

General Specifications

GS 33K15C10-50E

Model LFS1700 Control Function for
Field Control Station (for AFV30□/
AFV40□, Vnet/IP and FIO)
Model LFS1750 Node Expansion
Package (for AFV30□/AFV40□)



[Release 5]

■ GENERAL

Model LFS1700, Control Function for Field Control Station (for AFV30□/AFV40□, Vnet/IP and FIO) is installed and runs in any of the following FCS models: AFV30S, AFV30D, AFV40S, AFV40D

Moreover, the number of the connectable node units and the application capacity can be expanded if LFS1750 Node Expansion Package (for AFV30□/AFV40□) is added to Control Function for Field Control Station. Number of connectable node units and application capacity for Virtual Test can be expanded if LFS1755 Node Expansion Package for FCS Simulator (for AFV30□/AFV40□) is added to the control function for FCS Simulator.

■ FUNCTION SPECIFICATIONS

The control functions are described in the structure of functions and their elements.

● Structure of Control Functions

Control Function for Field Control Station consists of several types of function blocks and input/output function.

Multiple function blocks and inputs/outputs are arranged on a control drawing, and configure the flow of signals and the order of control.

Function Block

These are the smallest elements used to perform control and calculation.

Control Drawing

A control drawing represents the control instruments responsible for overall control of a small section of the plant, and typically contains several function blocks and input/output elements.

A control drawing may be used to implement cascade control or combustion fuel/air ratio control, for example.

Input/Output Function

These are composed of process input/output and software input/output.

The former exchanges data from/to the external devices, and the latter are virtual elements inside an FCS.

● Function Block

The function blocks basically consists of regulatory control blocks, calculation blocks, sequence control blocks, faceplate blocks and unit instruments. Valve pattern monitors and off-site blocks are provided as options. These function blocks may be combined to configure a control drawing.

Regulatory Control Block

These function blocks are mainly used for continuous process control.

Input Indicator Block:

Input Indicator

Input Indicator with Deviation Alarm

Controller Block:

PID Controller

Sampling PI Controller

PID Controller with Batch Switch

Two-Position ON/OFF Controller

Enhanced Two-Position ON/OFF Controller

Three-Position ON/OFF Controller

Enhanced Three-Position ON/OFF Controller

Time-Proportioning ON/OFF Controller

PD Controller with Manual Reset

Blending PI Controller

Self-Tuning PID Controller

Manual Loader Block:

Manual Loader

Manual Loader with Input Indicator

Manual Loader with Auto/Man SW

Motor Control Block:

Two-Position Motor Control

Enhanced Two-Position Motor Control

Three-Position Motor Control

Enhanced Three-Position Motor Control

Signal Setter Block:

Ratio Set

13-Zone Program Set

Flow-Totalizing Batch Set

Weight-Totalizing Batch Set

Signal Limiter Block:

Velocity Limiter

Signal Selector Block:

Signal Selector

Auto-Selector

Dual-Redundant Signal Selector

Signal Distributor Block:

Cascade Signal Distributor

Feed-Forward Signal Summing

Non-Interference Control Output

Control Signal Splitter

Alarm Block:

Representative Alarm (*1)

Pulse Count Input Block:

Pulse Count Input

*1: This block is classified as sequence element 2 in FCS database.

YS Instrument Block:

- YS Controller
- YS Programmable Controller
- YS Programmable Controller with Pulse-Width Output
- YS Manual Station with SV Output
- YS Manual Station with MV Output Lever
- YS Ratio Set Station
- YS Batch Set Station
- YS Blending Controller
- YS Batch Controller
- YS Totalizer

Foundation Fieldbus Faceplate Block:

- Fieldbus Analog Input
- Fieldbus Discrete Input
- Fieldbus Control Selector
- Fieldbus PID Control
- Fieldbus Ratio
- Fieldbus Analog Output
- Fieldbus Discrete Output
- Fieldbus Output Splitter
- Fieldbus Signal Characterizer (Totalizer)
- Fieldbus Integrator
- Fieldbus Input Selector
- Fieldbus Multiple Discrete Input
- Fieldbus Multiple Discrete Output
- Fieldbus Multiple Analog Input
- Fieldbus Multiple Analog Output
- Simple Universal

Calculation Block

These function blocks are mainly used to perform calculation.

Arithmetic Calculation Block:

- Addition
- Multiplication
- Division
- Averaging

Analog Calculation Block:

- Square Root
- Exponential
- First-Order Lag
- Integration
- Derivative
- Ramp
- Lead/Lag
- Dead-Time
- Dead-Time Compensation
- Moving-Average
- Cumulative-Average
- Variable Line-Segment Function
- Temperature and Pressure Correction
- ASTM Correction: Old JIS
- ASTM Correction: New JIS

Logic Operation Block:

- Logical AND
- Logical OR
- Logical NOT
- Set-Dominant Flip-Flop with 1 Output
- Reset-Dominant Flip-Flop with 1 Output
- Set-Dominant Flip-Flop with 2 Output
- Reset-Dominant Flip-Flop with 2 Output
- Wipeout
- ON-Delay Timer
- OFF-Delay Timer
- One-Shot (rising-edge trigger)
- One-Shot (falling-edge trigger)
- Comparator (greater than)
- Comparator (greater than or equal)

Equal Operator

- Bitwise AND
- Bitwise OR
- Bitwise NOT

General-Purpose Calculation Block:

- General-Purpose Calculation
- General-Purpose Calculation with String I/O

Calculation Auxiliary Block:

- 3-Pole 3-Position Selector Switch
- 1-Pole 9-Position Selector Switch
- Selector Switch for 16 Data
- Selector Switch for 16 String Data
- Data Set
- Data Set with Input Indicator
- Station Interconnection

Batch Data Block:

- 1-Batch Data Set
- 1-Batch String Data Set
- 2-Batch Data Set
- 2-Batch String Data Set
- Batch Data Acquisition
- Batch String Data Acquisition

Sequence Control Block

These function blocks are mainly used for interlock and batch control sequences.

Sequence Table Block:

- Sequence Table
- Rule Extension Sequence Table
- Expanded Sequence Table

Logic Chart Block:

- Logic Chart
- External Connection Logic Chart

SFC Block:

- 3-Position Switch SFC
- Pushbutton SFC
- Analog SFC

Switch Instrument Block:

- Switch Instrument with 1 Input
- Switch Instrument with 2 Inputs
- Switch Instrument with 1 Output
- Switch Instrument with 2 Outputs
- Switch Instrument with 1 Input and 1 Output
- Switch Instrument with 1 Input and 2 Outputs
- Switch Instrument with 2 Inputs and 1 Output
- Switch Instrument with 2 Inputs and 2 Outputs
- Switch Instrument with 1 Input, 2 One-Shot Outputs
- Switch Instrument with 2 Inputs, 2 One-Shot Outputs

Enhanced Switch Instrument Block:

- Enhanced Switch Instrument with 1 Input
- Enhanced Switch Instrument with 2 Inputs
- Enhanced Switch Instrument with 1 Output
- Enhanced Switch Instrument with 2 Outputs
- Enhanced Switch Instrument with 1 Input and 1 Output
- Enhanced Switch Instrument with 1 Input and 2 Outputs
- Enhanced Switch Instrument with 2 Inputs and 1 Output
- Enhanced Switch Instrument with 2 Inputs and 2 Outputs
- Enhanced Switch Instrument with 1 Input, 2 One-Shot Outputs
- Enhanced Switch Instrument with 2 Inputs, 2 One-Shot Outputs

Sequence Auxiliary Block:

- Timer (*1)
- Software Counter (*1)
- Pulse Train Input Counter (*1)
- Code Input (*1)
- Code Output (*1)
- Relational Expression (*2)
- Resource Scheduler (*2)

Valve Monitoring Block:

- Valve Monitoring (*2)

*1: This block is classified as sequence element 1 in FCS database.

*2: This block is classified as sequence element 2 in FCS database.

Faceplate Block

These faceplate blocks have a human-machine interface function that allows several function blocks to be represented by a single tag.

Analog Faceplate Block:

- Dual-Pointer Indicating Station
- Dual-Pointer Manual Station
- Triple-Pointer Manual Station

Sequence Faceplate Block:

- Batch Status Indicator
- Extended 5-Pushbutton Switch
- Extended 10-Pushbutton Switch

Hybrid Faceplate Block:

- Extended Hybrid Manual Station

Unit Instrument, Unit Operation Instrument, and Operation

The devices and instruments used to control a plant can be defined as a single unit for operation and control purposes.

Unit Instrument:

- 3-Position Switch-Type Unit Instrument
- 5-Pushbutton-Type Unit Instrument
- Analog-Type Unit Instrument

Non-Resident Unit Instrument:

- Non-Resident Unit Instrument with 3-Position Switch
- Non-Resident Unit Instrument with 5-Pushbutton Switch
- Analog Non-Resident Unit Instrument
- Each of the above instruments has both unit operation instrument supported type and non-supported type respectively.

Unit Operation Instrument:

- Non-Resident Unit Operation Function Instrument

Operation:

- SEBOL-Type Operation
- SFC-Type Operation
- SFC-Type Operation with Floating-Data Parameters
- SFC-Type Operation with Character-Data Parameters
- SFC-Type Operation with Floating/Character-Data Parameters
- SFC-Type Operation with Integer/Character-Data Parameters
- SFC-Type Operation with Floating/Integer-Data Parameters

Valve Pattern Monitor

The valve pattern monitor is a function block that monitors the open/close status of valves for transfer systems in the plant.

Valve Pattern Monitor:

- 64-Data Valve Pattern Monitor
- 128-Data Valve Pattern Monitor
- 256-Data Valve Pattern Monitor
- 512-Data Valve Pattern Monitor
- 64-Data Valve Pattern Monitor with Alarm
- 128-Data Valve Pattern Monitor with Alarm
- 256-Data Valve Pattern Monitor with Alarm
- 512-Data Valve Pattern Monitor with Alarm

Off-Site Block

The off-site block is a function block that controls the mixing at off-sites of oil refineries as well as the shipments.

Off-Site Block:

- Batch Set Control Block
- Blending Master Control Block

● **Software Input/Output**

Software input and output is a function to be carried out the virtual input and output connection inside of FCS by software.

Internal Switch

Used as buffers for storing statuses.

- Common Switch (%SW)
- Global Switch (%GS)

Message Output

This function notifies events from one FCS to another FCS, HIS or computer.

Annunciator Message:

- Annunciator Message (%AN)

Sequence Message:

- Print Message
- Operator Guide Message
- Multimedia Start Message
- Sequence Message Request

Event Message:

- Supervisory Computer Event Message
- Supervisory Computer Event Message for PICOT
- Signal Event Message
- SFC/SEBOL Return Event Message

● **Process Control Input/Output**

It exchanges data with field devices or subsystems outside the FCS.

Process Input/Output

The process input/output are used to exchange signals between field devices and FCSs.

- Process Input/Output (%Z)

Communication Input/Output

The communication input/output are used to access various types of data that are handled by subsystems such as the PLC (Programmable Logic Controller).

- Communication Input/Output (%W/%X)

Fieldbus Input/Output

The Fieldbus input/output are used to access various types of data that are handled by field devices on the Fieldbus.

- Fieldbus Input/Output (%Z)

● Subsystem Communication Function

The control function is to interchange various data with subsystems or field devices via communication functions. The list of communication types available for this function is shown as follows. As for the communication functions, refer to each hardware GS for more detailed information.

Serial Communication

GS 33K50G10-50E "Models ALR111, ALR121 Serial Communication Module (for FIO)"

Ethernet Communication

GS 33K50G11-50E "Model ALE111 Ethernet Communication Module (for FIO)"

Foundation Fieldbus Communication

GS 33K50G20-50E "Model ALF111 Foundation Fieldbus Communication Module (for FIO)"

PROFIBUS-DP Communication

GS 33K50G85-50E "Model ALP121 PROFIBUS-DP Communication Module (for FIO)"

GS 33K50G80-50E "Model ALP111 PROFIBUS-DP Communication Module"

● New features of LFS1700 Control Function

System Function Block

These blocks act as the interface to notify FCS internal operation status (loading information and application execution information) to the outside of FCS. When an FCS is defined, the system function blocks are automatically created. Those are not displayed on the drawing.

CPU Load Information

Communication Load Information

I/O Load Information

SEBOL Operation Information

Periodic SEBOL

The conventional SEBOL works during the CPU's idle time. The new "periodic SEBOL" works during the basic scan processing. This enhanced function enables SEBOL to be applied to the applications that have been executed by sequence tables or logic charts in the past.

■ APPLICATION CAPACITY

The “application capacity” represents the number of control functions that can be executed simultaneously. The below table shows the application capacity of the FCS.

The application capacity can be extended if LFS1750 Node Expansion Package (for AFV30□/AFV40□) is added to the Control Function for Field Control Station.

The application capacity when LFS1755 Node Expansion Package for FCS Simulator (for AFV30□/AFV40□) is added to the control function for FCS Simulator is the same as the one when LFS1750 Node Expansion Package (for AFV30□/AFV40□) is added to the control function for Field Control Station.

Table Application capacity

Item		Max. Capacity (AFV30□/AFV40□)		
		LFS1700	LFS1750 (10 Nodes)	LFS1750 (14 Nodes)
Tag Names	For elements per FCS (*1)	18000	18000	18000
	For function blocks (*2)	3500	3500	7000
Process I/O	Analog I/O points	480	1280	1760
	Contact I/O points	1920	4096	4096
Communication I/O (*3)	Data volume (in 16 bit units)	8000	8000	8000
Internal Switches	Common switches	9000	9000	9000
	Global switches	256	256	256
Message Outputs	Annunciator messages	2000	2000	2000
	Print messages	2000	2000	2000
	Operator guide messages	1000	1000	1000
	Sequence message request	200	200	200
	Event messages	1000	1000	1000
Control Functions	Control drawings	200	200 (300/400/500) (*4)	
1 second Trend	Acquisition points	1024	1024	1024
ADL Points	Number of other stations' data	512	512	512

- *1: The number of tag names for elements per FCS indicates the maximum number of a total of contact inputs/outputs (%Z elements), common switches (%SW elements), global switches (%GS elements) and communication inputs/outputs (%WB/%XB elements) to which tag names can be assigned. However, up to four thousands each of the %WB/%XB elements can only be given tag names.
- *2: The number of tag names for function blocks indicates the maximum number of a total of function blocks (%BL elements) and annunciators (%AN elements) to which tag names can be assigned.
- *3: Normal communication inputs/outputs (%WW, %WB) occupy 4000 words, enhanced communication inputs/outputs (%XW, %XB) occupy 4000 words, and the total comes to 8000 words.
- *4: If you have LFS1750 license, you can select the number of control drawings from 200/300/400/500. The number of default is 200. When selecting the number of 300 or more control drawings, it may cause restricting the total number of FCSs in the entire project. Refer to “Integrated Production Control System CENTUM VP System Overview (Vnet/IP Edition)” (GS 33K01A10-50E) for details.

● Scan Period

The CPU of the FCS can execute the standard control functions in any of three scan periods. One of the three scan periods can be set for each function block.

Standard Scan Period: 1 sec

Medium Speed Scan Period: Specify 200 or 500 ms.

Mainly used for computation and control of analog data.

Fast Scan Period: Specify 50, 100, 200 or 500 ms.

Mainly used for sequence control.

The above scan periods does not include I/O signal conversion time for nodes, and bus transmission time.

● Database

The number of function blocks is defined for each database type. Select the database type at system generation time, according to your needs.

The number of function blocks for each database type is shown below:

Table Database

Item	Database type					
	General-purpose			Batch		
	LFS1700	LFS1750 (10 Nodes)	LFS1750 (14 Nodes)	LFS1700	LFS1750 (10 Nodes)	LFS1750 (14 Nodes)
Node (*1)	4	10	14	4	10	14
ALF111	30	32	64	30	32	64
ALR111, ALR121, ALE111, ALP111, ALP121, AGS813, AGP813 (*2)	8	16	32	8	16	32
Communication Modules (*3)	30	48	64	30	48	64
Regulatory Control Blocks/Calculation Blocks (FF-FP Blocks) (*4)	500 (500)	1200 (1200)	1800 (1500)	400 (400)	1000 (1000)	1500 (1000)
Sequence Blocks (Standard) (*5)	200	400	700	100	200	400
Sequence Blocks (M-size) (*6)	100	200	400	50	100	150
Sequence Blocks (L-size) (*7)	100	200	300	50	100	150
General-Purpose Calculations	400	500	750	120	250	350
SFC Blocks	40	100	300	100	200	300
Operation Blocks	200	400	500	250	500	700
Switch Instrument Blocks	500	1000	1500	500	1000	1500
Sequence Elements 1	500	700	1100	500	700	1100
Faceplate Blocks	120	200	300	50	100	150
Logic Operation Blocks	100	200	300	50	100	150
Sequence Elements 2	100	200	300	50	100	150
Batch Data Blocks	100	400	600	50	100	150
Unit Instruments	30	60	80	30	60	80
Unit Operation Instruments	0	0	0	150	300	400
Offsite Blocks	30	40	60	0	0	0
Valve Pattern Monitors	0	0	0	0	0	0
System Function Blocks	4	4	4	4	4	4
SEBOL Daemon	630	630	630	840	840	840
SEBOL User Function	210	210	210	280	280	280
Control Recipe Area	1 MB	1 MB	1 MB	8 MB	8 MB	8 MB
Option Area	200 KB	200 KB	200 KB	200 KB	200 KB	200 KB

*1: The number of nodes include a CPU node.

*2: ALP111 and ALP121 cannot be mounted in the same FCS.

*3: The total number of ALR111, ALR121, ALE111, ALP111, ALP121, AGS813, AGP813 and ALF111.

*4: The number of Foundation fieldbus faceplate (FF-FP) blocks is included in regulatory control blocks/calculation blocks. Note that the maximum number of the blocks is fewer than the regulatory control blocks in case of LFS1750(14 nodes) alone.

*5: Standard: Total of 64 input and output signals and 32 rules

*6: M-size: Total of 96 signals (32-64 inputs and outputs, respectively) and 32 rules

*7: L-size: 64 inputs, 64 outputs, and 32 rules

Option Area

In order to use the following functions to the Control Function, option area is required.

Enhanced ON/OFF Controller Block, Enhanced Motor Control Block, Enhanced Switch Instrument Block: 64 KB (*1)

Off-site Block: 80 KB

Valve Pattern Monitor: 90 KB

*1: When using even one block among these 3 types, this area is consumed.

The total of the using function's size must not exceed the option area size in the database.

● Test Function (Virtual Test)

Number of nodes for FCS Simulator can be increased by using LFS1755 Node Expansion Package for FCS Simulator in the environment where a Field Control Station is not connected.

LFS1750 Node Expansion Package is required to increase the number of nodes while those are connected to a Field Control Station. LFS1750 Node Expansion Package can be used for both Virtual Test and Target Test.

■ OPERATING ENVIRONMENT

● Hardware Requirements

Model LFS1700 Control Function for Field Control Station (for AFV30□/AFV40□, Vnet/IP and FIO) and Model LFS1750 Node Expansion Package (for AFV30□/AFV40□) operate on the following FCS models:

AFV30S, AFV30D, AFV40S, AFV40D

■ MODELS AND SUFFIX CODES

Control Function for Field Control Station (for AFV30□/AFV40□, Vnet/IP and FIO)

Model	Description
LFS1700	Control Function for Field Control Station (for AFV30□/AFV40□, Vnet/IP and FIO), up to 4 nodes (*1)

Note: Specify with suffix codes for FCS.

*1: The number of nodes include a CPU node.

Node Expansion Package (for AFV30□/AFV40□)

		Description
Model	LFS1750	Node Expansion Package (for AFV30□/AFV40□) [Media model: LHSKM50-V11]
Suffix Codes	-V	Software license
	1	For 10 nodes (*1)
	2	For 14 nodes (*1)
	1	English version

*1: The number of nodes include a CPU node.

		Description
Model	LFS1750	Node Expansion Package (for AFV30□/AFV40□) [Media model: LHSKM50-V11]
Suffix Codes	-E	Expansion license
	3	For node expansion (from 10 nodes to 14 nodes) (*1)
	1	English version

*1: The number of nodes include a CPU node.

Node Expansion Package for FCS Simulator (for AFV30□/AFV40□)

		Description
Model	LFS1755	Node Expansion Package for FCS Simulator (for AFV30□/AFV40□)
Suffix Codes	-V	Software license
	1	For 10 nodes (*1)
	2	For 14 nodes (*1)
	1	English version

*1: The number of nodes include a CPU node.

		Description
Model	LFS1755	Node Expansion Package for FCS Simulator (for AFV30□/AFV40□)
Suffix Codes	-E	Expansion license
	3	For node expansion (from 10 nodes to 14 nodes) (*1)
	1	English version

*1: The number of nodes include a CPU node.

■ ORDERING INFORMATION

Specify model and suffix codes.

■ TRADEMARKS

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