General Specifications

STARDOM
FOUNDATION™ fieldbus
Communication

STARDOM™
FCN
FCJ

GS 34P02Q51-02E

■ GENERAL

This General Specification (GS) describes STARDOM FOUNDATION fieldbus system which using autonomous controller FCN and FCJ (hereinafter referred to as FCN/FCJ).

FCN/FCJ can communicate with the FOUNDATION fieldbus H1 enabled field devices.

Notation in this document:
- The term "FCN" refers to the module consisting type autonomous controllers.
- The term "FCN-500" refers to the autonomous controllers with NFCP501/NFCP502 CPU module.
- The term "FCN-100" refers to the autonomous controllers with NFCP100 CPU module.
- The term "FCN-RTU" refers to the low power autonomous controllers with NFCP050 CPU module.
- The term "FCJ" refers to the all-in-one type autonomous controllers.

■ FEATURES OF FOUNDATION FIELDBUS

The FOUNDATION fieldbus is an international communication standard developed and administered by the Fieldbus Foundation™. It replaces the conventional 4-20 mA analog signal connection with a digital, bi-directional, multi-drop communication link among field devices and the control system.

The FOUNDATION fieldbus has the following features:

- Multiple devices can be connected by multi-drop connections and multivariable can be transmitted on a single cable, reducing the number of cables and wiring cost.
- A digital transmission protocol ensures accurate information processing and hence strict quality control.
- Multiplex communications allow process variables (PVs), manipulated variables (MVs) and other information to be transmitted from field devices.
- Communication between field devices allows truly distributed control.
- Devices from different vendors can be integrated with assured interoperability.
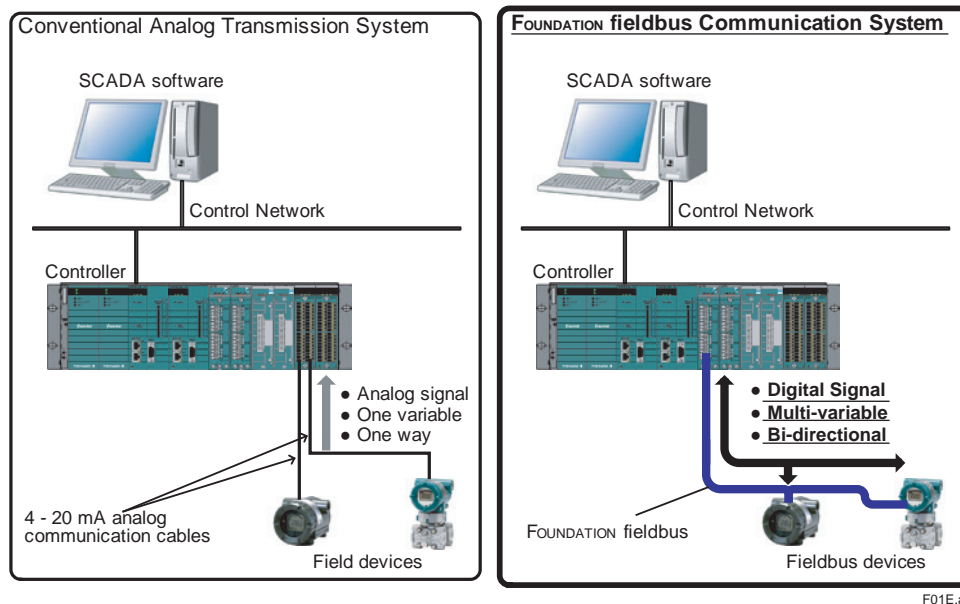- Some adjustments and inspections of field devices can be performed from the control room.

F01E.ai

Figure   Difference between Analog Transmission and FOUNDATION fieldbus Communication

■ FOUNDATION FIELDBUS SYSTEM IN STARDOM

The STARDOM FOUNDATION fieldbus system has all the features of the FOUNDATION fieldbus plus the following additional features:

- FOUNDATION fieldbus devices can be controlled and monitored by the FCN/FCJ autonomous controller via FOUNDATION fieldbus communication.
- The control and calculation functions of the FCN/FCJ allow calculation results to be output to fieldbus devices.
- Control optimized to system status can be achieved by monitoring and controlling fieldbus block on SCADA software (FAST/TOOLS, VDS, and etc.) via FCN/FCJ.
- Segment configuration data can be reused on per FCN/FCJ basis or per port (segment) basis.
- Differential download and parallel download shortens downloading time to field devices.
- Commissioning support functions (difference check function, communication confirmation function and schedule check function) and the FOUNDATION fieldbus configuration auto-check function help to reduce engineering worker-hours.
- Two FOUNDATION fieldbus communication modules (NFLF111) can be used for dual redundancy.
- System alarms and other alert information generated in the FOUNDATION fieldbus can be collected by the FCN/FCJ controller.

■ STARDOM FOUNDATION FIELDBUS SYSTEM CONFIGURATION

The figure below shows an example of a FOUNDATION fieldbus system configuration:
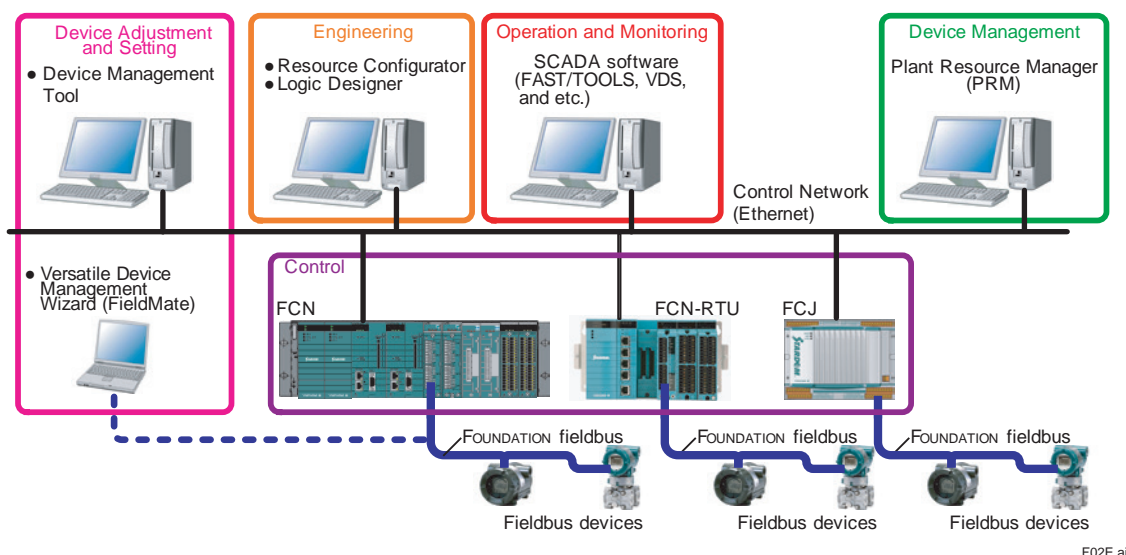

Figure FOUNDATION fieldbus System Configuration Example

● Autonomous controller (FCN/FCJ)

FCN/FCJ controls and monitors fieldbus devices. It collects system alarms from fieldbus devices. Its control and calculation functions allow calculation results to be sent to fieldbus devices.

● Fieldbus devices

Fieldbus devices are devices which can be connected to a FOUNDATION fieldbus. The devices from various vendors can be integrated if they have passed the interoperability test.

● Resource Configurator

Resource Configurator software is used for basic FCN/FCJ setup and FOUNDATION fieldbus engineering. It is used for basic configuration (IP address, I/O modules, license, and etc.) of the FCN/FCJ, device label definition, fieldbus device configuration (tag name, device class, and etc.), connection of fieldbus blocks, and confirmation of fieldbus execution schedules.

● Logic Designer

Logic Designer software is used for developing control applications for the FCN/FCJ. It is used to create, debug, and download control applications to be run on the FCN/FCJ.

● SCADA software (FAST/TOOLS, VDS, and etc.)

SCADA software is used for controlling and monitoring processes. SCADA software controls and monitors fieldbus blocks via the FCN/FCJ.

● **Versatile Device Management Wizard (FieldMate)**

FieldMate software is used for setting and adjustment of fieldbus devices parameters. It connects directly to the FOUNDATION fieldbus via a FOUNDATION fieldbus interface card.

● **Plant Resource Manager (PRM)**

In addition to the configuration, adjustment and management of fieldbus devices, PRM is the software to monitor field devices and equipments conditions and achieve advanced diagnosis.

PRM can be easily added later when the system is in operation.

■ STARDOM FOUNDATION FIELDBUS SYSTEM MAIN FUNCTION

The main function of a STARDOM FOUNDATION fieldbus system is described here.

● **Engineering Function**

Engineering tools are Resource Configurator and Logic Designer.

● **Control Function**

STARDOM controller FCN/FCJ is connected to FOUNDATION fieldbus via FOUNDATION fieldbus communication module. It fulfills the control application by linking up control application on FCN/FCJ with function blocks on field devices.

There are two ways for accessing data of fieldbus blocks from an FCN/FCJ:

• Access using device labels
• Access using FF Block View

Among control applications NPAS POUs (*1), POUs for connecting fieldbus blocks are prepared.

Refer to the following figure for detailed communication method.

*1:   The NPAS POUs in addition to PAS POUs are also available for use.
       For details, see "NPAS POU - Overview" (IM 34P02P25-01E).

Figure Relationship between Fieldbus Blocks and a Control Application

Table Comparing Fieldbus Block Access Methods

	Access using device labels	Access using FF Block View
Purpose	Control, Operation and Monitoring	Operation and Monitoring
Access to the parameters of the fieldbus block	Access to one parameter value at a time	Access to all the parameter values at one time
Data update Cycle	Input/output parameters are periodically updated in synchronization with LAS (Link Active Scheduler). (*1)	Parameters are updated in communication idle time, periodical update is not guaranteed.
Access method	Access parameters of fieldbus blocks via Input/Output Data Processing POUs. (*2)	Access parameters of fieldbus blocks via FF block views
Number of access points	48 points per port	100 blocks per module
Application	Parameters used for periodical control calculation, and etc.	Parameters only for being referred to by SCADA software (FAST/TOOLS, VDS, and etc.), for one shot setting, and etc.

*1:   Other parameters are updated in communication idle time, periodical update is not guaranteed.
*2:   The PAS Portfolio license is not required for using Input/Output Data Processing POUs but required for creating PVI, PID and other control loops.

● **Operation and Monitoring Function**

SCADA software (FAST/TOOLS, VDS, and etc.) is used for operation and monitoring. In addition to controlling and monitoring the FCN/FCJ, SCADA software can also control and monitor fieldbus devices via device labels and FF Block View labels.

The FCN/FCJ autonomous controller receives alerts from FOUNDATION fieldbus communication modules and fieldbus devices and transmits them to the SCADA software (FAST/TOOLS, VDS, and etc.) as system alarms. In addition, operation statuses of FOUNDATION fieldbus communication modules can be displayed in the same way as for other existing I/O modules.

● **Device Adjustment and Setting Function**

The Versatile Device Management Wizard FieldMate can be used to set and adjust parameters of fieldbus devices.

FieldMate implements parameter setting and adjustment by calling the DTM (Device Type Manager) for a fieldbus device. Parameters of fieldbus devices that do not support DTM are edited using DD (Device Description).

● **Device Management Function**

The Plant Resource Manager (PRM) is used to manage fieldbus devices.

In addition to the configuration, adjustment and management of fieldbus devices, PRM is the software to monitor field devices and equipments conditions and achieve advanced diagnosis. It can also consolidate the information such as management of the field device master, parameter history, and maintenance history in the database.

■ COMPONENT DEVICES OF STARDOM FOUNDATION FIELDBUS SYSTEM

The following devices make up the FOUNDATION fieldbus system hardware.
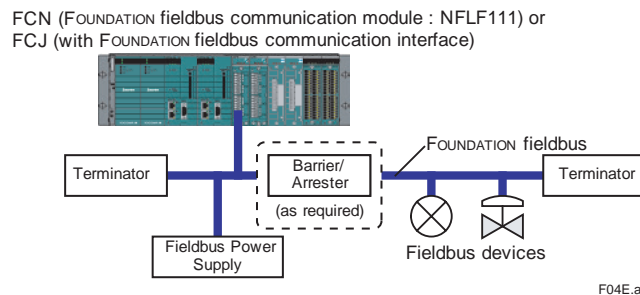
Figure Example of FOUNDATION fieldbus System Hardware Configuration

● **FCN/FCJ**

FCN mounted with FOUNDATION fieldbus communication module (NFLF111), controls communication schedules on a FOUNDATION fieldbus and performs data exchange between the FCN and fieldbus devices.

To ensure reliability, two NFLF111s can be paired up for a duplexed configuration.

Note: "Software License for Duplexed Field Network Module" is required for dual redundancy of Foundation fieldbus communication module (NFLF111) on the FCN-100. The licenses for FCN-500 are bundled with CPU module.
The FCN-RTU does not support duplexed FOUNDATION fieldbus communication modules.

The FCJ autonomous controller with FOUNDATION fieldbus communication interface (NFJT100-H100) is an all-in-one type controller with a built-in communication module equivalent to the FOUNDATION fieldbus communication module (NFLF111).

Table Specifications Applicable to both FCN and FCJ

Item	Specifications	Remarks
Interface	FOUNDATION fieldbus H1	
Inputs/Outputs	48 points per port	
Linkable fieldbus devices	16 devices per port	
Baud rate	31.25 kbps	
Functions	Link Active Scheduler (LAS)	
Number of Virtual Communication Relationships (VCRs)	105 VCRs per port	(*1)
Communication count	96 main schedules per port	(*2)
Number of subschedules	4 sub-schedules per port	(*3)

*1:   The system uses 3 out of the 105 VCRs.
*2:   This is the maximum count of the communication schedules (sequences) for the LAS (Link Active Scheduler) that the FOUNDATION fieldbus communication module contains.
*3:   If a fieldbus device with lower schedule capability (Ex. devices with a fewer subschedule capability) than the FOUNDATION fieldbus communication module is to be added as a Link Master, generation errors may occur. If this happens, reduce the number of schedules used.

FOUNDATION fieldbus communication module (NFLF111) and FCJ with FOUNDATION fieldbus communication interface have LM (Link Master) function, which has the following features:

• With LAS (Link Active Scheduler) function, it controls the schedule of all communications on FOUNDATION fieldbus including both synchronous and asynchronous communication as a master of FOUNDATION fieldbus.
  By linking with the LAS function, it can monitor the current communication status of each of the fieldbus devices on the FOUNDATION fieldbus (the so-called live list).
• With fallback function, if the control logic stops functioning and communication between the CPU module and a FOUNDATION fieldbus communication module is failed for four seconds or more, FOUNDATION fieldbus communication module stops data output. Consequently, the fieldbus devices shift to the output fault state and the output to the field equipment is maintained.
• With time setting function, broadcast the time set on the control network onto the FOUNDATION fieldbus and thus notify the current time to the fieldbus devices.

For detailed information about FOUNDATION fieldbus communication module (NFLF111), refer to "FOUNDATION fieldbus Communication Module" (GS 34P02Q55-01E).

For detailed information about FCJ with FOUNDATION fieldbus communication interface, refer to "FCJ Autonomous Controller Hardware" (GS 34P02Q11-01E).

● **Other Hardware**
• Cables
  Cables are needed to connect FOUNDATION fieldbus system components. Select dedicated cable according to the installation environment.
• Fieldbus Power Supply
  This power supply is used exclusively for the fieldbus that supplies power to fieldbus devices.
• Terminators
  A terminator must be installed on both ends of a FOUNDATION fieldbus network, i.e., in the last device on each end within a FOUNDATION fieldbus segment, in order to keep signals from bouncing back along the line.
  A terminator is built into the NFTF9S pressure clamp terminal block for each port on NFLF111.
  FCJ has no internal terminator. An external terminator must be installed.
• Fieldbus Devices
  This is a fieldbus device such as a transmitter or positioning unit.
  The devices from various vendors can be connected to FCN/FCJ if they have passed the interoperability test.
• Barrier
  The barrier is installed when intrinsically safe explosion-proof is required. The barrier is a unit that suppresses the power supply to the electrical circuit of a fieldbus or fieldbus device when the circuit is short-circuited, in order to prevent ignition and explosion of flammable gas due to electrical sparks.
• Arrester
  The arrester is an device that discharges overvoltage shock waves to the ground if overvoltage shock waves are generated by lightning, etc.

■ MIGRATION OF SEGMENT CONFIGURATION DATA

● Overview of FF Segment Configuration Data Conversion Tool

FF Segment Configuration Data Conversion Tool is a support tool to transit FOUNDATION fieldbus engineering environment from R2.20 or before to R3.10 or after. It is available to generate segment configuration data for FOUNDATION fieldbus Configurator from segment configuration data which created by R2.20 or before H1 Engineering Tool.

● Precautions for Segment Configuration Data Conversion

• To convert segment configuration data, get segment information from backup file by means of exporting project which created by H1 Engineering Tool.
• Schedule, Network Parameter will not be converted, will be newly created instead.
• Block Parameter will not be converted. To adjust block parameter, use FieldMate or PRM accordingly.
• Converted Segment Configuration Data is regarded as newly created one, it need to be downloaded to all the fieldbus devices during initial download after segment configuration data converted.

■ SOFTWARE

● Operating Environment

Refer to operating environment described in "Model NT751FJ Logic Designer" (GS 34P02Q75-01E) for required operating environment.

   Note: Refer to related GS for other software operating environment.

● Software Required

Table Software Required

Purposes	Software	
		Rev. No.
Implementation	Resource Configurator	R4.02.01 or later
	Logic Designer	R4.02.01 or later
Implementation/ execution	PAS Portfolio (Input/Output Data Processing POUs)	R4.02.01 or later
Execution	FCN/FCJ Basic Software	R4.02.01 or later
	Firmware of NFLF111	R12 or later (*1)
	Firmware of FCJ FOUNDATION fieldbus communication interface	R12 or later (*2)

*1:   If two NFLF111 modules are paired for dual redundancy, the firmware revision numbers of the two modules must be the same. Use the Resource Configurator to check the firmware revision number of an NFLF111 module.
*2:   Use the Resource Configurator to check the firmware revision number of the FCJ FOUNDATION fieldbus communication interface.
Note: Refer to related GS for other software revisions.

■ MODEL AND SUFFIX CODES (FOR FCN-100)

			Description
Model	NT730AJ		Software License for Duplexed Field Network Module
Suffix Codes	-L		License
	W		Issued at Web
	1		Always 1
		1	Always 1
		A	Standard

Note: Licenses for FCN-500 is bundled with CPU module.

■ RELATED DOCUMENT

FCN/FCJ Autonomous Controller Functions (FCN-100/FCJ)	GS 34P02Q01-01E
FCN Autonomous Controller Functions (FCN-500)	GS 34P02Q03-01E
FCJ Autonomous Controller Hardware	GS 34P02Q11-01E
FCN Autonomous Controller Hardware (FCN-100)	GS 34P02Q12-01E
FCN Autonomous Controller Hardware (FCN-500)	GS 34P02Q14-01E
Logic Designer	GS 34P02Q75-01E
Application Portfolios for FCN/FCJ	GS 34P02P20-01E
VDS	GS 34P02A02-01E
FCN-RTU Low Power Autonomous Controller Functions	GS 34P02Q02-01E
FCN-RTU Low Power Autonomous Controller Hardware	GS 34P02Q13-01E
Foundation fieldbus Communication Module	GS 34P02Q55-01E
Plant Resource Management (PRM)	GS 33Y05Q00-30E
FieldMate Versatile Device Management Wizard	GS 01R01A01-01E
FAST/TOOLS	GS 50A01A10-01EN

■ ORDERING INFORMATION

Specify the model and suffix codes.

■ TRADEMARKS

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