A-200	
54013820 hex	Too Many Characters	More characters were specified than the number that was set and the instruc- tion was executed.	More characters were specified than the number of characters set with the SECS/GEM Configu- rator.				✓		P. A-200	
54013821 hex	Invalid Size	An incorrect array or an array with an incorrect number of elements was speci- fied and the instruc- tion was executed.	A value was specified that is larger than the maximum table size set with the SECS/GEM Configu- rator.				√		P. A-201	
54013822 hex	Set to Disable	The instruction that was set to disable was executed.	The instruction executed for a GEM capability was disabled on the SECS/GEM Configurator.				√		P. A-201	
54013824 hex	Undefined CEID	An undefined CEID was specified and the instruction was executed.	A CEID that was not defined in the SECS/GEM Configu- rator was specified.				√		P. A-202	
54013825 hex	Undefined ALID	An undefined ALID was specified and the instruction was executed.	An ALID that was not defined in the SECS/GEM Configu- rator was specified.				√		P. A-202	
54013826 hex	Undefined CCODE	An undefined CCODE was specified and the instruction was executed.	A CCODE that was not defined in the SECS/GEM Configu- rator was specified.				√		P. A-203	
54013827 hex	Undefined Message Number	An undefined mes- sage number was specified and the instruction was exe- cuted.	A message number that was not defined in the SECS/GEM Configurator was specified.				√		P. A-203	

Event code	Event name	Meaning	Assumed cause			Leve			Refer-	
				Maj	Prt	Min	Obs	Info	ence	
54013828 hex	HSMS Com- munications Setting Out of Range	An HSMS communications setting that is out of range was specified and the instruction was executed.	An HSMS communications setting that is out of range was specified.				√		P. A-204	
54013829 hex	TID Out of Range	A TID that is out of range was specified and the instruction was executed.	A TID that is out of range was specified.				✓		P. A-204	
5401382C hex	Undefined ECID	An undefined ECID was specified and the instruction was executed.	An ECID that was not defined in the SECS/GEM Configu- rator was specified.				√		P. A-205	
5401382D hex	Type Mis- match	A value with an incorrect data type was specified and the instruction was executed.	A different equipment constant data type than the one regis- tered with the SECS/GEM Configu- rator was specified.				√		P. A-205	
5401382E hex	ECV Out of Range	An out-of-range value was specified for an equipment constant and the instruction was executed.	A value was specified that is outside the upper and lower lim- its of the value of the equipment constant that was set on the SECS/GEM Configu- rator.				✓		P. A-206	
5401382F hex	Illegal CPNAME	A CPNAME that is different form the received CPNAME was specified and the instruction was executed.	A CPNAME was specified that is differ- ent from the received CPNAME.				✓		P. A-206	
54013830 hex	HCACK Out of Range	An HCACK that is out of range was specified and the instruction was exe- cuted.	An HCACK that is out of range was speci- fied.				√		P. A-207	
54013831 hex	CPACK Out of Range	A CPACK that is out of range was speci- fied and the instruc- tion was executed.	A CPACK that is out of range was speci- fied.				✓		P. A-207	
54013832 hex	CEPACK Out of Range	A CEPACK that is out of range was specified and the instruction was exe- cuted.	A CEPACK that is out of range was speci- fied.				√		P. A-208	
54013833 hex	ACKC7 Out of Range	An ACKC7 that is out of range was specified and the instruction was executed.	An ACKC7 that is out of range was speci- fied.				√		P. A-208	

Event code	Event name	Moaning	Assumed cause			Leve			Refer-
Event code	Event name	Meaning	Assumed cause	Maj	Prt	Min	Obs	Info	ence
54013834 hex	ACKC7A Out of Range	An ACKC7A that is out of range was specified and the instruction was exe- cuted.	An ACKC7A that is out of range was specified.				√		P. A-209
54013835 hex	ACKC10 Out of Range	An ACKC10 that is out of range was specified and the instruction was exe- cuted.	An ACKC10 that is out of range was specified.				√		P. A-209
54013836 hex	EAC Out of Range	An EAC that is out of range was specified and the instruction was executed.	An EAC that is out of range was specified.				✓		P. A-210
54013838 hex	Illegal SECS Message	A message number for which an illegal SECS message is set was specified and the instruction was executed.	A message number for which a SECS message that does not agree with the instruction specifica- tions was specified.				√		P. A-210

^{*1.} Refer to the NJ/NX-series Instructions Reference Manual (Cat. No. W502).

Event Code Details

This section provides detailed information on errors (events) that occur for GEM instructions. The lower four digits of the event code give the error code for the instruction. For descriptions of the error codes, refer to the descriptions of the corresponding event codes. For example, if the error code of the instruction is 16#0400, refer to the description of the event with event code 54010400 hex.

The items that are used to describe individual errors (events) are described in the following copy of an error table.

Event name	Gives the name	of the error.		Event code	Gives the code o	f the error.				
Meaning	Gives a short des	scription of the erro	or.							
Source	Gives the source	of the error.	Source details	Gives details on the source of the error.	Detection tim- ing	Tells when the error is detected.				
Error attributes	Level	Tells the level of influence on control.*1	Recovery	Gives the recovery method.*2	Log category	Tells which log the error is saved in.*3				
Effects	User program	Tells what will happen to execution of the user program.*4	Operation	Provides special results from the e	information on the operation that error.					
Sys-	Variable		Data type		Name					
tem-defined variables		• •	•	•	variables that proves that cause the er					
Cause and	Assumed cause		Correction		Prevention					
correction	Lists the possible	causes, correctio	ns, and preventive	measures for the	error.					
Attached information	This is the attach	This is the attached information that is displayed by the Sysmac Studio or an HMI.*5								
Precautions/ Remarks	Provides precaut	ions, restrictions, a	and supplemental i	nformation.						

*1. One of the following:

Major fault: Major fault level Partial fault: Partial fault level Minor fault: Minor fault level

Observation Information

*2. One of the following:

Automatic recovery: Normal status is restored automatically when the cause of the error is removed.

Error reset: Normal status is restored when the error is reset after the cause of the error is removed.

Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.

Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.

Depends on cause: The recovery method depends on the cause of the error.

*3. One of the following:

System: System event log Access: Access event log

*4. One of the following:

Continues: Execution of the user program will continue.

Stops: Execution of the user program stops. Starts: Execution of the user program starts.

*5. Refer to the appendices of the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503) for the applicable range of the HMI Troubleshooter.

Event name	GEM Service Sta	itus in Initializing		Event code	54013810 hex	_			
Meaning	An instruction wa	s executed when	the GEM Service s	status was Initializi	ng.	_			
Source	PLC Function Mo	odule	Source details	Source details Instruction		At instruction execution			
Error attributes	Level	Observation	Recovery		Log category				
Effects	User program	Continues.	Operation	The relevant inst cations.	evant instruction will end according to spec				
Sys-	Variable		Data type		Name				
tem-defined variables	_GEM_ServiceS	tatus	_sGEM_SERVIC	E_STATUS	GEM Service Sta	atus			
	Assumed cause)	Correction		Prevention				
Cause and correction	The relevant inst cuted when the C tus was Initializin	SEM Service sta-	Execute the relevance of a GEM Service sinstruction can open		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.				
Attached information	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)								
Precautions/	None	· ·	`	•					
Remarks									

Event name	GEM Service Sta	tus in EQStarting		Event code	54013811 hex		
Meaning	An instruction wa	s executed when	the GEM Service s	tatus was EQStar	ting.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation The relevant instruction will end according to cations.		cording to specifi-		
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatussGEM		_sGEM_SERVIC	_sGEM_SERVICE_STATUS		GEM Service Status	
	Assumed cause		Correction	Correction			
Cause and correction	The relevant instruction was executed when the GEM Service status was EQStarting.		a GEM Service s	Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.	
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/ Remarks	None		0000 (2/10/1	·· <i>I</i>			

Event name	GEM Service Sta	itus in EQInitializin	g	Event code	54013812 hex		
Meaning	An instruction wa	s executed when	the GEM Service s	tatus was EQInitia	alizing.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant instruction will end according to speciations.		cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatus		_sGEM_SERVICE_STATUS		GEM Service Status		
	Assumed cause		Correction		Prevention		
Cause and correction	The relevant instruction was executed when the GEM Service status was EQInitializing.		a GEM Service st	Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.	
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/	None	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			
Remarks							

Event name	GEM Service Sta	tus in EQRun		Event code	54013813 hex		
Meaning	An instruction wa	s executed when	the GEM Service s	tatus was EQRun			
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant instruction will end according to specifications.			
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatus		_sGEM_SERVICE_STATUS		GEM Service Status		
	Assumed cause		Correction	Correction			
Cause and correction	The relevant instruction was executed when the GEM Service status was EQRun.		a GEM Service st	Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.	
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/	None	II Expandion					
Remarks							

Event name	GEM Service Status in Stop			Event code	54013814 hex		
Meaning	An instruction wa	as executed when	the GEM Service s	status was Stop.	•		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatus		_sGEM_SERVIC	_sGEM_SERVICE_STATUS		atus	
Cause and	Assumed cause		Correction		Prevention		
	The relevant instruction was exe-		Execute the relev	Execute the relevant instruction in		Service status in	
correction	cuted when the GEM Service sta-		a GEM Service status in which the		the _GEM_Servi	ceStatus system	
	tus was Stop.		instruction can operate.		variable before you execute the instruction.		
	Attached Informa	ation 1: Error Locat	ion		mod dodon.		
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.					
	Attached Information 4: Expansion Error Code (ErrorIDEx)						
Precautions/	None						
Remarks							

Event name	GEM Service Sta	tus in Error		Event code	54013815 hex		
Meaning	An instruction wa	s executed when	the GEM Service s	status was Error.			
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation The relevant instruction will end according to specifications.			cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceSt	atus	_sGEM_SERVICE_STATUS		GEM Service Status		
	Assumed cause		Correction		Prevention		
Cause and correction	The relevant instruction was executed when the GEM Service status was Error.		a GEM Service s	Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.	
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (ErrorIDEx)					
Precautions/ Remarks	None			·· <i>j</i>			

Event name	GEM Service Status in ShuttingDown		Event code	54013816 hex			
Meaning	An instruction wa	s executed when	the GEM Service s	tatus was Shutting	Down.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant instruction will end according to spec cations.		cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatus		_sGEM_SERVIC	_sGEM_SERVICE_STATUS		GEM Service Status	
	Assumed cause		Correction		Prevention		
Cause and correction	The relevant instruction was executed when the GEM Service status was ShuttingDown.		a GEM Service st	Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.	
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/	None						
Remarks							

Event name	GEM Service Sta	tus in Shutdown		Event code	54013817 hex		
Meaning	An instruction wa	s executed when	the GEM Service s	tatus was Shutdo	us was Shutdown.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant instruction will end according to specifications.			
Sys-	Variable		Data type		Name		
tem-defined variables	_GEM_ServiceStatus		_sGEM_SERVIC	E_STATUS	GEM Service Status		
	Assumed cause	Assumed cause		Correction			
Cause and correction	The relevant instruction was executed when the GEM Service status was Shutdown.		Execute the relevant instruction in a GEM Service status in which the instruction can operate.		Confirm the GEM Service status in the _GEM_ServiceStatus system variable before you execute the instruction.		
Attached information	Attached Informa from the start of t Attached Informa is more than one cannot be identifi	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (ErrorIDEx)					
Precautions/	None			,			
Remarks	- 112						

Event name	No Message Red	ceived		Event code 54013818 hex				
Meaning	An instruction wa	is executed withou	it receiving a SEC	S message from th	e host.			
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-		
	Variable		Data type		Name			
	_GEM_BusyHos	_GEM_BusyHostChangeECV		BOOL		uipment Constant tion Processing		
	_GEM_BusyHos	tCmd	BOOL		Host Command cessing Flag	Transaction Pro-		
Sys- tem-defined variables	_GEM_BusyEnha	ancedRmtCmd	BOOL		Enhanced Remo			
	_GEM_BusyHosi load	tFormattedPPUp-	BOOL		cessing Flag	Transaction Pro-		
	_GEM_BusyHos	tPPUpload	BOOL		Host-initiated Process Program Upload Transaction Processing Flag			
	_GEM_BusyHostFormattedP- PDownload		BOOL			Host-initiated Formatted Process Program Download Transaction Processing Flag		
	_GEM_BusyHos	tPPDownload	BOOL			ocess Program action Process-		
	_GEM_BusyHos	tTerminalMsgSB	BOOL		Host-initiated Single-block Termi- nal Message Transaction Pro- cessing Flag			
	_GEM_BusyHos	tTerminalMsgMB	BOOL		Host-initiated Multi-block Terminal Message Transaction Processing Flag			
	_GEM_BusyHos	tUserMsg	BOOL		Host-initiated Us sage Transaction	er-defined Mes- n Processing Flag		
	Assumed cause		Correction		Prevention			
Cause and correction	cuted without rec	The relevant instruction was executed without receiving the relevant SECS message from the		Receive the relevant SECS message for the relevant instruction before you execute the instruction.		m-defined vari- es processing of a ed to the relevant UE before you uction.		
	Attached Informa	ition 1: Error Locat	tion		1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			
Attached information	from the start of t Attached Informa	the section is given tion 3: Names of the possible instruction	ion Details (Rung Number). For a program section, the rung number is For ST, the line number is given. The Instruction and Instruction Instance Where the Error Occurred. The instruction is given on all of them. Nothing is given if the instruction.			Occurred. If there		
		Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)						
Precautions/ Remarks	None	, aa.	(·				

Event name	Multi-execution o	f Instructions		Event code	54013819 hex		
Meaning	Processing of a ti		fferent instance of	the same instructi	on that was execu	ted before this	
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
	Variable		Data type		Name		
	_GEM_BusyEquipFormattedP- PUpload		BOOL		Equipment-initiat Process Program action Processing	n Upload Trans-	
	_GEM_BusyEquipPPUpload		BOOL		Equipment-initiat gram Upload Tra cessing Flag		
Sys- tem-defined	_GEM_BusyEqui PDownload	pFormattedP-	BOOL		Equipment-initiat Process Program Transaction Proc	n Download	
variables	_GEM_BusyEqui	_GEM_BusyEquipPPDownload		BOOL		Equipment-initiated Process Program Download Transaction Processing Flag	
	_GEM_BusyEqui	pTerminalMsg	BOOL			ed Terminal Mes- n Processing Flag	
	_GEM_BusyEqui	pChangeTime	BOOL			ed Time Change essing Flag	
	_GEM_BusyEqui	pUserMsg	BOOL		Equipment-initiated User-defined Message Transaction Processing Flag		
	Assumed cause	1	Correction		Prevention		
	This instruction w			Correct the program to confirm		e of this instruc-	
Cause and	before completing		completion of the previous trans-		tion in the projec	-	
correction	a transaction for a different instance of the same instruction.		action processing before you execute the next instruction instance.		transaction processing status and write the user program to perform exclusive control of instruction execution.		
	Attached Informa	tion 1: Error Loca	tion				
Attached			tion Details (Rung n. For ST, the line r	, .	ogram section, the	rung number	
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Er is more than one possible instruction, information is given on all of them. Nothing is given on the identified.						
		tion 4: Expansion	Error Code (Errorl	DEx)			
Precautions/ Remarks	None						

Event name	State Transition in	n Progress		Event code	5401381A hex		
Magning	A state transition	for a different inst	ance of the same i	nstruction that was	s executed before	this instruction is	
Meaning	not completed.						
Source	PLC Function Module		Source details	Instruction	Detection tim-	At instruction	
Source			Source details		ing	execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined	_GEM_Commun	icationsState	_sGEM_COMM_	STATE	Communications	State	
variables	_GEM_ControlSt	ate	_sGEM_CONTR	OL_STATE	Control State		
	Assumed cause		Correction		Prevention		
Cause and correction	This instruction was different instance GEM_ChangeCotion in EnabledNotion. This instruction was different instance GEM_ChangeCotinstruction in Attention in Attention.	ce of the ammState instructorComm state. vas executed for ce of the antrolState amptOnline state.	cute the instruction trol state is Attem that a reply timed before you execute.	ledNotComm te the instruction. nications state is m, confirm that a coccurred before instruction. control state is e before you exe- on. Or, if the con- ptOnline, confirm		n-defined variable ute the instruction. 1_ControlState variable before	
Attached information	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified. Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)						
Precautions/ Remarks	None	•	•				

Event name	Insufficient Transaction Resource			Event code	5401381B hex				
Meaning	The instruction w	as executed while	the number of trai	nsactions that can	be buffered excee	ds the upper limit.			
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution			
Error attributes	Level	Observation	Recovery		Log category	System			
Effects	User program	Continues.	Operation	The relevant instruction will end according to cations.		cording to specifi-			
Sys-	Variable		Data type		Name				
tem-defined	_GEM_EquipMsgBuf		USINT		Buffer Size of Eq	uipment Initiated			
variables					Message				
	Assumed cause		Correction	Correction					
	The instruction w	as executed	Execute the instr	Execute the instruction again.		ute the instruc-			
Cause and	while the number of transactions				tion, confirm the	value of			
correction	that can be buffered exceeds the					gBuf sys-			
	upper limit.				tem-defined variable is not over				
			<u> </u>		the upper limit.				
	Attached Informa	Attached Information 1:Error Location							
	Attached Informa	ition 2: Error Locat	tion Details (Rung	Number), For a p	rogram section, the	rung number			
A44	from the start of t	Attached Information 2: Error Location Details (Rung Number), For a program section, the rung number from the start of the section is given, For ST, the line number is given.							
Attached information	Attached Informa	ition 3: Names of tl	ne Instruction and	Instruction Instanc	e Where the Error	Occurred. If there			
imormation	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction							
	cannot be identif	cannot be identified.							
	Attached Information 4: Expansion Error Code (ErrorIDEx)								
Precautions/	None	·		·					
Remarks									

Event name	Too Many Chara	cters		Event code	54013820 hex			
Meaning	•	were specified that	n the number that	was set and the ir	nstruction was exe	cuted.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation The relevant instruction will end according to cations.			cording to specifi-		
Sys-	Variable		Data type		Name			
tem-defined variables	None							
	Assumed cause		Correction		Prevention			
Cause and	More characters	were specified	Check the information set with the		None			
correction	than the number	of characters set	SECS/GEM Configurator and cor-					
		EM Configurator.	rect the user pro	gram.				
	Attached Informa	Attached Information 1: Error Location						
Attached		Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Informa	Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)						
Precautions/	None							
Remarks								

Event name	Invalid Size			Event code	54013821 hex		
Meaning	An incorrect arrage executed.	y or an array with	an incorrect numbe	er of elements was	s specified and the	instruction was	
Source	PLC Function Mo	PLC Function Module		Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	None						
	Assumed cause	Assumed cause			Prevention		
Cause and correction	A value was specified that is larger than the maximum table size set with the SECS/GEM Configurator.		Check the information set with the SECS/GEM Configurator and correct the user program.		None		
	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
Attached information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Information 4: Expansion Error Code (ErrorIDEx)						
Precautions/	None						
Remarks							

Event name	Set to Disable			Event code	54013822 hex		
Meaning	The instruction th	nat was set to disa	ble was executed.				
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	evant instruction will end according to specifi		
Sys-	Variable		Data type		Name		
tem-defined variables	None						
	Assumed cause		Correction		Prevention		
Cause and correction	The instruction e. GEM capability w the SECS/GEM (vas disabled on	Check the information set with the SECS/GEM Configurator and correct the user program.		None		
	Attached Information 1:Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number), For a program section, the rung number from the start of the section is given, For ST, the line number is given.						
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.					
	Attached Information 4: Expansion Error Code (ErrorIDEx)						
Precautions/ Remarks	None						

Event name	Undefined CEID	Undefined CEID			54013824 hex		
Meaning	An undefined CE	ID was specified a	and the instruction	was executed.			
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end according to specifi-		
Sys-			Data type		Name		
tem-defined variables							
	Assumed cause		Correction	Correction			
Cause and correction	A CEID that was SECS/GEM Contage.		Check the information set with the SECS/GEM Configurator and correct the user program.		None		
	Attached Informa	tion 1: Error Locat	tion				
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Informa	Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/	None						
Remarks							

Event name	Undefined ALID			Event code	54013825 hex			
Meaning	An undefined ALI	ID was specified a	nd the instruction	was executed.				
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation The relevant instruction will end according cations.			cording to specifi-		
Sys-	Variable		Data type		Name			
tem-defined variables	None							
	Assumed cause		Correction	Correction				
Cause and	An ALID that was	not defined in	Check the information set with the		None	_		
correction	the SECS/GEM (Configurator was	SECS/GEM Configurator and cor-					
	specified.		rect the user prog	gram.				
	Attached Informa	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.							
information		possible instruction	ne Instruction and I on, information is g					
	Attached Informa	ition 4: Expansion	Error Code (Errorl	DEx)				
Precautions/	None							
Remarks								

Event name	Undefined CCOE	ÞΕ		Event code	54013826 hex			
Meaning	An undefined CC	ODE was specifie	d and the instruction	on was executed.				
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-		
Sys-	m-defined None		Data type		Name			
tem-defined variables								
	Assumed cause		Correction		Prevention			
Cause and	A CCODE that w	as not defined in	Check the information set with the		None			
correction	the SECS/GEM (Configurator was	SECS/GEM Configurator and cor-					
	specified.		rect the user program.					
	Attached Information 1: Error Location							
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.							
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.							
	Attached Informa	Attached Information 4: Expansion Error Code (ErrorIDEx)						
Precautions/	None							
Remarks								

Event name	Undefined Messa	age Number	_	Event code	54013827 hex			
Meaning	An undefined me	ssage number wa	s specified and the	e instruction was e	xecuted.			
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation The relevant instruction will end according to specifications.			cording to specif		
Sys-	Variable None		Data type		Name			
tem-defined variables								
	Assumed cause		Correction	Correction				
Cause and correction	A message number defined in the SE urator was specification.	CS/GEM Config-	Check the information set with the SECS/GEM Configurator and correct the user program.		None			
	Attached Informa	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.							
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.							
	Attached Informa	Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)						
Precautions/ Remarks	None							

Event name	HSMS Communi	cations Setting Ou	it of Range	Event code	54013828 hex	
Meaning	An HSMS commi	unications setting	that is out of range	was specified and	the instruction wa	as executed.
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution
Error attributes	Level	Observation	Recovery		Log category	System
Effects	User program	Continues.	Operation The relevant instruction will end accord cations.			cording to specifi-
Sys-	-defined None		Data type		Name	
tem-defined variables						
	Assumed cause		Correction		Prevention	
Cause and correction	An HSMS communications setting that is out of range was specified.		Check the valid range defined for the GEM Services and correct the		None	
			user program.			
	Attached Information 1: Error Location					
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.					
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.					
	Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)					
Precautions/	None					
Remarks						

Event name	TID Out of Range	Э		Event code	54013829 hex		
Meaning	A TID that is out	of range was spec	ified and the instru	iction was execute	ed.		
Source	PLC Function Module		Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation The relevant instruction will end according to sp cations.			cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	None						
	Assumed cause		Correction	Correction			
Cause and	A TID that is out	of range was	Check the valid range defined for		None	_	
correction	specified.		the GEM Service	s and correct the	Э		
			user program.				
	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information		possible instruction	he Instruction and I on, information is g				
	Attached Informa	ition 4: Expansion	Error Code (Errorl	DEx)			
Precautions/	None						
Remarks							

Event name	Undefined ECID			Event code	5401382C hex		
Meaning	An undefined EC	ID was specified a	and the instruction	was executed.	•		
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable None		Data type		Name		
tem-defined variables							
	Assumed cause		Correction	Correction			
Cause and	An ECID that was	s not defined in	Check the information set with the		None		
correction	the SECS/GEM (Configurator was	SECS/GEM Configurator and cor-				
	specified.		rect the user pro	gram.			
	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Informa	ition 4: Expansion	Error Code (Errorl	DEx)			
Precautions/	None						
Remarks							

Event name	Type Mismatch			Event code	5401382D hex		
Meaning	A value with an ir	ncorrect data type	was specified and	the instruction wa	s executed.		
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery	Recovery		System	
Effects	User program	Continues.	Operation The relevant instruction will end according cations.			cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined variables	None						
	Assumed cause		Correction	Correction			
Cause and correction	A different equipment constant data type than the one registered with the SECS/GEM Configurator was specified.		Check the information set with the SECS/GEM Configurator and correct the user program.		None		
Attached information	Attached Informa from the start of t Attached Informa is more than one	Attached Information 1: Error Location Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given. Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.					
Precautions/ Remarks	None	1011 T. Expansion	Ellor Odde (Ellori				

Event name	Value of Equipment Constant Out of Range			Event code	5401382E hex		
Meaning	An out-of-range v	value was specifie	d for an equipment	constant and the	instruction was ex	ecuted.	
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable		Data type		Name		
tem-defined	None						
variables							
	Assumed cause		Correction		Prevention		
	A value was spec	cified that is out-	Check the information set with the		None		
Cause and	side the upper ar	nd lower limits of	SECS/GEM Configurator and cor-				
correction	the value of the e		rect the user program.				
	stant that was se SECS/GEM Conf						
	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.						
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.					
	Attached Informa	tion 4: Expansion	Error Code (Errorl	DEx)			
Precautions/	None						
Remarks							

Event name	Illegal CPNAME			Event code	5401382F hex	_		
Meaning	A CPNAME that	is different form th	e received CPNAN	ME was specified a	and the instruction	was executed.		
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation The relevant instruction will end according to s cations.			cording to specifi-		
Sys-	140110		Data type		Name			
tem-defined variables								
	Assumed cause		Correction		Prevention			
Cause and	A CPNAME was specified that is		Correct the user	Correct the user program so that				
correction	different from the received		the received CPNAME is stored					
	CPNAME.		correctly.					
	Attached Informa	Attached Information 1: Error Location						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.							
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.							
	Attached Information 4: Expansion Error Code (ErrorIDEx)							
Precautions/	None							
Remarks								

Event name	HCACK Out of R	ange		Event code	54013830 hex				
Meaning	An HCACK that i	s out of range was	s specified and the	instruction was ex	ecuted.				
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution			
Error attributes	Level	Observation	Recovery		Log category System				
Effects	User program	Continues.	Operation	cording to specifi-					
Sys-	Variable		Data type		Name				
tem-defined variables	None								
	Assumed cause		Correction		Prevention				
Cause and	A HCACK that is	out of range was	Check the valid range defined in		None				
correction	specified.		SEMI E5 and cor	rect the user pro-					
			gram.						
	Attached Informa	tion 1: Error Locat	tion						
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.								
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.							
	Attached Informa	Attached Information 4: Expansion Error Code (ErrorIDEx)							
Precautions/	None								
Remarks									

Event name	CPACK Out of Ra	ange		Event code	54013831 hex			
Meaning	An CPACK that is	s out of range was	specified and the	instruction was ex	ecuted.			
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation The relevant instruction will end according to cations.					
Sys-	Variable		Data type		Name			
tem-defined variables	None							
	Assumed cause	1	Correction	Correction				
Cause and correction	A CPACK that is specified.	out of range was		Check the valid range defined in SEMI E5 and correct the user program				
	Attached Informa	tion 1: Error Locat	ion		l .			
Attached			ion Details (Rung n. For ST, the line ı	Number). For a pro number is given.	ogram section, the	rung number		
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Informa	tached Information 4: Expansion Error Code (ErrorIDEx)						
Precautions/ Remarks	None							

Event name	CEPACK Out of I	Range		Event code	54013832 hex			
Meaning	An CEPACK that	is out of range wa	as specified and the	e instruction was e	executed.			
Source	PLC Function Mo	odule	Source details	Source details Instruction		At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation	The relevant instructions.	ruction will end ac	on will end according to specifi-		
Sys-	Variable		Data type		Name			
tem-defined variables	None							
	Assumed cause		Correction		Prevention			
Cause and	A CEPACK that is out of range		Check the valid range defined in		None	_		
correction	was specified.		SEMI E5 and correct the user pro-					
			gram.					
	Attached Informa	tion 1: Error Locat	tion					
Attached			tion Details (Rung n. For ST, the line r	, .	ogram section, the	rung number		
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Information 4: Expansion Error Code (ErrorIDEx)							
Precautions/	None							
Remarks								

Event name	ACKC7 Out of Ra	ange		Event code	54013833 hex		
Meaning	An ACKC7 that is	s out of range was	specified and the	instruction was ex	ecuted.		
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end ac	cording to specifi-	
Sys-	Variable Data type				Name		
tem-defined variables	None						
	Assumed cause		Correction Check the valid range defined in		Prevention		
Cause and	An ACKC7 that is	s out of range			None	_	
correction	was specified.		SEMI E5 and cor	rect the user pro-			
			gram.				
	Attached Informa	ition 1: Error Locat	tion				
Attached			tion Details (Rung n. For ST, the line r	, ,	ogram section, the	rung number	
information	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Informa	ition 4: Expansion	Error Code (Errorl	DEx)			
Precautions/	None						
Remarks							

Event name	ACKC7A Out of I	Range		Event code	54013834 hex			
Meaning	An ACKC7A that	is out of range wa	s specified and the	e instruction was e	xecuted.			
Source	PLC Function Mo	odule	Source details	Source details Instruction		At instruction execution		
Error attributes	Level	Observation	Recovery		Log category	System		
Effects	User program	Continues.	Operation	The relevant inst cations.	ruction will end acc	cording to specifi-		
Sys-	Variable		Data type		Name			
tem-defined variables	None							
	Assumed cause		Correction		Prevention			
Cause and	An ACKC7A that	n ACKC7A that is out of range		ange defined in	None	_		
correction	was specified.		SEMI E5 and cor	rect the user pro-				
			gram.					
	Attached Informa	tion 1: Error Locat	tion					
Attached	Attached Information 2: Error Location Details (Rung Number). For a program section, the rung number from the start of the section is given. For ST, the line number is given.							
information	is more than one	Attached Information 3: Names of the Instruction and Instruction Instance Where the Error Occurred. If there is more than one possible instruction, information is given on all of them. Nothing is given if the instruction cannot be identified.						
	Attached Information 4: Expansion Error Code (ErrorIDEx)							
Precautions/	None							
Remarks								

Event name	ACKC10 Out of F	Range		Event code	54013835 hex				
Meaning	An ACKC10 that	is out of range wa	s specified and the	e instruction was e	xecuted.				
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution			
Error attributes	Level	Observation	Recovery		Log category	System			
Effects	User program	Continues.	Operation The relevant instruction will end according to cations.						
Sys-	Variable		Data type		Name				
tem-defined variables	None	ne							
	Assumed cause)		Prevention					
Cause and	An ACKC10 that	is out of range	Check the valid range defined in		None				
correction	was specified.		SEMI E5 and col	rrect the user pro-					
	Attached Informa	tion 1: Error Locat	tion						
Attached			tion Details (Rung n. For ST, the line	Number). For a pro number is given.	ogram section, the	rung number			
information		possible instruction		Instruction Instance iven on all of them					
	Attached Informa	ttached Information 4: Expansion Error Code (ErrorIDEx)							
Precautions/	None								
Remarks									

Event name	EAC Out of Rang	је		Event code	54013836 hex	_	
Meaning	An EAC that is or	ut of range was sp	ecified and the ins	truction was execu	ited.		
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution	
Error attributes	Level	Observation	Recovery		Log category	System	
Effects	User program	Continues.	Operation	ruction will end ac	cording to specifi-		
Sys-	Variable		Data type		Name		
tem-defined variables	None						
	Assumed cause)	Correction		Prevention		
Cause and	An EAC that is out of range was		Check the valid r	ange defined in	None	_	
correction	specified.		SEMI E5 and cor	SEMI E5 and correct the user pro-			
			gram.				
	Attached Informa	ition 1: Error Locat	tion				
Attached			tion Details (Rung n. For ST, the line r	, ,	ogram section, the	rung number	
information		possible instruction	ne Instruction and I on, information is g				
	Attached Information 4: Expansion Error Code (<i>ErrorIDEx</i>)						
Precautions/	None						
Remarks							

Event name	Illegal SECS Mes	gal SECS Message Event code 54013838 hex									
Meaning			egal SECS messa	ge is set was spec	ified and the instru	ıction was exe-					
Source	PLC Function Mo	odule	Source details	Instruction	Detection tim- ing	At instruction execution					
Error attributes	Level	Observation	Recovery		Log category	System					
Effects	User program	Continues.	Operation	The relevant inst cations.	nt instruction will end according to sp						
Sys-	Variable		Data type		Name						
tem-defined variables	None										
	Assumed cause		Correction		Prevention						
Cause and correction	A message number for which a SECS message that does not agree with the instruction specifications was specified.			ation set with the figurator and corgram.	None						
		tion 1: Error Location 2: Error Locat	tion tion Details (Rung	Number). For a pr	ogram section, the	rung number					
Adda alla all	from the start of t	he section is giver	n. For ST, the line i	number is given.							
Attached information		possible instruction	ne Instruction and lon, information is g								
	Attached Informa	tion 4: Expansion	Error Code (Errori	IDEx)							
Precautions/	None										
Remarks											

A-2 System-defined Variables

System-defined variables are assigned specific functions by the system.

They are registered in the global variable table, or the local variable table for each POU, in advance. The variable names cannot be changed.

You read and write the variables with the user program, with communications from external devices, with the Sysmac Studio, or with an NS/NA-series HMI.

Examples of how to interpret the tables of system-defined variables are given below.

• Example for Structure Variables

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_G	GEM_EquipInfo	Equipment Information	Gives information on the equipment.	_sGEM_EQUIP _INFO					
	MDLN	Equipment Model Type	Gives the model of the equipment.	STRING[21]	Depends on data type.	G	RW	Retained.	Pub-
	SOFTREV	Software Revision Code	Gives the software revision code.	STRING[21]	Depends on data type.	J	IXVV	rvetaineu.	lished.

Example for Variables That Are Not Structures

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Default Communications State	Default Communications State	Specifies the commu- nications state to enter when the equipment starts. 0: DISABLE Not 0: ENABLE	USINT	Depends on data type.	G	RW	Retained.	Pub- lished.

- (a) Gives the name of the system-defined variable. The name starts with the category name.
- (b) Gives the member names for structure variables only.
- (c) Gives the meaning of the variable.
- (d) Describes the function of the variable.
- (e) Gives the data type of the variable.
- (f) Gives the range of values of the variable.
- (g) G: Global variable, L: Local variable.
- (h) Gives the R/W attribute of the variable. R: Read only, RW: Read/write
- (i) Gives the Retain attribute of the variable. Either "Retained" or "Not retained" is given.
- (j) Gives the Network Publish attribute of the variable. Either "Published" or "Not published" is given.

A-2-1 GEM Service Version

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Version	GEM Service Version	Gives the version of the GEM service. Element 0 is the integer part of the version. Element 1 is the fractional part of the version. Example: For GEM service version 1.00, element 0 is 1 and element 1 is 0. Example: For GEM service version 1.00, element 0 is 1 and element 1 is 10.	ARRAY[01] OF USINT	0 to 99	G	R	Not retained.	Pub- lished.

A-2-2 Equipment Information

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_G	EM_EquipInfo	Equipment Information	Gives information on the equipment.	_sGEM_EQUIP _INFO					
	MDLN	Equipment Model Type	Gives the model of the equipment.	STRING[21]	Depends on data type.	G	RW	Retained.	Pub-
	SOFTREV	Software Revision Code	Gives the software revision code.	STRING[21]	Depends on data type.	J	IXVV	i Netailleu.	lished.

A-2-3 GEM Service Status

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM ServiceStatus		GEM Service Status	Gives the GEM Service status.	_sGEM_SER- VICE_STATUS					

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Idle	Idle	TRUE while GEM Services are inactive. *1	BOOL	TRUE or FALSE				
Initializing	Initializing	TRUE while GEM Service initialization is in progress.	BOOL	TRUE or FALSE				
Run	Run	TRUE while GEM Services are active.	BOOL	TRUE or FALSE				
EQStarting	EQStarting	TRUE while waiting for equipment initialization processing.	BOOL	TRUE or FALSE				
EQInitializing	EQInitializing	TRUE while equip- ment initialization pro- cessing is in progress.	BOOL	TRUE or FALSE				
EQRun	EQRun	TRUE when you can use all GEM Services, including communications with the host.	BOOL	TRUE or FALSE	G	R	Not retained.	Pub- lished.
Stop	Stop	TRUE while GEM Service activity is stopped.	BOOL	TRUE or FALSE				
Error	Error	TRUE while GEM Services are inactive because of an error.	BOOL	TRUE or FALSE	<u>-</u>			
ShuttingDown	ShuttingDown	TRUE while shut- down processing is in progress.	BOOL	TRUE or FALSE				
Shutdown	Shutdown	TRUE after shutdown processing is completed.	BOOL	TRUE or FALSE				

^{*1.} This is a standby state while waiting for the Controller's operating mode to change from PROGRAM to RUN.

A-2-4 SECS Communications

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Comm	SECS Communica-	Gives the number of	UINT	Depends on	(D	Not	Pub-
LogCnt	tions Log Count	entries in the log.	UINT	data type.	G	I.	retained.	lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_CommLog	SECS Communications Log	Gives information on SECS communications log.	ARRAY[099] OF _sGEM_COM- MLOG					

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
	LogNo	Log Number	Gives the order of the record in the log.	UDINT	Depends on data type.				
	LogDate	Logged Date	Gives the date the record was placed in the log.	DATE_AND TIME	Depends on data type.				
	SndRcv	Send/Receive	Tells whether the message was sent or received. 1: Sent 2: Received	USINT	1 to 2				
	StreamCode	Stream Number	Gives the stream number of the message.	USINT	0 to 127				
	FunctionCode	Function Number	Gives the function number of the message.	USINT	0 to 255			Not	Pub-
	MsgPtn	Message Branch Number	Gives the branch number of the mes- sage.	USINT	0 to 255	G	R	retained.	lished.
	OutType	Message Output Type	Tells how the message was sent. 0: Normal 1: Spooled	USINT	0 to 1				
	Rsit	Communications Result	Gives the result of message communications. 0: Normal 3: T3 timeout 6: T6 timeout 7: T7 timeout 8: T8 timeout 10: Not connected.	USINT	0 to 10				
	(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_G	EM_EquipMsgBuf	Equipment-initiated Message Bufferings	Gives the number of buffering transactions in the GEM Service message queue for equipment-initiated messages.	USINT	Depends on data type.	G	R	Not retained.	Pub- lished.
_G	EM_HostMsgBuf	Host-initiated Mes- sage Bufferings	Gives the number of buffering transactions in the GEM Service message queue for host-initiated mes- sages.	USINT	Depends on data type.	G	R	Not retained.	Pub- lished.

A-2-5 Interlocks

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Interlock _ControlState	Control State Inter- lock	Specifies whether to prohibit Request ON-LINE from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE				
_GEM_Interlock _Time	Time Change Inter- lock	Specifies whether to prohibit time changes from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE				
_GEM_Interlock _HostCmd	Host Command Interlock	Specifies whether to prohibit reception of host commands from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE				
_GEM_Interlock _EnhancedRmtCmd	Enhanced Remote Command Interlock	Specifies whether to prohibit reception of enhanced remote commands from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE	G	RW	Not retained.	Not pub- lished.
_GEM_Interlock _PP	Process Program Interlock	Specifies whether to prohibit process program deletion requests and upload/download requests from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE				
_GEM_Interlock _ECV	Equipment Constant Interlock	Specifies whether to prohibit equipment constant changes from the host. TRUE: Prohibited. FALSE: Granted.	BOOL	TRUE or FALSE				

A-2-6 HSMS Communications

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_	SEM_ SMSState	HSMS Communications State	Gives the HSMS Communications state. (The HSMS Communications states are defined in E37.)	_sGEM_HSMS_ STATE					
	Not Connected	NOT CONNECTED	TRUE when TCP/IP is not connected.	BOOL	TRUE or FALSE				
	NotSelected	NOT SELECTED	TRUE when attempting to connect TCP/IP.	BOOL	TRUE or FALSE	G	R	Not retained.	Pub- lished.
	Selected	SELECTED	TRUE when an TCP/IP connection is established.	BOOL	TRUE or FALSE			rotaliou.	nonou.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM HSMSError	HSMS Communica- tions Errors	Gives errors detected by the HSMS.	_sGEM_HSMS_ ERROR					
Т5	Connection Separation Timeout Detection Count	Gives the number of times a connection separation timeout has occurred.*1	UINT	Depends on data type.				
Т6	Control Timeout Detection Count	Gives the number of times a control transaction timeout has occurred.*1	UINT	Depends on data type.	G	R	Not	Pub-
Т7	Connection Idle Timeout Detection Count	Gives the number of times a NOT SELECTED timeout has occurred.*1	UINT	Depends on data type.	G	K	retained.	lished.
Т8	Network Intercharacter Timeout Detection Count	Gives the number of times a network inter-character timeout has occurred.*1	UINT	Depends on data type.				

^{*1.} After the upper limit is reached, counting continues from 1.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM HSMSParam	HSMS Communications Parameters	Gives the active HSMS communica- tions settings.	_sGEM_HSMS_ PARAM					

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	
ConnectMode	TCP/IP Connection Mode	Gives the TCP/IP connection mode.	_eGEM_CON- NECT	_GEM CON- NECT_PAS SIVE or _GEM CON- NECT_ACT IVE					
PassiveIPSeI	IP Address Connection Restriction Flag	Tells whether the IP address for connection is restricted when the TCP/IP connection is PASSIVE. FALSE: No restriction. TRUE: Connection is possible only with the IP address set in IpAdr.	BOOL	TRUE or FALSE					
lpAdr	IP Address	Gives the IP address of the host.	STRING[256]	000.000.00 0.000 - 255.255.25 5.255					
PortNo	Port Number	Gives the standby port number for GEM Ser- vices when the TCP/IP connection is PASSIVE.	UINT	1 to 65,535					
DeviceID	Device ID	Gives the ID that identifies the HSMS message.	UINT	0 to 32767	G	R	Not	Pub-	
Т3	Reply Timeout Time	Gives the maximum time in seconds to wait for a reply during HSMS message communications.	USINT	1 to 120	· G	K	retained.	lished.	
T5	Connection Separation Timeout Time	Gives the interval in seconds to resend Select Requests when a selection response is not received to a sent Select Request.	USINT	1 to 240					
T6	Control Timeout Time	Gives the maximum time in seconds to wait for a reply during HSMS message communications.	USINT	1 to 240					
Т7	Connection Idle Timeout Time	Gives the maximum time in seconds to wait for a Select Request when the TCP/IP connection is PASSIVE.	USINT	1 to 240					
Т8	Network Intercharacter Timeout Time	Gives the time in sec- onds to monitor for multi-packet sent HSMS messages.	USINT	1 to 120		-			
ConversationTim- eout	Conversation Time- out Time	Gives the maximum time in seconds to wait for a reply after sending a message.	USINT	1 to 240					

A-2-7 Communications State Model

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Co	GEM_ ommunications ate	Communications State	Gives the status of communications with the host. (Based on Communications State Model defined in E30.)	_sGEM_COM- M_STATE					
	Disabled	DISABLED	TRUE when communications with the host are inactive.	BOOL	TRUE or FALSE				
	Enabled NotComm	NOT COMMUNI- CATING	TRUE while communications with the host are established.	BOOL	TRUE or FALSE	G	R	Not retained.	Pub- lished.
	Enabled Comm	COMMUNICATING	TRUE when commu- nications with the host are active.	BOOL	TRUE or FALSE				

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Default Communications State	Default Communications State	Specifies the commu- nications state to enter when the equipment starts. 0: DISABLE Not 0: ENABLE	USINT	Depends on data type.	G	RW	Retained.	Pub- lished.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM Establish Communications Timeout	Establish Communications Timeout	Gives the timeout time for establishing communications.	UINT	1 to 256	G	R	Retained.	Pub- lished.

A-2-8 Equipment Processing State

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_PreviousProcessState	Previous Process- ing State	Specifies the previous process state of the equipment.	USINT	Depends on data type.	c	RW	Not	Pub-
_GEM_ProcessState	Processing State	Specifies the current process state of the equipment.	USINT	Depends on data type.	9	KVV	retained.	lished

A-2-9 Control State Model

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM ControlState	Control State	Gives the control state of the equipment.	_sGEM_CON- TROL_STATE					

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
EquipOffline	EQUIPMENT OFF-LINE	TRUE when equipment is OFF-LINE.	BOOL	TRUE or FALSE				
HostOffline	HOST OFF-LINE	TRUE when operator requested ON-LINE but the host denied ON-LINE.	BOOL	TRUE or FALSE			Not	Dub
AttemptOnline	ATTEMPT ON-LINE	TRUE when operator requests ON-LINE from the host.	BOOL	TRUE or FALSE	G	R	Not retained.	Pub- lished.
OnlineLocal	ON-LINE/LOCAL	TRUE during ON-LINE/LOCAL.	BOOL	TRUE or FALSE				
OnlineRemote	ON-LINE/REMOTE	TRUE during ON-LINE/REMOTE.	BOOL	TRUE or FALSE				

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Control StateParam	Control State Parameters	Specifies the default values for the control state.	_sGEM_CON- TROL_STATE_ PARAM					
Default	Default Default Control Control State	Specifies the default state when the system starts. 0: EQUIPMENT OFF-LINE	USINT	0 to 3				
Control		1: ATTEMPT ON-LINE 2: HOST OFF-LINE 3: ON-LINE						
DefaultOnline- SubState	Default ON-LINE Substate	Specifies the default substate after transition to ON-LINE. 0: REMOTE 1: LOCAL	USINT	0 to 1	G	RW	Retained.	Pub- lished.
ChangeOnline- Failed	ON-LINE Failure State	Specifies the default state after failed ON-LINE attempt. 0: EQUIPMENT OFF-LINE 1: HOST OFF-LINE	USINT	0 to 1				

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM Operator Command	Operator Command	Specifies operator activity while REMOTE state is active.	USINT	Depends on data type.	G	RW	Not retained.	Not pub- lished.

A-2-10 Remote Control

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Busy HostCmd	Host Command Transaction Pro- cessing Flag	Gives the status of processing a transaction for a host command. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Busy Enhanced RmtCmd	Enhanced Remote Command Transac- tion Processing Flag	Gives the status of processing a transac- tion for an enhanced remote command. TRUE: Processing FALSE: Not process- ing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

A-2-11 Equipment Constants

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost ChangeECV	Host-initiated Equipment Con- stant Change Transaction Pro- cessing Flag	Gives the status of processing a transaction for a host-initiated equipment constant change. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

A-2-12 Process Program Management

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost PPDelete	Host-initiated Process Program Deletion Transaction Processing Flag	Gives the status of processing a transaction for a host-initiated process program deletion. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost FormattedPP Upload	Host-initiated For- matted Process Program Upload Transaction Pro- cessing Flag	Gives the status of processing a transaction for a host-initiated formatted process program upload. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_BusyHost PPUpload	Host-initiated Process Program Upload Transaction Processing Flag	Gives the status of processing a transaction for a host-initiated process program upload. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Busy EquipFormatted PPUpload	Equipment-initiated Formatted Process Program Upload Transaction Pro- cessing Flag	Gives the status of processing a transaction for an equipment-initiated formatted process program upload. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM EquipFormatted PPUploadRsIt	Equipment-initiated Formatted Process Program Upload Results	Gives the results of processing an equipment-initiated formatted process program upload.	_sGEM_RSLT					
Rslt	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
RsltCode	Result Code	Gives a code that tells the result of the upload. 16#0000: Normal 16#0100: Transmis- sion error*1 16#0200: Reception error*1 16#0301 to 16#033F: Same as for PPGNT. 16#0401 to 16#043F: Same as for ACKC7.	WORD	Depends on data type.	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Busy- EquipPPUpload	Equipment-initiated Process Program Upload Transaction Processing Flag	Gives the status of processing a transaction for an equipment-initiated process program upload. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub-lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Equip PPUploadRslt	Equipment-Initiated Process Program Upload Results	Gives the results of processing an equipment-initiated process program upload.	_sGEM_RSLT					
Rsit	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
RsltCode	Result Code	Gives a code that tells the result of the upload. 16#0000: Normal 16#0100: Transmission error*1 16#0200: Reception error*1 16#0301 to 16#033F: Same as for PPGNT. 16#0401 to 16#043F: Same as for ACKC7.	WORD	Depends on data type.	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost FormattedPP Download	Host-initiated For- matted Process Program Download Transaction Pro- cessing Flag	Gives the status of processing a transaction for a host-initiated formatted process program download. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_BusyHost PPDownload	Host-initiated Process Program Download Transaction Processing Flag	Gives the status of processing a transaction for a host-initiated process program download. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyEquip- FormattedPPDown- load	Equipment-initiated Formatted Process Program Download Transaction Pro- cessing Flag	Gives the status of processing a transaction for an equipment-initiated formatted process program download. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Equip FormattedPPDown- loadRsIt	Equipment-initiated Formatted Process Program Download Results	Gives the results of processing an equipment-initiated formatted process program download.	_sGEM_RSLT					
Rslt	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
RsltCode	Result Code	Gives a code that tells the result of the download. 16#0000: Normal 16#0100: Transmission error*1 16#0200: Reception error*1*2*3 16#0300: Rejected by host*4 16#0400: PP data error*5	WORD	0 to 63	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

^{*2.} If the maximum SECS message size is exceeded by the received secondary message, the secondary message may have exceeded the *Permissible message LENGTH*.

^{*3.} If the message structure of the received secondary message is incorrect, the CCODE count may be larger than the set number of registered CCODEs, or the PPARM count may be larger than the maximum PPARM count set for the CCODE.

^{*4.} This occurs for Formatted Process Program Data (S7,F26) when the list length is 0.

^{*5.} This occurs if a PPID is incorrect, a CCODE is not registered, or the same CCODE is used twice.

Not

pub-

lished.

Not

retained.

G R

Depends on

data type.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Busy- EquipPPDownload	Equipment-initiated Process Program Download Transac- tion Processing Flag	Gives the status of processing a transaction for an equipment-initiated process program download. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
()								
(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Equip PPDownloadRslt	Equipment-Initiated Process Program Download Results	Gives the results of processing an equipment-initiated process program download.	_sGEM_RSLT					
Rslt	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
		Gives a code that tells the result of the down- load. 16#0000: Normal						

Result Code

WORD

16#0100: Transmis-

16#0200: Reception

16#0300: Rejected by

16#0400: PP data

sion error*1

error*1*2*3

host*4

error*5

RsltCode

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM_ PChangeInfo	Process Program Change Information	Specifies information on operator changes to process programs (i.e., creating, editing, and deleting).	_sGEM_P- P_CHANGE					
PPChangeName	Process Program ID	Specifies the process program that was created, edited, or deleted by the operator.	STRING[121]	Depends on data type.				
PPChangeStatus	Status	Specifies the action performed for the process program. 1: Created. 2: Edited. 3: Deleted. 4 to 63: Reserved	USINT	1 to 63	G	RW	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

^{*2.} If the maximum SECS message size is exceeded by the received secondary message, the secondary message may have exceeded the *Permissible message LENGTH*.

^{*3.} If the message structure of the received message is incorrect, the size of PPBODY may be larger than the PPBODY data size that is set in the item definition.

^{*4.} This occurs for Process Program Data (S7,F6) when the list length is 0.

^{*5.} This occurs when a PPID is incorrect.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_PPFormat	Supported Process Program Formats	Specifies the process program formats supported by the equipment. 1: Process programs 2: Formatted process programs 3: Process programs and formatted process programs 4 to 15: Specification is not possible because large process programs are not supported. 16 and higher: Reserved	USINT	Depends on data type.	G	RW	Not retained.	Not pub- lished.
GEM PPExecName	Current Process Program	Specifies the currently selected process program.	STRING[121]	Depends on data type.	G	RW	Not retained.	Not pub- lished.

A-2-13 Equipment Terminal Services

	(a)	(c)	(d)	(e)	(f)	G	(h)	(i)	(j)
	SEM_BusyEquip- rminalMsg	Equipment-initiated Terminal Message Transaction Pro- cessing Flag	Gives the processing status of an equipment-initiated terminal message transaction. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
	EM_Equip rminalMsgRslt	Equipment-initiated Terminal Message Results	Gives the results of an equipment-initiated terminal message.	_sGEM_RSLT					
•	Rslt	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
	RsltCode	Result Code	Gives a code that tells the result of the termi- nal message. 16#0000: Normal 16#0100: Transmis- sion error ^{*1} 16#0200: Reception error ^{*1} 16#0301 to 16#033F: Same as for ACKC10.	WORD	Depends on data type.	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost TerminalMsgSB	Host-initiated Sin- gle-block Terminal Message Transac- tion Processing Flag	Gives the processing status of a host-initi- ated single-block ter- minal message transaction. TRUE: Processing FALSE: Not process- ing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_Host TerminalMsgSB _TID	Host-initiated Sin- gle-block Terminal Message Receiv- ing Terminal Num- ber	Gives the receiving terminal number for a host-initiated single-block terminal message.	вуте	Depends on data type.				

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost TerminalMsgMB	Host-initiated Multi-block Termi- nal Message Trans- action Processing Flag	Gives the processing status of a host-initi- ated multi-block termi- nal message transaction. TRUE: Processing FALSE: Not process- ing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_Host TerminalMsgMB _TID	Host-initiated Multi-block Termi- nal Message Receiving Terminal Number	Gives the receiving terminal number for a host-initiated multi-block terminal message.	вуте	Depends on data type.				

A-2-14 Error Messages

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_S9Error	S9 Errors	Gives SECS mes- sage alarm informa- tion received from the host.	_sGEM_S9ER- ROR					
S9F1	Unrecognized Device ID Detec- tion Count	Gives the number of times unrecognized devices IDs were received from the host.*1	UINT	Depends on data type.				
S9F3	Unrecognized Stream Detection Count	Gives the number of times unrecognized stream types were received from the host.*1	UINT	Depends on data type.				
S9F5	Unrecognized Function Detection Count	Gives the number of times unrecognized functions were received from the host.*1	UINT	Depends on data type.	G	R	Not retained.	Pub- lished.
S9F7	Illegal Data Detection Count	Gives the number of times illegal data for- mats were received from the host.*1	UINT	Depends on data type.				
S9F9	Transaction Timer Timeout Detection Count	Gives the number of times an expected reply message was not received from the host.*1	UINT	Depends on data type.				
S9F11	Data Too Long Detection Count	Gives the number of times the equipment received data from the host that was too large to process.*1	UINT	Depends on data type.				
S9F13	Conversation Time- out Detection Count	Gives the number of times that data was not received in time.*1	UINT	Depends on data type.	G	R	Not retained.	Pub- lished.
S9F13_MEXP	Conversation Time- out Message	Indicates the SECS message that resulted in a conversation time-out.	STRING[7]	Depends on data type.				

^{*1.} After the upper limit is reached, counting continues from 1.

A-2-15 Clock

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyEquip- ChangeTime	Equipment-initiated Time Change Request Transac- tion Processing Flag	Gives the processing status of an equipment-initiated time change transaction. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Equip ChangeTimeRsIt	Equipment-initiated Time Change Results	Gives the results of an equipment-initiated time change.	_sGEM_RSLT					
Rsit	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
RsltCode	Result Code	Gives a code that tells the result of the time change. 16#0000: Normal 16#0100: Transmis- sion error*1 16#0200: Reception error*1 16#0300: TIME data error	WORD	Depends on data type.	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM TimeFormat	Time Format	Gives the format of time data. 0: 12-byte format Not 0: 16-byte format	USINT	Depends on data type.	G	R	Retained.	Not pub- lished.

A-2-16 Spooling

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM SpoolingState	Spooling State	Gives the spooling state. 0: FUNCTION OFF 1: SPOOL INACTIVE 2: SPOOL ACTIVE 3: SPOOL ACTIVE/ SPOOL FULL	USINT	0 to 3	G	R	Not retained.	Pub- lished.

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
GEM SpoolParam	Spool Parameters	Gives the parameters for spooling.	_sGEM_SPOOL _PARAM					

(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Enable Spooling	Spooling Enabled Flag	Tells whether spooling is enabled. TRUE: Enabled. FALSE: Disabled.	BOOL	TRUE or FALSE				
OverWrite Spool	Overwrite Spool	Tells whether the spool is overwritten when it is full. TRUE: Overwrite. FALSE: Do not overwrite.	BOOL	TRUE or FALSE	G	R	Retained.	Pub- lished.
MaxSpoolTrans- mit	Max Spool Transmit	Gives the maximum number of SECS mes- sages that can be sent from the spool.	UDINT	0 to 1000				

(a) (b)		(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_Spool Condition		Spool Information	Gives information for managing the spool.	_sGEM_SPOOL _CONDITION					
SpoolCount tual	tAc-	Spool Count Actual	Gives the number of SECS messages stored on the spool.	UINT	0 to 1000				
SpoolCount	tTotal	Spool Count Total	Gives the total number of SECS messages that were stored on the spool.	UDINT	Depends on data type.	G	R	Not retained.	Pub-
SpoolFullTi	me	Spool Full Time	Gives the date and time at which the spool was last full.	DATE_AND TIME	Depends on data type.			retained.	naneu.
SpoolStartT	Гime	Spool Start Time	Gives the date and time that the spool was last started.	DATE_AND TIME	Depends on data type.				

A-2-17 User-defined Messages

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyHost UserMsg	Host-initiated User-defined Mes- sage Transaction Processing Flag	Gives the processing status of a host-initi- ated user-defined message transaction. TRUE: Processing FALSE: Not process- ing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_Host UserMsgNo	Host-initiated User-defined Mes- sage Number	Gives the number of the received host-initi- ated user-defined message.	UINT	Depends on data type.				

(a)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_GEM_BusyEqui- pUserMsg	Equipment-initiated User-defined Mes- sage Transaction Processing Flag	Gives the processing status of an equipment-initiated user-defined message transaction. TRUE: Processing FALSE: Not processing.	BOOL	TRUE or FALSE	G	R	Not retained.	Not pub- lished.
_GEM_Equip UserMsgNo	Equipment-initiated User-defined Mes- sage Number	Gives the number of a received equip-ment-initiated user-defined message.	UINT	Depends on data type.	G	R	Not retained.	Not pub- lished.

	(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
_	GEM_Equip erMsgRslt	Send Equipment- initiated User-defined Mes- sage Result	Gives the results of sending an equip- ment-initiated user-defined mes- sage.	_sGEM_RSLT					
	Rslt	Result Flag	TRUE: Normal end FALSE: Error end	BOOL	TRUE or FALSE				
	RsltCode	Result Code	Gives a code that tells the result of the user-defined mes- sage. 16#0000: Normal 16#0100: Transmis- sion error*1 16#0200: Reception error*1	WORD	Depends on data type.	G	R	Not retained.	Not pub- lished.

^{*1.} Refer to 5-1-3 Transaction Processing on page 5-6.

A-3 Correspondence between Formats and Data Types

The meanings of the formats used in the items and variable data and the corresponding data types used in an NJ-series CPU Unit are given in the following table.

Format	Meaning	Corresponding data type
В	Binary	BYTE
U1	1-byte unsigned integer	USINT
U2	2-byte unsigned integer	UINT
U4	4-byte unsigned integer	UDINT
I1	1-byte signed integer	SINT
12	2-byte signed integer	INT
14	4-byte signed integer	DINT
F4	4-byte floating point number	REAL
F8	8-byte floating point number	LREAL
A	ASCII	STRING
BOOLEAN	Logic value	BOOL

A-4 Designing Tasks to Use the GEM Services

When you design tasks to use the GEM Services, you must consider the GEM Service startup time and the communications performance for GEM instructions.

Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for the task operation specifications and system service operation specifications of the NJ-series Controllers.

A-4-1 GEM Service Startup Time

The time required for the GEM Service status to change to Run after the power supply to the SECS/GEM CPU Unit is turned ON is called the startup time. It depends on the task execution time ratio. The task execution time ratio is the ratio between the set task period and the task execution time. You can check the set task period and the task execution time with the Task Execution Time Monitor on the Sysmac Studio. Refer to *A-4-3 Checking the Task Execution Time Ratio* on page A-234 for details on checking the task execution time ratio.

The following table gives guidelines for the GEM Service startup time. The GEM Service startup time increases with the task execution time ratio. If the GEM Service startup time reaches 60 s or longer, an error occurs in the GEM Services.

Task execution time ratio [%]	Average startup time of GEM Services [s]
20	18.1
50	20.6
80	38.6

The above values are the results of actual measurements. The measurement conditions are given in the following table.

Item	Measurement condition		
Task configuration	Primary periodic task only		
Task period [ms]	1		
Unit configuration	No CJ-series Units		
Network configuration	No EtherCAT connection		
	No HMI connection		
	No connections to other Controllers		
	Connection to Sysmac Studio through Ethernet		

The time required for the operating mode to change to RUN mode after the power supply is turned ON to the SECS/GEM CPU Unit is the same as for NJ-series Standard CPU Units.



Precautions for Correct Use

As a guideline, design the tasks so that the task execution time ratio is 80% or lower. Always use the actual system to confirm the GEM Service startup time under all possible conditions.

Startup processing for the GEM Services is performed by the system services. Therefore, if other processing is performed by the system services, the GEM Service startup time may exceed the design value.

A-4-2 Communications Performance of GEM Instructions

The communications performance of the GEM instructions depends on the task execution time ratio and the size of the SECS message send data.

You can consecutively execute GEM instructions even before the SECS messages have been sent. If you consecutively execute GEM instructions before the SECS message are sent, the SECS messages to send are buffered in the send buffer of the GEM Services. If the volume of the SECS messages exceeds the send buffer capacity, GEM instructions will end in errors. Therefore, use the following reference values to design the tasks and user program.

Task Execution Time Ratio and GEM Instruction Communications Performance

The communications performance of the GEM instruction decreases as the task execution time ratio increases. The following table provides reference values for the SECS message send interval when the Report Event (GEM ReportEvent) instruction is executed consecutively.

Task execution time ratio [%]	SECS message average send interval for consecutive GEM_ReportEvent instruction execution [ms]
20	73
30	83
40	100
50	128
60	160
70	243
80	424

The above values are the results of actual measurements. The measurement conditions are given in the following table.

Item	Measurement condition
Task configuration	Primary periodic task only
Task period [ms]	1
Unit configuration	No CJ-series Units
Network configuration	No EtherCAT connection
	No HMI connection
	No connections to other Controllers
	Connection to Sysmac Studio through Ethernet
Sent SECS messages	Event Report Send (S6,F11)
Sent data size [bytes]	17

Size of SECS Message Send Data and Communications Performance of GEM Instructions

The communications performance of the GEM instruction decreases as the size of the SECS message send data increases. The following table provides reference values for the SECS message send interval when the Event Report (GEM_ReportEvent) instruction is executed consecutively.

Sent data size [bytes]	SECS message average send interval for consecutive GEM_ReportEvent instruction execution [ms]
17	73
30K	154

The above values are the results of actual measurements. The measurement conditions are given in the following table.

Item	Measurement condition
Task configuration	Primary periodic task only
Task period [ms]	1
Task execution time ratio [%]	20
Unit configuration	No CJ-series Units
Network configuration	No EtherCAT connection
	No HMI connection
	No connections to other Controllers
	Connection to Sysmac Studio through Ethernet
Sent SECS messages	Event Report Send (S6,F11)



Precautions for Correct Use

Always use the actual system to confirm the GEM instruction communications performance under all possible conditions. GEM instruction processing is performed by the system services. Therefore, if other processing is performed by the system services, the GEM instruction communications performance may be lower than the design value.

A-4-3 Checking the Task Execution Time Ratio

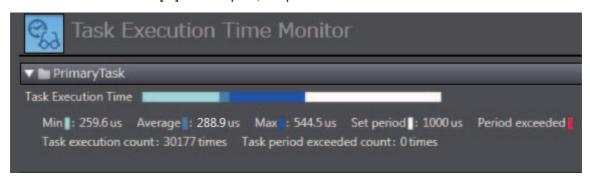
You can check the task execution time ratio in the Task Execution Time Monitor of the Sysmac Studio. Refer to the Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for operating procedures for the Task Execution Time Monitor.

The task execution time ratio is calculated with the following formula.

Task execution time ratio [%] = Average value of task execution time [s] ÷ Set task period [s] × 100

For example, if the Task Execution Time Monitor displays the following values, the task execution time ratio is approx. 28.9%.

Task execution time ratio [%] = 288.9 μ s/1,000 μ s × 100 = 28.9%



A-5 Basic Specifications, Performance Specifications, and Functional Specifications

Refer to the following manual or sections for the basic specifications, performance specifications, and function specifications of the SECS/GEM CPU Unit.

	Specifications	Reference
Basic specificat	ions	NJ/NX-series CPU Unit Software User's
Performance sp	pecifications	Manual (Cat. No. W501)
Functional	Functions shared with NJ-series CPU Units	
specifications	SECS/GEM standard functions supported by the	1-2 Standard Compliance of the
	SECS/GEM CPU Unit	SECS/GEM CPU Unit on page 1-4
	GEM Services	2-1 System Configuration on page 2-2

A-6 Version Information

There are six types of versions of the hardware and software related to the SECS/GEM CPU Unit:

- · Unit version
- · GEM Service version
- · SECS/GEM Configurator version
- · Log Viewer version
- · Version of a project that is created by the SECS/GEM Configurator
- · Sysmac Studio version

This appendix describes how to check these versions, how they are related to each other, and what to note on the versions.

A-6-1 Checking Versions

The checking methods of versions are given in the following table.

Туре	How to check
Unit version	ID information indication on the SECS/GEM CPU Unit
	Production Information on the Sysmac Studio
	Refer to <i>Versions</i> on page 20 for details.
GEM Service version	ID information indication on the SECS/GEM CPU Unit
	Production Information on the Sysmac Studio
	System-defined variable: _GEM_Version
	Refer to Versions on page 20 and A-2-1 GEM Service Version on page A-212 for
	details.
SECS/GEM	About Software under the Help Menu on the SECS/GEM Configurator
Configurator version	Title bar of the SECS/GEM Configurator
	Refer to About Software on page 8-35 for details.
Log Viewer version	Help on the Log Viewer
	Refer to 6-3-12 Help on page 6-22 for details.
Project version	Open under the File Menu on the SECS/GEM Configurator
	GEM Service Operation under the Controller Menu on the SECS/GEM Configurator
	Refer to <i>Open</i> on page 8-17 and <i>GEM Service Operation</i> on page 8-25 for details.
Sysmac Studio	About Sysmac Studio under File Menu on of the Sysmac Studio
version	Refer to the Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for details.

A-6-2 Relationship between Unit Version and GEM Service Version

The relationship between the unit version of the SECS/GEM CPU Unit and the GEM Service version is given in the following table.

Unit version	GEM Service version		
Ver.1.09	Ver.1.00		
Ver.1.10			
Ver.1.11 or later	Ver.1.01		



Precautions for Correct Use

If you use the backup functions between different CPU Units, the backup data may not be compatible depending on the unit version of the CPU Unit and GEM Service version of the backup source and the unit version of the CPU Unit and GEM Service version of the restore destination. Refer to 7-2-5 Compatibility between Versions of CPU Units on page 7-6 for details on the compatibility of backup data between different CPU Unit versions.

A-6-3 Relationship between Unit Version and Sysmac Studio Version

Each unit version of the SECS/GEM CPU Unit has a corresponding Sysmac Studio version. You cannot use any combinations other than the corresponding combinations.

Ask your OMRON representative about the Sysmac Studio versions that you can use with each unit version of the SECS/GEM CPU Units.

A-6-4 Combinations of Versions That Require Attention and How to Deal with Them

You need to pay attention to the following combinations of versions. You cannot use them if the combinations of versions are not correspondence.

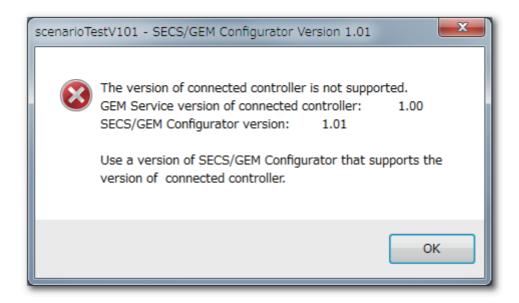
- GEM Service version and SECS/GEM Configurator version
- SECS/GEM Configurator version and project version

GEM Service Version and SECS/GEM Configurator Version

For the possible combinations of the GEM Service version and SECS/GEM Configurator version, availability is shown in the following table.

GEM Service version	SECS/GEM Configurator version		
GEWI Service version	Ver.1.01	Ver.1.00	
Ver.1.01	Can be used.	Cannot be used.	
Ver.1.00	Cannot be used.	Can be used.	

If the combination of the GEM Service version and SECS/GEM Configurator version cannot be used, an error message is displayed when you transfer the GEM setting data between the SECS/GEM CPU Unit and the SECS/GEM Configurator.



In this case, replace either of the SECS/GEM CPU Unit and the SECS/GEM Configurator so that the combination of their versions can be used.

Between SECS/GEM Configurator Version and Project Version

The version of a project will be the same as the version of the SECS/GEM Configurator where the project is created. Therefore, a difference in versions of the SECS/GEM Configurator and a project indicates that the version of the SECS/GEM Configurator where its project was created is different from the version of the currently used SECS/GEM Configurator.

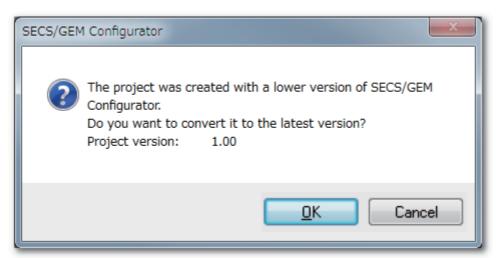
For the possible combinations of the SECS/GEM Configurator version and project version, availability is shown in the following table.

SECS/GEM Configurator version	Project version		
SECS/GEM Configurator version	Ver.1.01	Ver.1.00	
Ver.1.01	Can be used.	Cannot be used.	
Ver.1.00	Cannot be used.	Can be used.	

If the combination of the SECS/GEM Configurator version and project version cannot be used, an error message is displayed on the computer when you open the project on the SECS/GEM Configurator. The error message that displayed and its corrective action depend on which version is earlier between the project to open and the SECS/GEM Configurator.

When the Version of a Project to Open Is Earlier Than the Version of the SECS/GEM Configurator

When the version of a project to open is earlier than the version of the SECS/GEM Configurator, an error message is displayed as shown below.

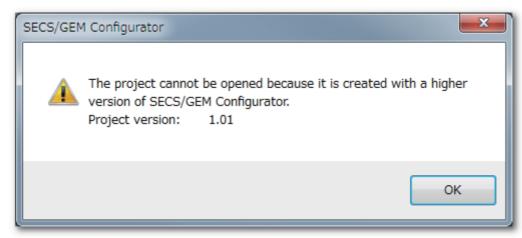


If you click **OK** Button, the version of the project is updated to correspond to the version of the SECS/GEM Configurator.

If you click the **Cancel** Button, the processing to open the project is interrupted.

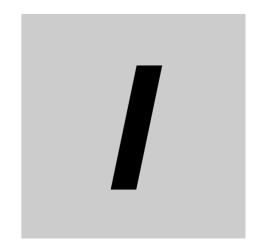
● When the Version of the SECS/GEM Configurator Is Earlier Than the Version of a Project to Open

When the version of the SECS/GEM Configurator is earlier than the version of a project to open, an error message is displayed as shown below.



In this case, replace the SECS/GEM Configurator so that the combination of their versions can be used.

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Index

Index

A	equipment2-2
	Equipment Constant InterlockA-215
Acknowledge Enhanced Remote CommandA-60	equipment constants 5-62
Acknowledge Equipment Constant ChangeA-71	Equipment Information
Acknowledge Formatted Process Program Download A-115	equipment processing states 5-37
Acknowledge Host CommandA-50	equipment terminal service 5-88
Acknowledge Multi-block Equipment Terminal	Equipment-initiated Formatted Process Program Download
MessageA-165	ResultsA-222
Acknowledge Process Program DeletionA-76	Equipment-initiated Formatted Process Program Download
Acknowledge Single-block Equipment Terminal	Transaction Processing FlagA-222
MessageA-160	Equipment-initiated Formatted Process Program Upload Re-
Acknowlege Process Program DownloadA-125	sultsA-221
alarm management5-53	Equipment-initiated Formatted Process Program Upload
assumed cause9-3	Transaction Processing FlagA-220
	Equipment-initiated Message Bufferings A-214
В	Equipment-Initiated Process Program Download
	ResultsA-223
backup functions7-5	Equipment-initiated Process Program Download Transaction
built-in EtherCAT port2-3	Processing FlagA-223
built-in EtherNet/IP port2-3	Equipment-Initiated Process Program Upload Results A-221
balk in Edicinosti port	Equipment-initiated Process Program Upload Transaction
C	Processing FlagA-221
	Equipment-initiated Terminal Message Results A-224
Change Communications State	Equipment-initiated Terminal Message Transaction Process-
Change Control State	ing FlagA-224
Change Equipment Constant	Equipment-initiated Time Change Request Transaction Pro-
clock	cessing FlagA-227
Communications State	Equipment-initiated Time Change ResultsA-227
communications state model	Equipment-initiated User-defined Message Number .A-229
Control GEM Service Status	Equipment-initiated User-defined Message Transaction Pro-
Control State	cessing FlagA-229
Control State Interlock A-215	Error
control state model	error descriptions
Control State Parameters	error messages5-43
controller variable24	event code 9-3
Controller Variable	event name9-3
Current Process Program	event notification5-40
Current Process ProgramA-224	execution log6-2
D	F
Default Communications StateA-218	
detail view of SECS message log	filters 6-18
documentation	
dynamic event report configuration 5-45	<u>G</u>
E	GEM
L 	GEM capability24, 5-26
Edward Brook Or His Life	GEM instruction
Enhanced Remote Command Interlock	GEM Service logs24
Enhanced Remote Command Transaction Processing	GEM Service StatusA-212
FlagA-220	GEM Service version
enhanced remote commands5-60	GEM Services
EQInitializing4-4	_GEM_ ServiceStatus (GEM Service Status)A-212
EQRun	GEM setting data24
EQStarting4-4	GEM Setting Tool24

GEM Setting Tools2-3	GEM_ChangeCommState (Change Communications
GEM standard messages5-102	State) A-25
GEM Version A-212	GEM_ChangeControlState (Change Control State) A-32
GEM_AckChangeECV (Acknowledge Equipment Constant	GEM_ChangeECV (Change Equipment Constant) A-65
Change) A-71	_GEM_CommLog (SECS Communications Log) A-213
GEM_AckEnhancedRmtCmd (Acknowledge Enhanced Re-	_GEM_CommLogCnt (SECS Communications Log
mote Command)A-60	Count) A-213
GEM_AckFormattedPPDownload (Acknowledge Formatted	_GEM_CommunicationsState (Communications
Process Program Download)	State) A-218
GEM_AckHostCmd (Acknowledge Host Command) A-50	GEM_ControlService (Control GEM Service Status) A-10
GEM_AckPPDelete (Acknowledge Process Program Dele-	_GEM_ControlState (Control State) A-218
tion) A-76	_GEM_ControlStateParam (Control State
GEM_AckPPDownload (Acknowlege Process Program	Parameters)
Download) A-125	_GEM_DefaultCommunicationsState (Default Communica-
GEM_AckTerminalMsgMB (Acknowledge Multi-block Equip-	tions State)
ment Terminal Message)	_GEM_EquipChangeTimeRsIt (Equipment-initiated Time
GEM_AckTerminalMsgSB (Acknowledge Single-block Equip-	Change Results)
ment Terminal Message)	_GEM_EquipFormattedPPDownloadRslt (Equipment-initiat-
_GEM_BusyEnhancedRmtCmd (Enhanced Remote Com-	ed Formatted Process Program Download Results) A-222
mand Transaction Processing Flag)	_GEM_EquipFormattedPPUploadRsIt (Equipment-initiated
_GEM_BusyEquipChangeTime (Equipment-initiated Time	Formatted Process Program Upload Results) A-221
Change Request Transaction Processing Flag) A-227	_GEM_EquipInfo (Equipment Information)
_GEM_BusyEquipFormattedPPDownload (Equipment-initiated Formatted Process Program Download Transaction	ings) A-214
Processing Flag)A-222	_GEM_EquipPPDownloadRslt (Equipment-Initiated Process
_GEM_BusyEquipFormattedPPUpload (Equipment-initiated	Program Download Results)
Formatted Process Program Upload Transaction Process-	_GEM_EquipPPUploadRslt (Equipment-Initiated Process
ing Flag)A-220	Program Upload Results)
_GEM_BusyEquipPPDownload (Equipment-initiated Pro-	_GEM_EquipTerminalMsgRsIt (Equipment-initiated Terminal
cess Program Download Transaction Processing	Message Results)
Flag) A-223	_GEM_EquipUserMsgNo (Equipment-initiated User-defined
_GEM_BusyEquipPPUpload (Equipment-initiated Process	Message Number)
Program Upload Transaction Processing Flag) A-221	_GEM_EquipUserMsgRslt (Send Equipment A-229
_GEM_BusyEquipTerminalMsg (Equipment-initiated Termi-	_GEM_EstablishCommunicationsTimeout (Establish Com-
nal Message Transaction Processing Flag) A-224	munications Timeout) A-218
_GEM_BusyEquipUserMsg (Equipment-initiated User-de-	GEM_GetCommLog (Get SECS Communications Log) A-17
fined Message Transaction Processing Flag) A-229	_GEM_HostMsgBuf (Host-initiated Message
_GEM_BusyHostChangeECV (Host-initiated Equipment	Bufferings) A-214
Constant Change Transaction Processing Flag) A-220	_GEM_HostTerminalMsgMB_TID (Host-initiated Multi-block
_GEM_BusyHostCmd (Host Command Transaction Process-	Terminal Message Receiving Terminal Number) A-225
ing Flag)A-219	_GEM_HostTerminalMsgSB_TID (Host-initiated Single-block
_GEM_BusyHostFormattedPPDownload (Host-initiated For-	Terminal Message Receiving Terminal Number) A-225
matted Process Program Download Transaction Process-	_GEM_HostUserMsgNo (Host-initiated User-defined Mes-
ing Flag)	sage Number) A-228
_GEM_BusyHostFormattedPPUpload (Host-initiated For-	_GEM_HSMSError (HSMS Communications Errors) A-216
matted Process Program Upload Transaction Processing	_GEM_HSMSParam (HSMS Communications
Flag)	Parameters)
_GEM_BusyHostPPDelete (Host-initiated Process Program	_GEM_HSMSState (HSMS Communications State) . A-215
Deletion Transaction Processing Flag)	GEM_InitEvent (Initialize Events)
_GEM_BusyHostPPDownload (Host-initiated Process Program Powelland Transportion Processing Flor)	_GEM_Interlock_ControlState (Control State
gram Download Transaction Processing Flag) A-222	Interlock)
_GEM_BusyHostPPUpload (Host-initiated Process Program Upload Transaction Processing Flag)	_GEM_Interlock_ECV (Equipment Constant Interlock) A-215 _GEM_Interlock_EnhancedRmtCmd (Enhanced Remote
_GEM_BusyHostTerminalMsgMB (Host-initiated Multi-block	Command Interlock) A-215
Terminal Message Transaction Processing Flag) A-225	_GEM_Interlock_HostCmd (Host Command Interlock) A-215
_GEM_BusyHostTerminalMsgSB (Host-initiated Single-block	_GEM_Interlock_PP (Process Program Interlock) A-215
Terminal Message Transaction Processing Flag) A-225	_GEM_Interlock_Time (Time Change Interlock) A-215
_GEM_BusyHostUserMsg (Host-initiated User-defined Mes-	_GEM_OperatorCommand (Operator Command) A-219
sage Transaction Processing Flag)	GEM PPChangeInfo (Process Program Change Informa-

tion)A-223	cessing Flag	A-220
_GEM_PPExecName (Current Process Program)A-224	Host-initiated Process Program Download Transact	tion Pro-
_GEM_PPFormat (Supported Process Program	cessing Flag	A-222
Formats)	Host-initiated Process Program Upload Transaction	Process
_GEM_PreviousProcessState (Previous Processing	ing Flag	
State)	Host-initiated Single-block Terminal Message Rece	iving Ter-
_GEM_ProcessState (Processing State)A-218	minal Number	
GEM_ReportAlarm (Report Alarm)A-45	Host-initiated Single-block Terminal Message Trans	saction
GEM_ReportEvent (Report Event)A-41	Processing Flag	
GEM_RequestChangeTime (Request Time Change) A-171	Host-initiated User-defined Message Number	
GEM_RequestFormattedPPDownload (Request Formatted	Host-initiated User-defined Message Transaction Pr	ocessing
Process Program Download)A-132	Flag	
GEM_RequestPPDownload (Request Process Program	HSMS	
Download)	HSMS communications	
GEM_RespFormattedPPUpload (Respond to Formatted Pro-	HSMS Communications Errors	
cess Program Upload)A-82	HSMS communications log	
GEM_RespHostUserMsg (Respond to Host-initiated Us-	HSMS Communications Parameters	
er-defined Message)A-182	HSMS Communications State	A-215
GEM_RespPPUpload (Respond to Process Program Up-		
load)A-91	1	
_GEM_S9Error (S9 Errors)A-226		
GEM_SendEquipUserMsg (Send Equipment-initiated Us-	ldle	
er-defined Message)	Initialize Events	
GEM_SendPPVerify (Send Process Program Verification Re-	Initializing	
sult)	interlocks	
GEM_SendTerminalMsg (Send Equipment Terminal Mes-	item definitions	5-17
sage)A-155		
GEM_SetHSMSParam (Set HSMS Communications Param-	L	
eters)		
GEM_Shutdown (Shutdown GEM Service)A-14	limit monitoring	5-93
_GEM_SpoolCondition (Spool Information)	link variable	24
_GEM_SpoolingState (Spooling State)A-227	link variables	
_GEM_SpoolParam (Spool Parameters)A-227	list view of SECS message log	
_GEM_TimeFormat (Time Format)A-227	Log Viewer	24, 6-6
GEM_UploadFormattedPP (Upload Formatted Process Pro-		
gram)	М	
GEM_UploadPP (Upload Process Program)A-107		
_GEM_Version (GEM Version)A-212	message settings	5-102
Get SECS Communications LogA-17		
н	0	
nost	Operator Command	
Host Command InterlockA-215	outputting logs to flies	6-19
Host Command Transaction Processing FlagA-219	_	
nost commands	Р	
nost connection function		
Host-initiated Equipment Constant Change Transaction Pro-	Previous Processing State	A-218
• •	primary message	
cessing FlagA-220 Host-initiated Formatted Process Program Download Trans-	Process Program Change Information	A-223
	Process Program Interlock	A-215
action Processing FlagA-222	process program management	5-66
Host-initiated Formatted Process Program Upload Transac-	Processing State	A-218
tion Processing FlagA-220 Host-initiated Message BufferingsA-214		
	R	
Host-initiated Multi-block Terminal Message Receiving Terminal NumberA-225		
Host-initiated Multi-block Terminal Message Transaction Pro-	Report Alarm	A-45
	Report Event	
cessing FlagA-225 Host-initiated Process Program Deletion Transaction Pro-	Request Formatted Process Program Download	A-132
1000 miliated i 100000 i 10gram Deletion Hansaction F10-	Request Process Program Download	

Request Time Change	A-82 A-182 A-91
<u> </u>	
S9 Errors	A-226
SD Memory Cards	
secondary message	
SECS	
SECS Communications Log	A-213
SECS Communications Log Count	A-213
SECS message log	6-2
SECS/GEM	
SECS/GEM Configurator	
SECS/GEM CPU Unit	
SECS/GEM operation programming	
SECS-II	
SEMI	25
Send Equipment- initiated User-defined Message	
Result	
Send Equipment Terminal Message	
Send Equipment-initiated User-defined Message	
Send Process Program Verification Result	
Set HSMS Communications Parameters	
shutdown	
Shutdown GEM Service	
ShuttingDown	
Spool Information	
Spool Parameters	
spooling	
Spooling State	
status data collection	
Stop	
stream and function	25
summary view of SECS message log	6-13
Supported Process Program Formats	A-224
Sysmac Studio	2-4
system configuration	2-2
Т	
Time Change Interlock	
Time Format	
trace data collection	5-49
U	
	00
unit version	
Upload Formatted Process Program	
Upload Process Program	
UPS	∠-4

	-
•	
А	v

variable data collection	5-48
ariable data definitions	s5-21
version	20

user-defined messages5-104

Index

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