

General Specifications

STARDOM FOUNDATION Fieldbus Communication



GS 34P02Q51-01E

■ GENERAL

This document describes the FOUNDATION Fieldbus enabled field devices in low-speed voltage mode communication function in the FCN/FCJ autonomous controllers, which can communicate. Throughout this document, "fieldbus" indicates a low-speed voltage mode FOUNDATION fieldbus, i.e., an H1 fieldbus.

● What Fieldbus Is

A fieldbus is a replacement to a conventional, 4-20 mA analog signal connection and offers bi-directional digital signal transmissions on a bus (multi-drop) network. Advanced communication functions of a fieldbus enable distributed control by fieldbus devices as well as optimization control by interlinking those devices with FCJ or FCN controllers.

■ BENEFITS

The vast benefits of a fieldbus include the following:

- Multiple devices can be connected to a single bus cable, thus decreasing the amount of cables and reducing the wiring cost.
- Digital transmissions enable highly precise data to be conveyed and hence stringent quality control to be implemented.
- Thanks to multiplex communication, diverse information not limited to measured process values and manipulated values can be transmitted.
- Inter-device communication enables distributed control by fieldbus devices.
- Assured interoperability allows use of devices from different manufacturers.
- Device manufacturers are not restricted, so the ranges of device models that can be selected are widened and your system can be configured optimally.
- Adjustment and checking of field devices can be performed remotely at the control room.
- The Foundation Fieldbus communication module (NFLF111) can be duplexed for increased reliability.

■ CONFIGURATIONS

● Fieldbus System Configurations

A fieldbus system in STARDOM is composed of FCNs, FCJs, and fieldbus devices, and can be monitored and operated from versatile data server software(VDS). The following shows examples of fieldbus system configuration.

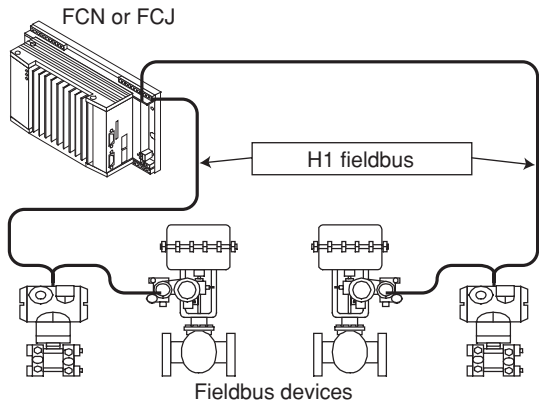


Figure Example of Fieldbus System Configuration

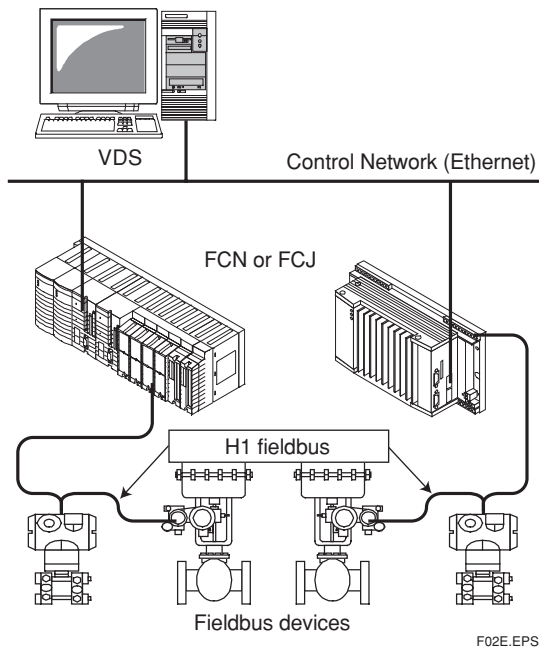


Figure Example of Fieldbus System Configuration Using VDS for Monitoring and Controlling System

● Fieldbus System Hardware Components

Devices composing a fieldbus system include the following.

FCN (with NFLF111 Foundation Fieldbus communication module) or FCJ (Foundation Fieldbus-enabled model)

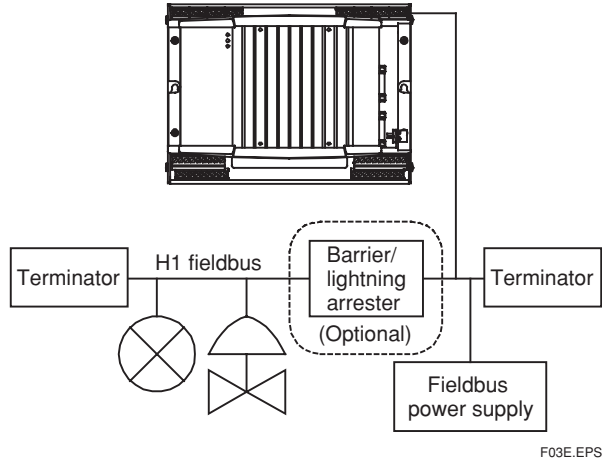


Figure Example of Fieldbus Hardware Configuration

NFLF111 Foundation Fieldbus Communication Module

The NFLF111 is a module for an FCN controller. It functions as a link master (LM) device capable of controlling communication schedules on the H1 fieldbus segment connected to each of its ports and performs data exchange between the FCN and fieldbus devices.

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

For details of the NFLF111, see Model NFLF111 Foundation Fieldbus Communication Module, GS 34P02Q55-01E.

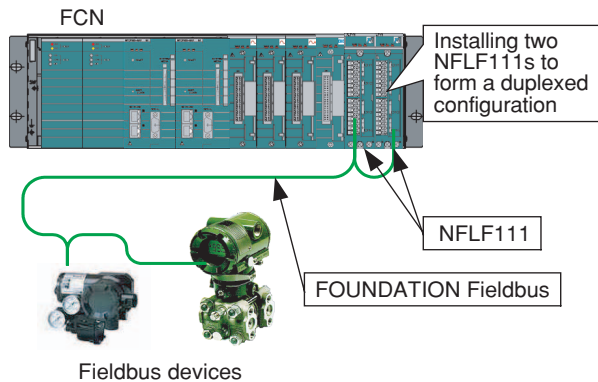


Figure Example of Duplexed NFLF111s

NFJT100-H100 Foundation Fieldbus-enabled FCJ

The NFJT100-H100 is a Foundation Fieldbus-enabled model of the FCJ all-in-one controller incorporating the NFLF111 module's functionality. This FCJ model also functions as a link master (LM) device capable of controlling communication schedules on an H1 fieldbus segment connected to each of its ports and performs data exchange between the FCJ itself and fieldbus devices.

For details of this Foundation Fieldbus-enabled model of the FCJ, see FCJ Autonomous Controller Hardware, GS 34P02Q11-01E.

Fieldbus Power Supply

A power supply unit, which is designed for fieldbus, supply power to the devices on the fieldbus.

Terminators

A terminator must be installed on both ends of a bus network, i.e., in the last device on each end within a fieldbus segment, in order to keep signals from bouncing back along the line. A terminator is built into the NTF9S pressure clamp terminal block for NFLF111, for each port.

Fieldbus Devices

Fieldbus devices may be transmitters and valve positioners. Field devices from any manufacturer can be connected to a fieldbus as far as they implement the FOUNDATION Fieldbus.

Barrier

A protective device to be installed when intrinsic safety is required. A barrier prevents excess power from being delivered from the power supply to the fieldbus excess power.

Lightning Arrester

A protective device that reduces excessive impulse voltage resulting from lightning to a safe level by grounding the discharge.

● Fieldbus System Development Environment

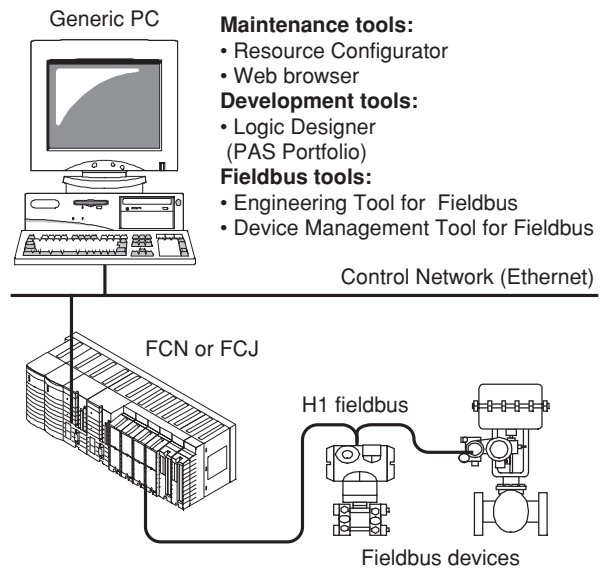
To build and maintain a fieldbus system, use the following tools designed to run on a generic personal computer on a control network.

Engineering Tool for Fieldbus is used for fieldbus system engineering.

Device Management for Fieldbus is used to supervise and administrate devices on the fieldbus, such as sensors, positioners, and analyzers, as well as to view and modify their parameter settings for maintenance.

Other useful tools include PAS Portfolio, Resource Configurator, and Logic Designer. For details, see the respective general specifications:

- Application Portfolios, GS 34P02P20-01E
- FCN/FCJ Autonomous Controller Functions, GS 34P02Q01-01E
- Logic Designer, GS 34P02Q75-01E



- Maintenance tools:**
- Resource Configurator
 - Web browser
- Development tools:**
- Logic Designer (PAS Portfolio)
- Fieldbus tools:**
- Engineering Tool for Fieldbus
 - Device Management Tool for Fieldbus

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Figure Fieldbus System Development Environment

FUNCTIONS

In a fieldbus system, control applications in FCNs and FCJs and function blocks inside fieldbus devices link to each other.

Fieldbus Devices as Input/Output Devices

Each of FCNs and FCJs can use a fieldbus device as an input/output device. The table below shows the input/output terminals of fieldbus function blocks in field device to which a control application in an FCN and FCJ can connect. Also shown are the NPAS/PAS POU's (short for process automation system's program organization units) designed to connect the respective terminals.

Table Fieldbus Function Blocks Connectable from FCN/FCJ

Fieldbus Function Block		NPAS/PAS POU for Inputting /Outputting
Block Name	I/O Terminals	
AI (analog input)	OUT	NPAS_FFI_ANLG PAS_FFI_ANLG
DI (discrete input)	OUT_D	NPAS_FFI_STS PAS_FFI_STS
AO (analog output)	CAS_IN, BKCAL_OUT	NPAS_FFO_ANLG PAS_FFO_ANLG
DO (discrete output)	CAS_IN_D, BKCAL_OUT_D	NPAS_FFO_STS PAS_FFO_STS

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Link Active Scheduler (LAS) Functionality

An FCJ or the NFLF111 module in an FCN, both containing Link Active Scheduler functionality, functions as the LAS of each fieldbus segment connected, and controls all communication on the segment including scheduled cyclic communication and scheduled non-cyclic communication.

Fieldbus Device Status Monitoring

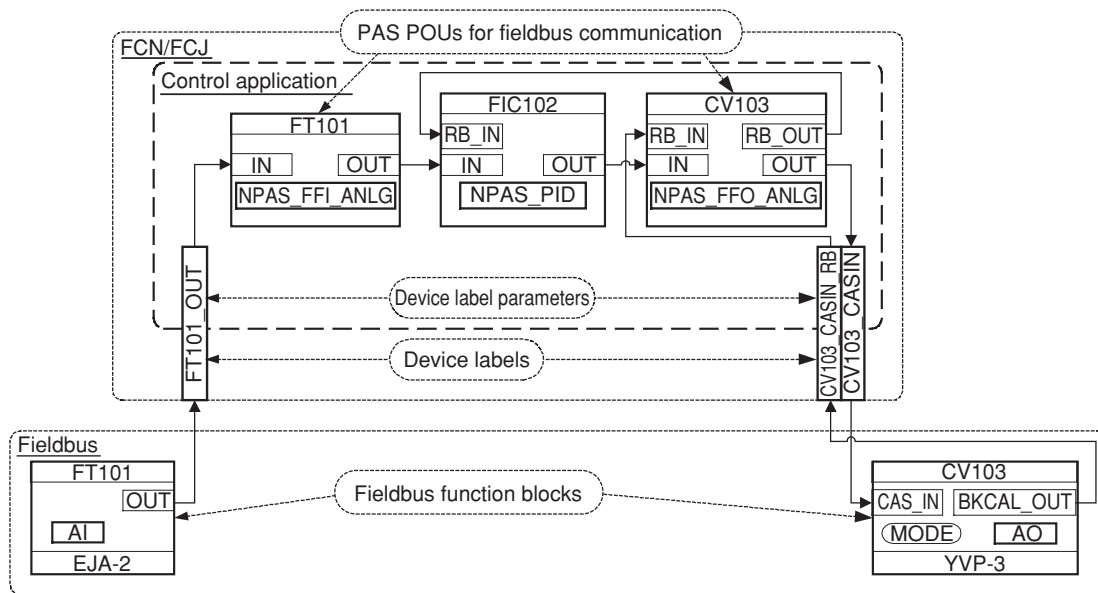
The live list, which resides in the LAS and indicates communication statuses of the individual devices on each fieldbus segment, can be viewed via Device Management Tool for Fieldbus.

Alert Reception and Notification

An FCJ or the NFLF111 module in an FCN, receives alerts transmitted from fieldbus devices and notifies VDS of them as system alarms.

Time Synchronization

An FCJ and an NFLF111 module in an FCN broadcast the current time on each fieldbus segment for notification to the fieldbus devices.



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Figure Link between Control Application and Fieldbus Function Blocks

● **Internal Parameter Reading and Writing**

If you use the FF Block View, it is easy to refer to or set values for internal parameters of the FF Function Blocks. The FF Block Views map the FF Function Blocks onto control applications. In other words, parameters of the FF Block Views are updated, in fixed intervals, to the internal parameters of the FF Function Blocks. Therefore, referring to or setting values for parameters of the FF Block Views using VDS, POU of the control applications, or Java applications, is equivalent to accessing the FF Function Blocks.

However, FF Block View data is updated during the spare time of the scheduled communication. The updating interval may vary. When accessing the FF Function Block internal parameter from the control application, NPAS/PAS POU should be used.

Table FF Function Blocks Supported by FF Block Views

FF Function Blocks Supported by FF Block Views	
RESOURCE	OS (Output Splitter)
AI (Analog Input)	SC (Signal Characterizer)
DI (Discrete Input)	IT (Integrator)
CS (Control Selector)	IS (Input Selector)
PID (PID Control)	MDI (Multiple Discrete Input)
RA (Ratio)	MDO (Multiple Discrete Output)
AO (Analog Output)	MAI (Multiple Analog Input)
DO (Discrete Output)	MAO (Multiple Analog Output)

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Note: The corresponding FF block Views are provided for the FF Function Blocks above.

Note: FF block Views do not support vendor-specific extended parameters.

● **Alarm Summary and Alarm History Display**

VDS shows alerts received from fieldbus devices as system alarms in the alarm summary and alarm history.

● **FCN/FCJ Status Display**

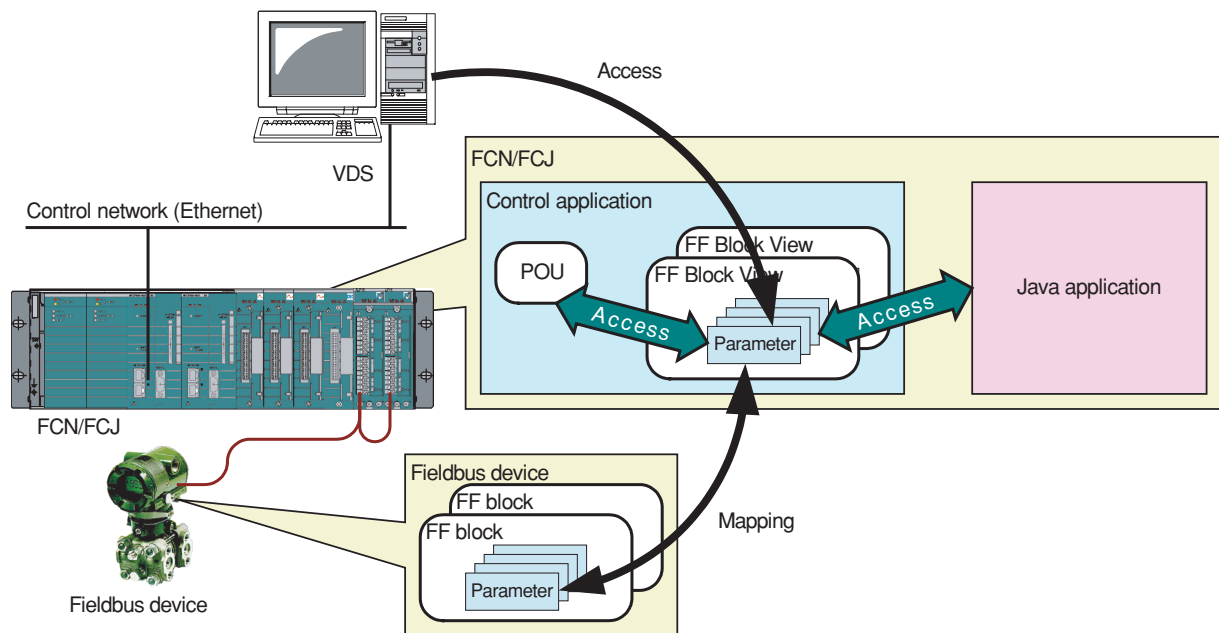
The FCN/FCJ status display of VDS shows the statuses of the Foundation Fieldbus communication modules in each FCN and the same fieldbus communication functionality in each FCJ.

● **Device Management**

Fieldbus devices' statuses can be monitored, their parameter settings modified, and functionality specific to each fieldbus device controlled as necessary. In short, operation and monitoring of fieldbus devices, which cannot be done solely with the standard operation and monitoring functions of VDS, are possible and remote maintenance of fieldbus devices is facilitated.

● **System Development**

Use can effortlessly set configuration data for fieldbus device and their internal function blocks, as well as convert those built configurations into data downloadable to fieldbus devices.



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Figure Operation of FF Blocks View

■ SOFTWARE

The following software is used to build and maintain a fieldbus system.

● Resource Configurator

Resource Configurator is a tool program used for making basic settings in an FCN/FCJ, including the IP addresses, device labels, I/O module configurations, and license registrations.

● Logic Designer

Logic Designer is a tool program to develop and debug a control application running in FCNs and FCJs, as well as download the developed application to FCNs and FCJs.

● PAS Portfolio

PAS Portfolio is a library of functions used when developing a control application using Logic Designer, and provides program organization units (POUs) that are ready to link a control application to fieldbus function blocks. The table below lists these NPAS/PAS POUs and shows the corresponding device label parameters to be connected to them.

Table NPAS/PAS POUs and Corresponding Device Label Parameters

NPAS/PAS POU for Fieldbus Function Block		Device Label Parameter
Type	POU Name (feature)	
Data input/output processing	NPAS_FFI_ANLG PAS_FFI_ANLG (analog input)	I_FFAnlg (analog input)
	NPAS_FFI_STS PAS_FFI_STS (status input)	I_FFSts (status input)
	NPAS_FFO_ANLG PAS_FFO_ANLG (analog output)	O_FFAnlg (analog output)
	NPAS_FFO_STS PAS_FFO_STS (status output)	O_FFSts (status output)
Data read/write	NPAS_FFRD_ANLG PAS_FFRD_ANLG (analog data reading)	I_FFAnlg (analog input)
	NPAS_FFRD_STS PAS_FFRD_STS (status data reading)	I_FFSts (status input)
	NPAS_FFRD_DINT PAS_FFRD_DINT (integer data reading)	I_FFInt (integer input)
	NPAS_FFWT_ANLG PAS_FFWT_ANLG (analog data writing)	O_FFAnlg (analog output)
	NPAS_FFWT_STS PAS_FFWT_STS (status data writing)	O_FFSts (status output)
	NPAS_FFWT_DINT PAS_FFWT_DINT (integer data writing)	O_FFInt (integer output)

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● Engineering Tool for Fieldbus

Engineering Tool for Fieldbus is used for engineering of communication and control in a fieldbus system, and enables the users to:

- Build control loops consisting of function blocks in individual fieldbus devices.
- Set up the fieldbus network configuration.
- Download control loop configuration data to fieldbus devices via fieldbus.

● Device Management Tool for Fieldbus

Device Management for Fieldbus is used to supervise and administrate devices on the fieldbus, such as sensors, positioners, and analyzers, as well as to view and modify their parameter settings for maintenance.

■ SOFTWARE AND LICENSES

Software required to build and maintain a fieldbus system is supplied on a CD-ROM.

Table Software Titles

Tool or Package Software	Model Code of CD-ROM	License
Resource Configurator	NT203AJ	Unnecessary
Logic Designer		Necessary
PAS Portfolio		(*1)
Engineering Tool for Fieldbus	SSSSM01	Necessary
Device Management Tool for Fieldbus I		Necessary

*1: Not required when installing in a computer; required when running in an FCJ and FCN. T04E.EPS

● System Requirements

A computer is required to meet the following requirements to run the software above.

Item	Specification
Personal computer	PC/AT-compatible computer
CPU	Pentium II 300 MHz or better (Pentium II 400 MHz or better recommended)
RAM	128 MB or more (160 MB or more recommended)
Hard disk	At least 300 MB of free space is required.
Display	800 (600 pixels or more (1024 (768 pixels or more recommended), 256 colors or more
CD-ROM drive	A CD-ROM drive that is supported by the operating system specified at the bottom of this table is required.
Ethernet adapter	A 10Base5, 10Base-T, or 100Base-TX adapter that is supported by the operating system specified at the bottom of this table is required.
Operating system	Windows 2000 Professional SP4 Windows XP Professional SP1, SP2

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● License for FCN and FCJ

To run an FCN and FCJ, an FCN/FCJ Basic Software License and I/O credits as required for the inputs and outputs used by the user's control application (number of device label parameter definitions), are needed. The quantity of I/O credits is calculated from the number of I/O points of each signal type. When linking a fieldbus, these I/O points must include the inputs and outputs the control application will access via device labels. Use the table below to calculate the quantity of credits required for fieldbus communication and add it to the quantity required for other I/O points to determine the quantity of I/O credits to be purchased.

Table I/O Credit Calculation for Fieldbus Communication

Signal Type (*1)	Number of Points		Factor		Subtotal
I_FFAnlg (analog input)		x	5	=	
I_FFSts (status input)		x	1	=	
I_FFDDint (integer input)		x	1	=	
O_FFAnlg (analog output)		x	10	=	
O_FFSts (status output)		x	2	=	
O_FFDDint (integer output)		x	2	=	
Total					

*1: Signal type selected when defining a device label parameter using Logic Designer.

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● Software License for Duplexed Field Network Module

Required for each FCN when pairing NFLF111 Foundation Fieldbus modules in it to constitute a duplexed configuration. A single license allows multiple pairs in the same FCN.

■ STYLES OF SOFTWARE SUPPLY

● Software Medium

Software for a fieldbus, i.e., Fieldbus Engineering Tool and Resource Management Tool, and the respective user's manuals are supplied on a CD-ROM (Model SSSSM01). For details, see Models SSS5700 and SSS6700 Fieldbus Communication Functions (R4), GS 33Y05P10-32E.

● Licenses

Fieldbus Engineering Tool or Resource Management Tool comes with an order ID sheet showing a license ID, which is needed at software installation.

■ MODEL AND SUFFIX CODES

		Description
Model	SSS5700	Engineering Tool for Fieldbus (media: Model SSSSM01-C11)
Suffix Codes	-S	Basic Software license
	-C	Multiple software license (for 2 or more)
	1	Windows 2000
	1	English version

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		Description
Model	SSS6700	Device Management Tool for Fieldbus (media: Model SSSSM01-C11)
Suffix Codes	-S	Basic Software license
	-C	Multiple software license (for 2 or more)
	1	Windows 2000
	1	English version

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		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

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■ ORDERING PROCEDURE

Specify the model and suffix codes.

■ TRADEMARKS

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