

# General Specifications

## FCN Autonomous Controller Hardware (FCN-500)



GS 34P02Q14-01E

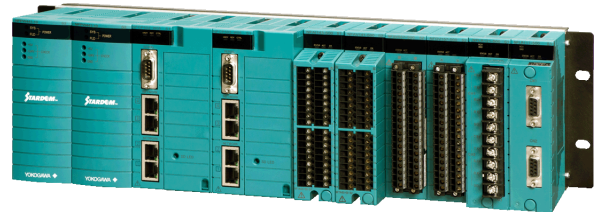
### ■ GENERAL

*This document describes the general specifications of the FCN autonomous controller with NFCP501/NFCP502 CPU module. (FCN is an acronym for field control node.)*

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.

For Function, refer to FCN Autonomous Controller Functions (FCN-500), GS 34P02Q03-01E.



### ■ FEATURES

- High-performance, high-reliability modular controller
- Memory with ECC
- Low heat dissipation eliminates the need for a fan
- A wealth of RAS features — CPU self-diagnostics, temperature monitoring, I/O diagnostics, and more
- The CPU, power supply module, internal communication bus on backboard (SB bus), E2 bus (extension bus), and control network (Ethernet port 1 and 2) can all be duplexed, and all modules are hot-swappable. Use a couple of the CPU module of the same type to make the CPU module duplex configuration.
- Can function as link active schedulers (LASs) for low-speed voltage mode (H1) FOUNDATION Fieldbus segments, and link up FOUNDATION Fieldbus-enabled field devices.

## ■ CONFIGURATION

An FCN-500 consists of the following:

- Base module
  - Power supply module
  - CPU module
  - E2 bus interface module (extending the unit) (\*1)
  - SB bus repeat module (extending the SB bus to connect an extension unit) (\*1)
  - I/O modules
- \*1: SB bus repeat module and E2 bus interface module can not be used together.

There are four types of base module.

- NFBU200 base module (long): Control unit and extension unit sharing, duplexed power supply possibility
- N2BU051 base module (short): Control unit and extension unit sharing
- NFBU050 base module (short): Control unit only, for low power
- N2BU030 base module (compact): Control unit and extension unit sharing

### ● Control unit alone

The control unit is unit with CPU module. The maximum number of I/O modules that can be implemented depends on the type of base module and the number of CPUs.

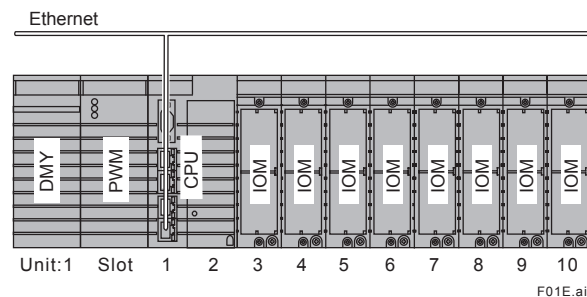
#### Maximum I/O Module Configurations

| Base Module                   | Unit Configuration | Standard       | Duplexed (*1)       |
|-------------------------------|--------------------|----------------|---------------------|
| NFBU200 base module (long)    | Control unit alone | Max. 8 modules | Max. 6 modules      |
| N2BU051 base module (short)   | Control unit alone | Max. 3 modules | Not applicable (*2) |
| NFBU050 base module (short)   | Control unit alone | Max. 3 modules | Not applicable (*2) |
| N2BU030 base module (compact) | Control unit alone | Max. 1 module  | Not applicable (*2) |

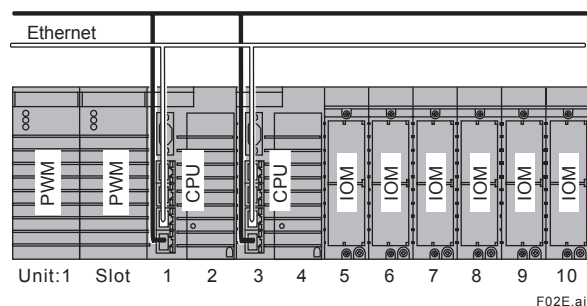
\*1: When CPU modules are duplexed

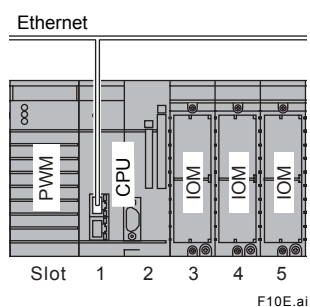
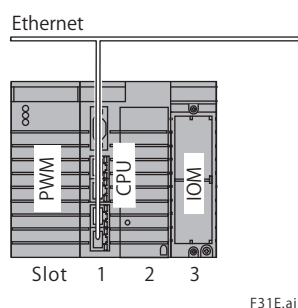
\*2: Neither power supply nor CPU modules can be duplexed on N2BU051, NFBU050 or N2BU030.

#### Example: Standard control unit



#### Example: Control unit with duplexed CPU and power supply modules



**Example: Short control unit****Example: Compact control unit**

| Abbreviation | Description                              |
|--------------|------------------------------------------|
| PWM          | Power supply module                      |
| CPU          | CPU module                               |
| IOM          | I/O module                               |
| N2EB         | E2 bus interface module                  |
| NFSB         | SB bus repeat module                     |
| DMY          | Dummy cover for power supply Module Slot |

**● Unit extension with E2 bus**

Up to eight extension units can be connected to the control unit using the E2 bus interface modules. Two ports of the E2 bus interface module mounted on the control unit can be connected to extension units as separate lines. The maximum number of extendable units that can be connected is a maximum of 8 units in total of two lines. Three types of base modules (NFBU200, N2BU051 or N2BU030) can be used as control unit and extension unit. By installing two E2 bus interface modules in each base module, it is possible to duplex E2 bus. (\*1)

Connect each E2 bus interface module with UTP straight cable (CAT 5e or higher). The distance between units can be extended up to 100 m.

\*1: When using the compact base module for the control unit, it is not possible to duplex the communication lines.

**Maximum I/O Module Configurations**

| Base Module                | Unit Configuration                       | Standard        | Duplexed (*1)   |
|----------------------------|------------------------------------------|-----------------|-----------------|
| NFBU200 base module (long) | Control unit with 8 extension units (*2) | Max. 79 modules | Max. 68 modules |

Note: NFBU200/NFBU202 CPU module style S2 or later is required to use the E2 bus interface module.

\*1: When CPU and E2 bus interface modules are duplexed.

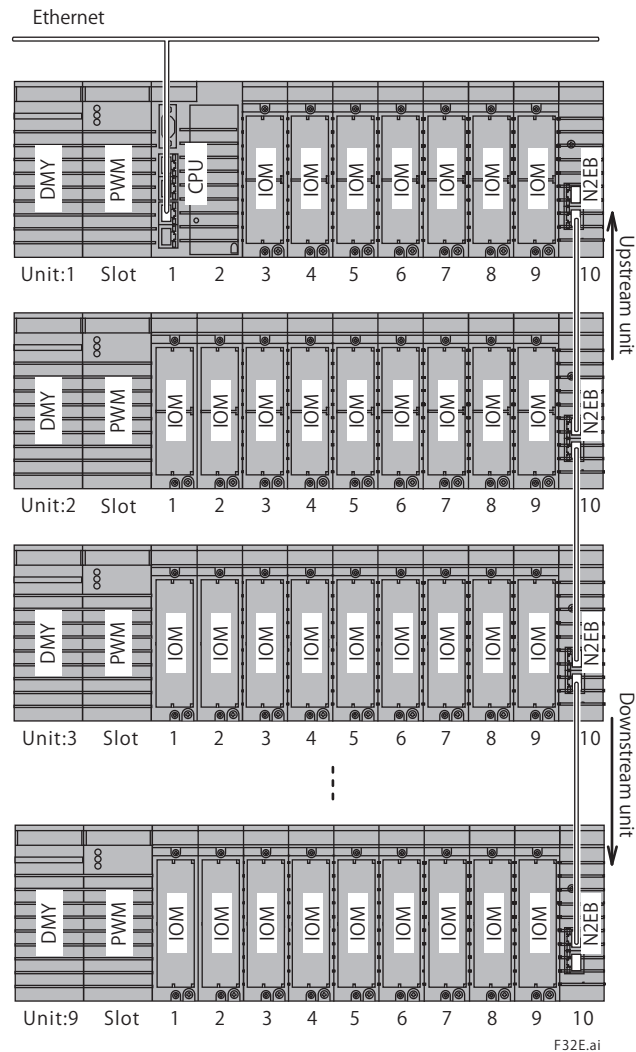
\*2: When NFBU200 base modules are used in all extension units.

**Extension of Transmission distance by Optical fiber**

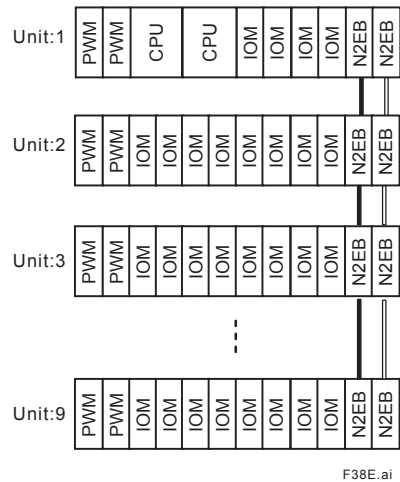
The transmission distance between units can be extended by converting the system from UTP straight cable to fiber optic cable with third party's media converters. Only Layer 1 (Physical Layer) media converters which simply convert packets from electric signal to optical signal can be used for the E2 bus. Refer to the verified media converter information and precaution on Yokogawa Partner Portal STARDOM site when choosing the model.

<https://partner.yokogawa.com/global/member/rtu/os/index.htm#tab04>

Example: Standard control unit + 8 extension units with E2 bus interface modules / 1 lines



Example: Control unit with duplexed CPU modules, power supply modules, and E2 bus + 8 extension units / 1 lines



**Example: Control unit with duplexed CPU modules, power supply modules, and E2 bus + 8 extension units / 2 lines**

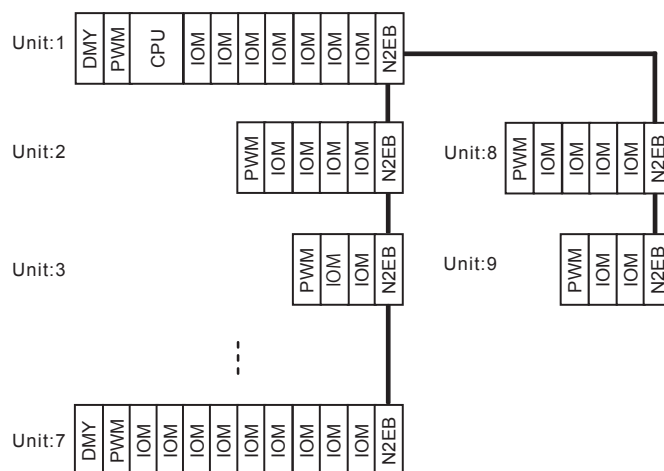
Note: The CPU module, power supply module, and E2 bus can be made duplex individually, when required.



F33E.ai

**Example: Mixed base module configuration, E2 bus + 8 extension units / 2 lines**

Note: Three kinds of base modules (NFBU200, N2BU051 or N2BU030) can be arranged according to the number of I/O points and installation environment required for the control unit and extension unit.



F39E.ai

### ● Unit extension with SB bus

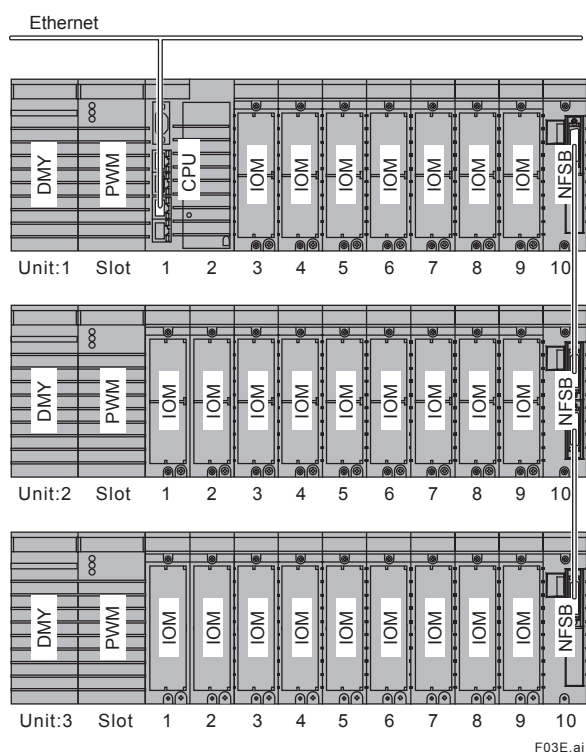
Up to two extension units can be connected using the SB bus repeat modules. The SB bus repeat module can be mounted on the base module (NFBU200 only). By installing two SB bus repeat modules on each base module, it is possible to duplex the SB bus. Connect each SB bus repeat module with a dedicated cable.

#### Maximum I/O Module Configurations

| Base Module                | Unit Configuration                  | Standard        | Duplexed (*1)   |
|----------------------------|-------------------------------------|-----------------|-----------------|
| NFBU200 base module (long) | Control unit with 2 extension units | Max. 25 modules | Max. 20 modules |

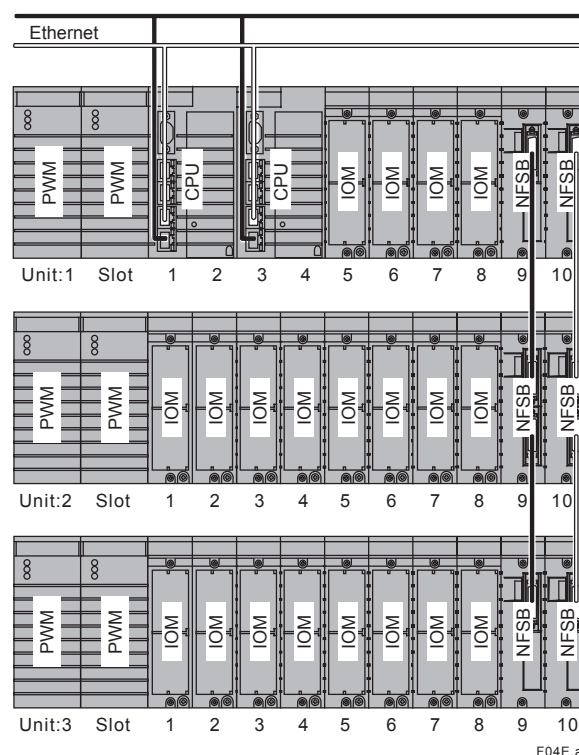
\*1: When CPU and SB bus repeat modules are duplexed.

#### Example: Standard control unit + 2 extension units with SB bus repeat modules



#### Example: Control unit with duplexed CPU modules, power supply modules, and SB bus + 2 extension units

Note: The CPU module, power supply module, and SB bus can be made duplex individually, when required.



## ■ INSTALLATION REQUIREMENTS

| Item                          |                         | Specification                                                                                        |                                                                         |
|-------------------------------|-------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                               |                         | FCN-500<br>(NFCP501-□□□/NFCP502-□□□<br>Standard Type)                                                | FCN-500<br>(NFCP501-□1□/NFCP502-□1□<br>Extended Temperature range Type) |
| Ambient temperature           | Operation               | 0° to 55°C                                                                                           | -20° to 70°C (*1)                                                       |
|                               | Transportation/storage  | -40° to 85°C                                                                                         |                                                                         |
| Ambient humidity              | Operation               | 5 to 95 %RH (no condensation)                                                                        |                                                                         |
|                               | Transportation/storage  | 5 to 95 %RH (no condensation)                                                                        |                                                                         |
| Rate of change in temperature | Operation               | Within ±10°C/h                                                                                       |                                                                         |
|                               | Transportation/storage  | Within ±20°C/h                                                                                       |                                                                         |
| Dust                          |                         | 0.3 mg/m <sup>3</sup> or less                                                                        |                                                                         |
| Protection class              |                         | IP20                                                                                                 |                                                                         |
| Resistance to corrosive gases |                         | ANSI/ISA S71.04 Class G2 (Standard) (ANSI/ISA S71.04 Class G3, option)                               |                                                                         |
| Resistance to vibration       |                         | 0.15 mm P-P (5 to 58 Hz), 1 G (58 to 150 Hz)                                                         |                                                                         |
| Resistance to shock           |                         | 15 G, 11 ms (during power-off, for sine half-waves in XYZ-directions)                                |                                                                         |
| Altitude                      |                         | 2000 m or less                                                                                       |                                                                         |
| Noise                         | Electric field          | 3 V/m or less (26 MHz to 1 GHz)                                                                      |                                                                         |
|                               | Magnetic field          | 30 A/m (AC) or less, 400 A/m (DC) or less                                                            |                                                                         |
|                               | Electrostatic discharge | 4 kV or less contact discharge, 8 kV or less aerial discharge                                        |                                                                         |
| Grounding                     |                         | Apply the grounding system which is defined by the rules and standards of the country or the region. |                                                                         |
| Cooling                       |                         | Natural air cooling                                                                                  |                                                                         |

\*1: It depends on I/O modules. Refer to "■ I/O MODULES" for details

## ■ COMPLIANT STANDARDS

|                                                         | Item                                                             | Standards                                                                                                                                                                                      |
|---------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Safety standards<br>(*1) (*5)(*8)                       | CSA                                                              | CAN/CSA-C22.2 No.61010-1<br>CAN/CSA-C22.2 No.61010-2-201<br>CAN/CSA-C22.2 No.61010-2-030                                                                                                       |
|                                                         | CE Marking Low Voltage Directive                                 | EN 61010-1<br>EN IEC 61010-2-201<br>EN 61010-2-030                                                                                                                                             |
|                                                         | UKCA Marking Safety Regulation                                   | EN 61010-1<br>EN IEC 61010-2-201<br>EN 61010-2-030                                                                                                                                             |
|                                                         | EAC Marking                                                      | CU TR 004                                                                                                                                                                                      |
|                                                         | Morocco Compliance Marking<br>(C <sub>p</sub> Marking)           | NM EN 61010 1<br>NM EN 61010 2 201<br>NM EN 61010 2 030                                                                                                                                        |
| EMC standards (*8)                                      | CE Marking EMC Directive                                         | EN 55011 Class A Group 1 (emission) (*7)<br>EN 61000-6-2 (immunity) (*1) (*2) (*6)<br>EN 61000-3-2<br>EN 61000-3-3 (*3)                                                                        |
|                                                         | UKCA Marking EMC Regulation                                      | EN 55011 Class A Group 1 (emission) (*7)<br>EN 61000-6-2 (immunity) (*1) (*2) (*6)<br>EN 61000-3-2<br>EN 61000-3-3 (*3)                                                                        |
|                                                         | RCM                                                              | EN 55011 Class A Group 1 (*7)                                                                                                                                                                  |
|                                                         | KC Marking                                                       | Korea Electromagnetic Conformity Standard                                                                                                                                                      |
|                                                         | EAC Marking                                                      | CU TR 020                                                                                                                                                                                      |
|                                                         | Morocco Compliance Marking<br>(C <sub>p</sub> Marking)           | NM EN 55011 Class A Group 1 (*7)<br>NM EN 61000 6 2<br>NM EN 61000 3 2<br>NM EN 61000 3 3                                                                                                      |
| Standards for Hazardous<br>Location Equipment (*8) (*9) | US (FM) Nonincendive (*1)                                        | Class I Division 2, Groups A, B, C, D T4<br>FM 3600:2018<br>FM 3611:2018<br>FM 3810:2018<br>ANSI/UL 121201:2017<br>ANSI/UL 61010-1:2012<br>ANSI/UL 61010-2-30:2012<br>ANSI/UL 61010-2-201:2014 |
|                                                         | ATEX Ex "ec" (*10) (*11)                                         | Ⓔ II 3 G Ex ec nC II C T4 Gc X (*12)<br>EN IEC 60079-0:2018<br>EN IEC 60079-7:2015 + A1:2018<br>EN 60079-15:2010<br>EN IEC 60079-15:2019                                                       |
|                                                         | UKEX Ex "ec" (*10) (*11)                                         | Ⓔ II 3 G Ex ec nC II C T4 Gc X (*12)<br>EN IEC 60079-0:2018<br>EN IEC 60079-7:2015 + A1:2018<br>EN 60079-15:2010<br>EN IEC 60079-15:2019                                                       |
|                                                         | Canada (CSA) Non-Incendive (*1)                                  | Class I Division 2, Groups A, B, C, D T4<br>C22.2 No.213-17<br>CAN/CSA-C22.2 No.61010-1-12 + Amd1-18<br>CAN/CSA-C22.2 No.61010-2-030:18<br>CAN/CSA-C22.2 No.61010-2-201:18                     |
|                                                         | IECEx Ex "ec" (*11)                                              | Ex ec IIC T4 Gc<br>IEC 60079-0 Ed. 7.0 (2017)<br>IEC 60079-7 Ed. 5.1 (2017)<br>IEC 60079-15 Ed.5.0 (2017)                                                                                      |
|                                                         | Emirates Conformity Assessment<br>Scheme (ECAS-Ex) Ex "ec" (*11) | Ex ec IIC T4 Gc<br>IEC 60079-0 Ed. 7.0 (2017)<br>IEC 60079-7 Ed. 5.1 (2017)<br>IEC 60079-15 Ed.5.0 (2017)                                                                                      |

|                                          |                                      |                                                                                                                                                                                                                           |
|------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Marine Standards (*13) (*14)             | ABS<br>(American Bureau of Shipping) | Marine Vessel Rules (2021), Part4, Chapter 9.                                                                                                                                                                             |
|                                          | BV (Bureau Veritas)                  | Rules for the Classification of Steel ships-January 2018 edition, Part C Chapter 3 Section 6 (EC Code: 31)                                                                                                                |
|                                          | LR (Lloyd's Register)                | Type Approval System Test Specification Number 1 July 2015 (Environmental categories ENV2)                                                                                                                                |
|                                          | DNV                                  | Environmental test specification for electrical, electronic and programmable equipment and systems Edition December 2019 Location Classes: Temperature B, Humidity B, Vibration A, EMC B, Enclosure According to IEC60529 |
| Restriction of Hazardous Substances (*8) | RoHS Directive (*15)                 | EN IEC 63000:2018                                                                                                                                                                                                         |
|                                          | UK RoHS Regulation                   | EN IEC 63000:2018                                                                                                                                                                                                         |
|                                          | UAE RoHS Directive                   | UAE Cabinet Decision No. 10 of 2017                                                                                                                                                                                       |

- \*1: For the rack-mountable devices, DIN rail-mountable devices, and wall-mountable devices to meet the Safety Standards and EMC Standards, the devices must be installed in a lockable metal cabinet. The cabinet must conform to IEC/EN/CSA 61010-2-201 or provide degrees of protection IP3X or above and IK09 or above.
- \*2: For lightning surge immunity, a device such as a lightning arrester needs to be installed externally. Some module can select a pressure clamp terminal block with surge absorber. For details, see "Terminal Block" (GS 34P02Q41-01E).
- \*3: The specified magnitude of the voltage drop determined by the cable wiring length needs be met.
- \*5: To be compliant with these standards, the FCN's cable which is drawn out from the metal, needs to be used the VW-1 class or more of flame-retardant cable.
- \*6: When using the NFLP121, mount one (A1193MN) ferrite core on the NFLP121 side of the PROFIBUS cable to meet the EMC standards.
- \*7: A Class A hardware device is designed for use in the industrial environment. Please use this device in the industrial environment only.
- \*8: For modules conforming to each standards, refer to the section "I/O Module" and the table "List of FCN's Modules and Compliant Standards, Installation Limitations" of this document.
- \*9: Refer to TI 34P02Q91-01E for the products meeting NI.
- \*10: When FCN is used for regions where the ATEX/UKEX applies, the Instruction Manual, "Explosion Protection of FCN/FCJ Products" (IM 34P02Q11-02E) is required for safer installation and wiring.
- \*11: To be compliant with these standards, the FCN hardware needs to be installed in a lockable metal cabinet of IP54 or higher protection rating.
- \*12: This marking is the explosion-proof specification for FCN. The marking of each module is either "Ⓔ II 3G Ex ec II C T4 Gc X" or "Ⓔ II 3G Ex ec nC II C T4 Gc X". Symbol 'X' denotes the specific condition of use. See "Explosion Protection of FCN/FCJ Products" (IM 34P02Q11-02E) for detail.
- \*13: Refer to TI 34P02Q93-01E for the products meeting the Marine Standards.
- \*14: Please inquire about marine standards conformity to each country/region.
- \*15: Including the confirmation of 10 restricted substances defined in the Commission Delegated Directive(EU) 2015/863 amending Annex II to Directive 2011/65/EU.

"Administration on the Control of Pollution Caused by Electrical and Electronic Products" in the People's Republic of China.

The Product information required by the law is disclosed in the Yokogawa's website. Please refer to the following site.

<http://www.yokogawa.com/dcs/CNRoHS/>

This instrument is intended to be sold and used only as a part of equipment which is excluded from EU WEEE (Waste Electrical and Electronic Equipment) Directive and UK WEEE Regulation, such as large-scale stationary industrial tools, a large-scale fixed installation and so on, and therefore, subjected to the exclusion from the scope of the EU WEEE Directive and the UK WEEE Regulation.

## ■ BASE MODULE

A base module is a chassis on which various function modules such as CPU, power supply, E2 bus interface, SB bus repeat, and I/O modules are mounted to configure a control unit or extension unit.

### ● Features

#### Feature of Base Modules

| Type    | Model   | Power Supply Slots | I/O Slots | SB Bus (Internal Backboard Bus) |
|---------|---------|--------------------|-----------|---------------------------------|
| Long    | NFBU200 | 2 slots            | 10 slots  | Duplex                          |
| Short   | N2BU051 | 1 slot             | 5 slots   | Duplex                          |
|         | NFBU050 | 1 slot             | 5 slots   | Single                          |
| Compact | N2BU030 | 1 slot             | 3 slots   | Duplex                          |

#### Number of Mountable Modules on Control unit alone

| Usage        | Model   | Power Supply Modules | CPU Modules (*1) | Extension bus Module | I/O Modules   |
|--------------|---------|----------------------|------------------|----------------------|---------------|
| Control Unit | NFBU200 | Single or Duplexed   | Single           | -                    | max 8 modules |
|              |         |                      | Duplex           | -                    | max 6 modules |
|              | N2BU051 | Single               | Single           | -                    | max 3 modules |
|              | NFBU050 | Single               | Single           | -                    | max 3 modules |
|              | N2BU030 | Single               | Single           | -                    | max 1 module  |

#### Number of Mountable Modules with E2 bus interface module

| Usage          | Model   | Power Supply Modules | CPU Modules (*1) | E2 bus Interface Modules | I/O Modules   |
|----------------|---------|----------------------|------------------|--------------------------|---------------|
| Control Unit   | NFBU200 | Single or Duplex     | Single           | Single                   | max 7 modules |
|                |         |                      |                  | Duplex                   | max 6 modules |
|                |         |                      | Duplex           | Single                   | max 5 modules |
|                |         |                      |                  | Duplex                   | max 4 modules |
|                | N2BU051 | Single               | Single           | Single                   | max 2 modules |
|                | N2BU030 | Single               | Single           | Duplex                   | max 1 module  |
| Extension Unit | NFBU200 | Single or Duplex     | -                | Single                   | max 9 modules |
|                |         |                      |                  | Duplex                   | max 8 modules |
|                | N2BU051 | Single               | -                | Single                   | max 4modules  |
|                |         |                      |                  | Duplex                   | max 3 modules |
|                | N2BU030 | Single               | -                | Single                   | max 2 modules |
|                |         |                      |                  | Duplex                   | max 1 module  |

#### Number of Mountable Modules with SB bus repeat module

| Usage          | Model   | Power Supply Modules | CPU Modules (*1) | SB bus Repeat Modules | I/O Modules   |
|----------------|---------|----------------------|------------------|-----------------------|---------------|
| Control Unit   | NFBU200 | Single or Duplex     | Single           | Single                | max 7 modules |
|                |         |                      |                  | Duplex                | max 6 modules |
|                |         |                      | Duplex           | Single                | max 5 modules |
|                |         |                      |                  | Duplex                | max 4 modules |
| Extension Unit | NFBU200 | Single or Duplex     | -                | Single                | max 9 modules |
|                |         |                      |                  | Duplex                | max 8 modules |

\*1: Two slots are occupied for at least one CPU module in the control unit.

## ● Model and Suffix Codes

### Base Module (long)

|                     |         | Description                                             |
|---------------------|---------|---------------------------------------------------------|
| <b>Model</b>        | NFBU200 | Base module (long)                                      |
| <b>Suffix Codes</b> | -S      | Standard type                                           |
|                     | 0       | 19-inch rack-mounted                                    |
|                     | 1       | DIN rail-mounted                                        |
|                     | 5       | Basic type with no explosion protection                 |
|                     | 6       | With ISA Standard G3 option and no explosion protection |
|                     | E       | Basic type with explosion protection                    |
|                     | F       | With ISA Standard G3 option and explosion protection    |

### Base Module (short)

|                     |         | Description                                             |
|---------------------|---------|---------------------------------------------------------|
| <b>Model</b>        | N2BU051 | Base module (short, for E2 bus)                         |
| <b>Suffix Codes</b> | -S      | Standard type                                           |
|                     | 1       | DIN rail-mounted                                        |
|                     | 5       | Basic type with no explosion protection                 |
|                     | 6       | With ISA Standard G3 option and no explosion protection |
|                     | E       | Basic type with explosion protection                    |
|                     | F       | With ISA Standard G3 option and explosion protection    |

|                     |         | Description                                             |
|---------------------|---------|---------------------------------------------------------|
| <b>Model</b>        | NFBU050 | Base module (short)                                     |
| <b>Suffix Codes</b> | -S      | Standard type                                           |
|                     | 1       | DIN rail-mounted                                        |
|                     | 5       | Basic type with no explosion protection                 |
|                     | 6       | With ISA Standard G3 option and no explosion protection |
|                     | E       | Basic type with explosion protection                    |
|                     | F       | With ISA Standard G3 option and explosion protection    |

### Base Module (compact)

|                     |         | Description                                             |
|---------------------|---------|---------------------------------------------------------|
| <b>Model</b>        | N2BU030 | Base module (compact)                                   |
| <b>Suffix Codes</b> | -S      | Standard type                                           |
|                     | 1       | DIN rail-mounted                                        |
|                     | 5       | Basic type with no explosion protection                 |
|                     | 6       | With ISA Standard G3 option and no explosion protection |
|                     | E       | Basic type with explosion protection                    |
|                     | F       | With ISA Standard G3 option and explosion protection    |

### Optional Accessories

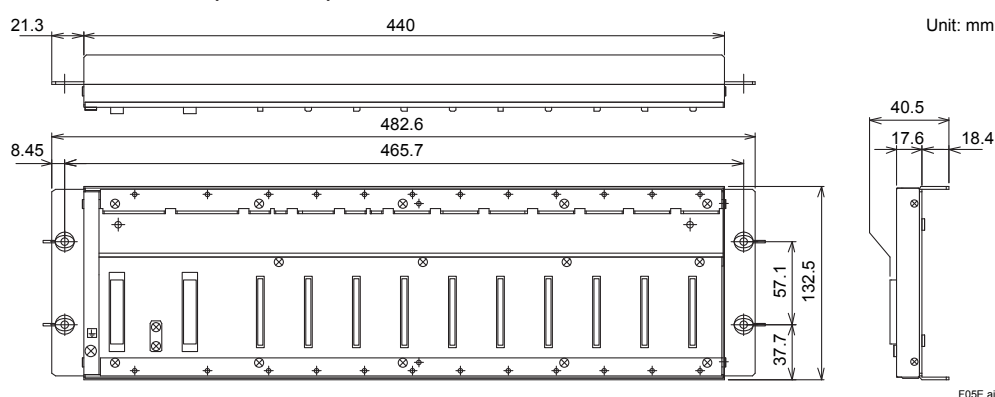
|              |         | Description                              |
|--------------|---------|------------------------------------------|
| <b>Model</b> | NFDCV01 | Dummy cover for I/O module slot          |
|              | NFDCV02 | Dummy cover for power supply module slot |

## ● Specifications

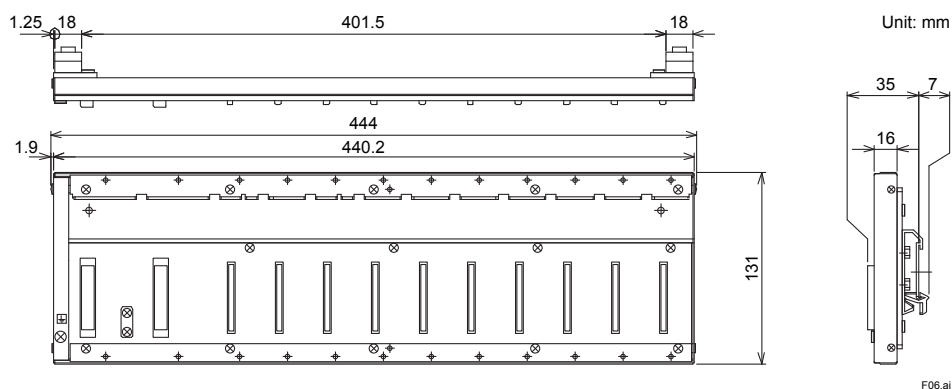
| Item                      |      |                  | Specification        |                  |                 |                 |
|---------------------------|------|------------------|----------------------|------------------|-----------------|-----------------|
| Model                     |      |                  | NFBU200-S0□          | NFBU200-S1□      | N2BU051-S1□     | NFBU050-S1□     |
| Weight                    |      |                  | 1.9 kg               | 1.0 kg           | 0.6 kg          | 0.6 kg          |
| Dimensions (W x H x D)    |      |                  | 482.6×132.5×40.5 mm  | 440×131×42.3 mm  | 283×131×24.2 mm | 283×131×24.2 mm |
| Mounting                  |      |                  | 19-inch rack-mounted | DIN rail-mounted |                 |                 |
| Maximum power consumption | 5 V  | Self-consumption | 0.4 A(max)           |                  | 0.035 A         | 0.025 A         |
|                           | 24 V | Self-consumption | 0                    |                  |                 |                 |

## ● Dimensions

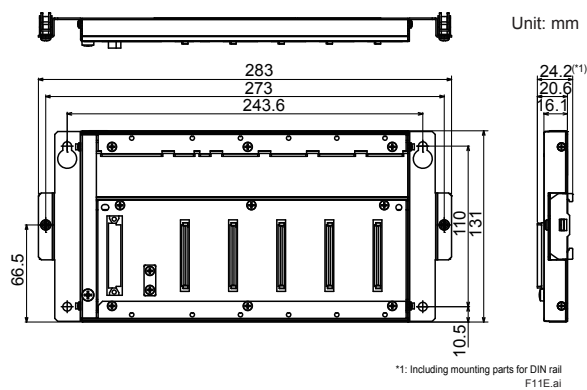
### 19-inch rack-mounted Model (NFBU200)



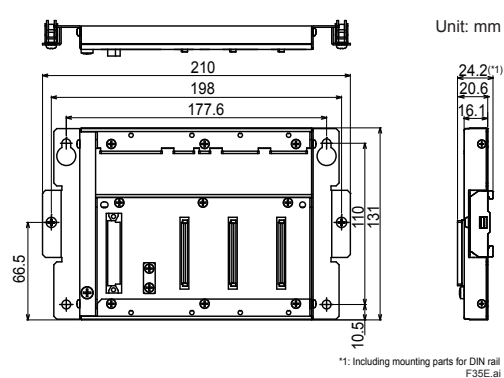
### DIN rail-mounted Model (NFBU200)



### DIN rail-mounted Model (N2BU051, NFBU050)



### DIN rail-mounted Model (N2BU030)



## ■ POWER SUPPLY MODULE

Mounted on a base module, a power supply module supplies steady power to other modules. Two power supply modules can be installed on a base module for redundancy.

This power supply module is equipped with input terminals for a 24 V DC power supply in addition to the main power input. The 24 V DC power input from these terminals are referred to as analog field power supply and fed to analog I/O modules to drive their field interface circuits and supply power to the connected field devices through the base module. However, when a 24 V DC power supply is needed for digital outputs, it must be supplied to individual terminals of the corresponding I/O modules. (For details, see the respective specifications for I/O modules.)

### ● Model and Suffix Codes

|                     |         | Description                                |
|---------------------|---------|--------------------------------------------|
| <b>Model</b>        | NFPW441 | Power supply module (100-120 V AC input)   |
| <b>Suffix Codes</b> | -5      | Standard type with no explosion protection |
|                     | -E      | Standard type with explosion protection    |
|                     | 0       | Basic type                                 |
|                     | 1       | With ISA Standard G3 option                |

|                     |         | Description                                |
|---------------------|---------|--------------------------------------------|
| <b>Model</b>        | NFPW442 | Power supply module (220-240 V AC input)   |
| <b>Suffix Codes</b> | -5      | Standard type with no explosion protection |
|                     | 0       | Basic type                                 |
|                     | 1       | With ISA Standard G3 option                |

|                     |         | Description                                |
|---------------------|---------|--------------------------------------------|
| <b>Model</b>        | NFPW444 | Power supply module (24 V DC input)        |
| <b>Suffix Codes</b> | -5      | Standard type with no explosion protection |
|                     | -E      | Standard type with explosion protection    |
|                     | 0       | Basic type                                 |
|                     | 1       | With ISA Standard G3 option                |

### ● Pin Assignment

#### Power supply terminals (Models NFPW441 and 442)

| Pin No. | Name         | Signal                                  |
|---------|--------------|-----------------------------------------|
| 1       | FLD24 V DC + | 24 V analog field power supply (+) (*1) |
| 2       | FLD24 V DC - | 24 V analog field power supply (-) (*1) |
| 3       | G            | Ground of line filter                   |
| 4       | L            | Power input                             |
| 5       | N            |                                         |

#### Power supply terminals (Model NFPW444)

| Pin No. | Name         | Signal                                  |
|---------|--------------|-----------------------------------------|
| 1       | FLD24 V DC + | 24 V analog field power supply (+) (*1) |
| 2       | FLD24 V DC - | 24 V analog field power supply (-) (*1) |
| 3       | G            | Ground of line filter                   |
| 4       | +            | Power input                             |
| 5       | -            |                                         |

\*1: When analog I/O modules such as NFAI141 (with 2-wire transmitter), NFAI135, NFAI841, NFAB841, NFAI835, NFAF135, and NFAP135 are installed, an analog field power supply is needed.

### Checking terminals

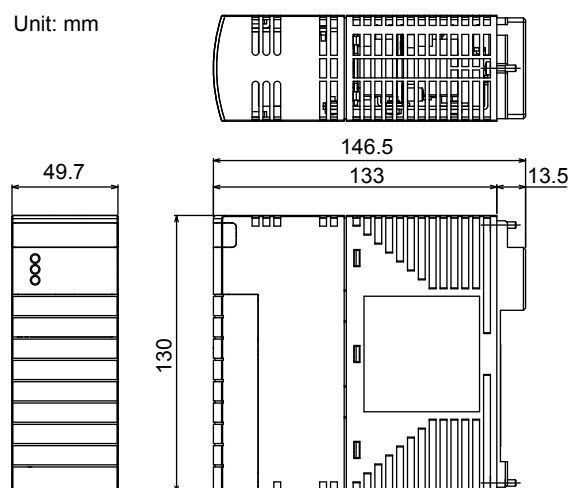
| Pin No. | Name      | Signal                              |
|---------|-----------|-------------------------------------|
| 1       | +5 V-CHK  | Checking of 5 V system power        |
| 2       | +24 V-CHK | Checking of 24 V field power supply |
| 3       | GND       | Signal grounding                    |

### ● LEDs

| LED Indicator | Color | Description                                    |
|---------------|-------|------------------------------------------------|
| SYS-POWER     | Green | Lights when the 5 V system power output is on. |
| FLD-POWER     | Green | Lights when the 24 V field power supply is on. |

## ● Dimensions

Unit: mm



F07E.ai

## ● Specifications

| Item                      |                                          | Specification                                                           |                                         |                       |
|---------------------------|------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|-----------------------|
| Model                     |                                          | NFPW441                                                                 | NFPW442                                 | NFPW444               |
| Power supply input        | Rated input voltage                      | 100 to 120 V AC                                                         | 220 to 240 V AC                         | 24 V DC               |
|                           | Input voltage range                      | 80 to 132 V AC (rms)                                                    | 170 to 264 V AC (rms)                   | 21.6 to 31.2 V DC     |
|                           | Input frequency                          | 47 to 66 Hz (Rating: 50/60 Hz)                                          |                                         |                       |
|                           | Input current                            | Max. 1.4 A                                                              | Max. 0.7 A                              | Max. 3.3 A            |
|                           | Fuse rating                              | 3.15 A                                                                  | 3.15 A                                  | 6.3 A                 |
|                           | Rush current                             | Max. 80 A for 5 ms or less                                              | Max. 90 A for 5 ms or less              | Max. 20 A             |
|                           | Leak current                             | Max. 1 mA                                                               |                                         | —                     |
|                           | Withstanding voltage                     | 3000 V AC for 1 minute                                                  |                                         | 500 V AC for 1 minute |
|                           | Insulation resistance                    | 50 MΩ at 500 V DC                                                       |                                         |                       |
|                           | Insensitive momentary power-failure time | 10 ms (80%)                                                             |                                         | 2 ms (90%)            |
| Output                    | Rated output voltage                     | +5.1 V DC                                                               |                                         |                       |
|                           | Rated output current                     | 0 to 7.8 A                                                              |                                         |                       |
|                           | Peak current                             | 11.8 A                                                                  |                                         |                       |
|                           | Total output                             | 40 W (60 W peak)                                                        |                                         |                       |
|                           | Startup time after power-on              | Max. 300 ms                                                             |                                         |                       |
|                           |                                          | Max. 100 ms (after a power failure of 200 ms long with the rated input) |                                         |                       |
|                           | Overvoltage protection                   | Max. 7 V                                                                |                                         |                       |
|                           | Overcurrent protection                   | Min. 105% (shutdown after 4 to 14 seconds long overcurrent)             |                                         |                       |
| Analog field power supply | Input                                    | Rated input voltage                                                     | 24 V DC ±10%                            |                       |
|                           |                                          | Input current                                                           | Max. 4 A                                |                       |
|                           |                                          | Fuse rating                                                             | 6.3 A                                   |                       |
|                           | Output                                   | Rated output voltage                                                    | Input voltage minus matching-diode drop |                       |
|                           |                                          | Rated output current                                                    | 4 A                                     |                       |
|                           |                                          | Overvoltage protection                                                  | 35 V                                    |                       |
| Duplex configuration      |                                          | Possible (when installed on base module NFBU200)                        |                                         |                       |
| Weight                    |                                          | 0.6 kg                                                                  |                                         |                       |
| Dimensions (W x H x D)    |                                          | 49.7 x 130 x 146.5 mm                                                   |                                         |                       |

## ■ CPU MODULE

One CPU module is mounted in each control unit, or two for a duplexed CPU configuration. The CPU module runs a real-time operating system, supports programming languages compliant with the IEC 61131-3 international standard, and serves as a Duolet virtual machine.

### ● Model and Suffix Codes

|              |         | Description                                             |
|--------------|---------|---------------------------------------------------------|
| Model        | NFCP501 | CPU module for FCN (with 2 Ethernet ports)              |
|              | NFCP502 | CPU module for FCN (with 4 Ethernet ports)              |
| Suffix Codes | -S      | With standard functions (*1)                            |
|              | -W      | With extended functions (*1)                            |
|              | 0       | Standard type                                           |
|              | 1       | With Extended Temperature range option                  |
|              | 5       | Basic type with no explosion protection                 |
|              | 6       | With ISA Standard G3 option and no explosion protection |
|              | E       | Basic type with explosion protection                    |
|              | F       | With ISA Standard G3 option and explosion protection    |

\*1: The application portfolio which can be used differs by Standard function type and Extended function type. For details, refer to "FCN Autonomous Controller Functions (FCN-500)" (GS 34P02Q03-01E).

### ● Specifications

| Item                 |                        | Specification                                                                                                 |                                      |
|----------------------|------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Model                |                        | NFCP501                                                                                                       | NFCP502                              |
| Style                |                        | S2 (*6)                                                                                                       |                                      |
| Processor            |                        | Atom E3815 1.46 GHz                                                                                           |                                      |
| Memory               | Main                   | 256 MB with ECC                                                                                               |                                      |
|                      | Static RAM             | 2 MB with ECC, backed up by battery                                                                           |                                      |
| Secondary memory     |                        | 1 GB on-board flash memory                                                                                    |                                      |
| External media       |                        | SD card 1 slot : SDHC (4 to 32GB) Class 10                                                                    |                                      |
| Serial Port (*1)     |                        | 1 RS-232-C port: D-sub 9 pins, male (*2)                                                                      |                                      |
|                      | Communication method   | Full/Half duplex (software settings)                                                                          |                                      |
|                      | Synchronisation        | Asynchronous                                                                                                  |                                      |
|                      | Baud rate              | 0.3, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, or 115.2 kbps                                          |                                      |
| Network interface    |                        | 2 Ethernet ports: RJ45 modular jacks                                                                          | 4 Ethernet ports: RJ45 modular jacks |
| Baud rate            |                        | 1000, 100, 10 Mbps, (1000BASE-T, 100BASE-TX, 10BASE-T)                                                        |                                      |
| I/O interface        |                        | SB bus (duplex)                                                                                               |                                      |
| RAS features         |                        | Watchdog timer, temperature monitor, etc.                                                                     |                                      |
| Battery (*3)         |                        | 1000 mAh graphite fluoride lithium battery (*4)                                                               |                                      |
| Display              |                        | 3 LEDs for CPU status indication, 2 LEDs for Ethernet status indication, 1 LED for SD LED, 1 LED for EXEC LED |                                      |
| Switches             |                        | RESET switch, SHUT DOWN switch, FUNC switch, EXEC switch                                                      |                                      |
| Protection           |                        | CPU cover (with the hole for wire lock)                                                                       |                                      |
| Power supply         | Supply voltage         | 5 V DC $\pm$ 5%                                                                                               |                                      |
|                      | Current consumption    | Max. 1200 mA                                                                                                  | Max. 1700 mA                         |
| Duplex configuration |                        | Possible (*5)                                                                                                 |                                      |
| Weight               |                        | 0.9 kg                                                                                                        |                                      |
| Size                 | Dimensions (W x H x D) | 65.8 x 130 x 149.3 mm                                                                                         |                                      |
|                      | Occupying slots        | 2                                                                                                             |                                      |

\*1: A serial port cannot be used when CPU modules are configured in redundancy.

\*2: Connectors are fastened using inch screw threads (No. 4-40 UNC).

\*3: With battery exhaustion detection function

\*4: A battery is exchangeable at on-line.

\*5: Use a couple of the CPU module of the same type (same Model, same suffix codes and same system software version) for the CPU module duplex configuration. A combination of CPU module styles S1 and S2 is possible.

\*6: The CPU module NFCP501/NFCP502 style S2 or later is required to use the E2 bus interface module.

## ● Appearances

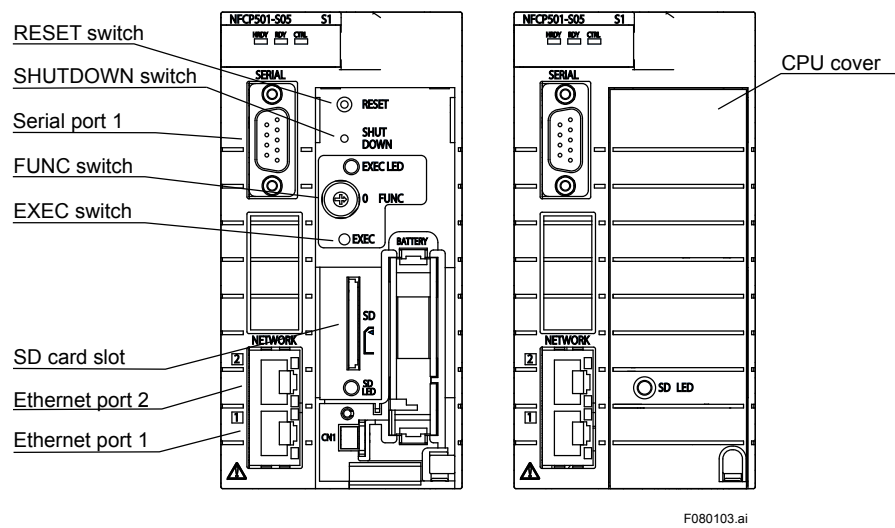


Figure NFCP501 (Left: removed CPU cover, Right: mounted CPU cover)

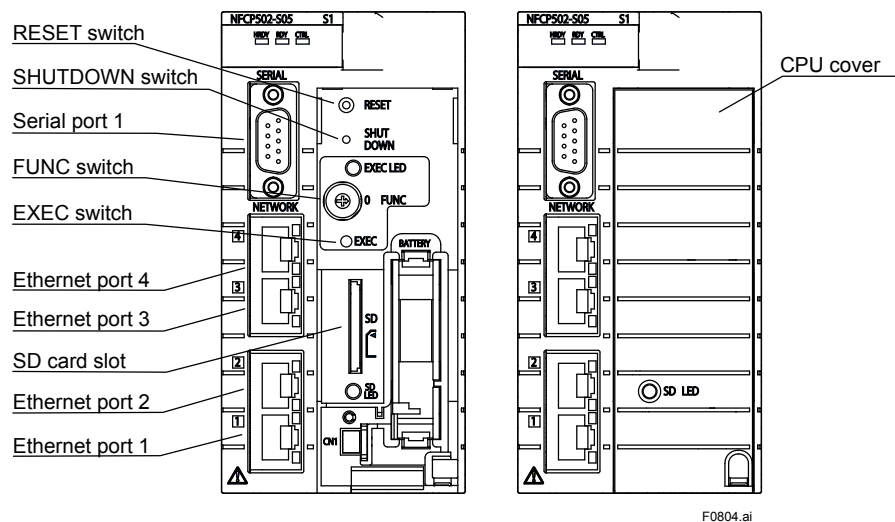
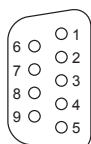


Figure NFCP502 (Left: removed CPU cover, Right: mounted CPU cover)

## ● Pin Assignments of CPU Module's Serial Port

Table Connector Pin Assignment (D-sub 9-pin, male)

| Pin No | Signal name | Function                                 |
|--------|-------------|------------------------------------------|
| 1      | CD          | Data channel receiving carrier detection |
| 2      | RD          | Receiving data                           |
| 3      | SD          | Transmission data                        |
| 4      | ER          | Data terminal ready                      |
| 5      | SG          | Signal ground                            |
| 6      | DR          | Data set ready                           |
| 7      | RS          | Transmission request                     |
| 8      | CS          | Transmission enabled                     |
| 9      | —           | Not used                                 |



F13E.ai

Figure Pin Position (Front View)

## ● Switches

### RESET Switch

Restart the CPU module.

### SHUT DOWN Switch

Terminate the CPU module.

### FUNC Switch

Select backup and restore function

### EXEC Switch

Execute backup and restore function.

## ● CPU Cover

Prevent the erroneous operation or mischief of various switches and SD card.

### Hole for wire lock

Secure the CPU cover by a wire.

Recommended wire diameter: 1 mm

## ● LEDs

### Operation Status Indicators

| LED Indicator | Color | Description                                               |
|---------------|-------|-----------------------------------------------------------|
| HRDY          | Green | Lights when the hardware is normal.                       |
| RDY           | Green | Lights when the system is normal.                         |
| CTRL          | Green | Lights when the control actions are carried out normally. |

### Ethernet Status Indicators (near RJ45 modular jacks)

| LED Indicator | Color  | Description                                    |
|---------------|--------|------------------------------------------------|
| LINK          | Green  | Lights when the connection to a hub is normal. |
| ACT           | Orange | Blinks when the transmission/reception is on.  |

### SD LED Indicators

| LED Indicator | Color | Description                                                                     |
|---------------|-------|---------------------------------------------------------------------------------|
| SD            | Green | Lights when the SD card is mounted.<br>Blinks when the memory card is accessed. |

### EXEC LED Indicators

| LED Indicator | Color | Description                                                                                      |
|---------------|-------|--------------------------------------------------------------------------------------------------|
| EXEC          | Green | Lights when the maintenance function error.<br>Blinks when the maintenance function is executed. |

## ● Dimensions

Unit: mm

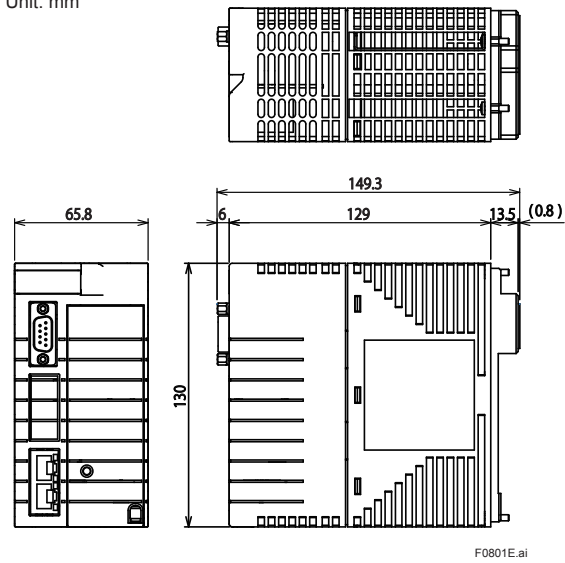


Figure NFCP501 (Dimension)

Unit: mm

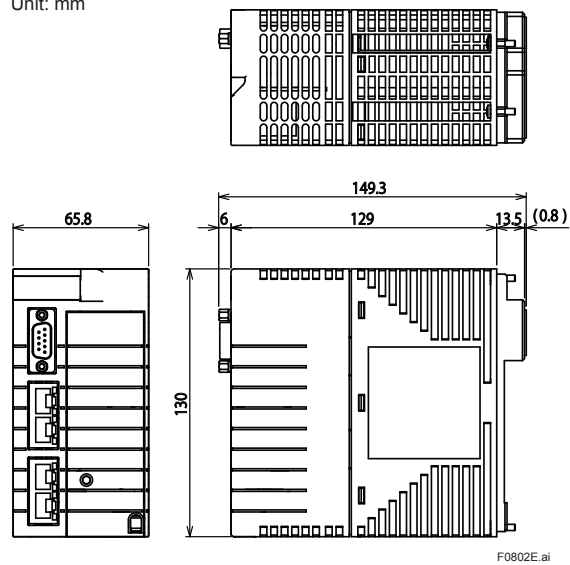


Figure NFCP502 (Dimension)

## ■ E2 BUS INTERFACE MODULE

Used to connect a control unit to I/O extension units.

To duplex the E2 bus, install two E2 bus interface modules in each unit.

Each E2 bus interface module is connected to another via an UTP straight cable (CAT5e or higher).

### ● Model and Suffix Codes

|                     |         | Description                  |
|---------------------|---------|------------------------------|
| <b>Model</b>        | N2EB100 | E2 bus interface module      |
| <b>Suffix Codes</b> | -S      | Standard model               |
|                     | 5       | With no explosion protection |
|                     | E       | With explosion protection    |
|                     | 0       | Basic type                   |
|                     | 1       | With ISA Standard G3 option  |

### ● Specifications

| Item                                | Specification                                                                                                                     |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Model                               | N2EB100                                                                                                                           |
| Baud rate                           | 100 Mbps                                                                                                                          |
| Transmission distance               | Max. 100 m between each unit                                                                                                      |
| Transmission cable                  | UTP straight cable (CAT5e or higher)                                                                                              |
| Connector                           | RJ45 (ISO/IEC 8877)                                                                                                               |
| Connection type                     | Daisy chain, Max. 2 lines                                                                                                         |
| Extension units                     | Max. 8 units<br>(9 units including a control unit and 2 lines)                                                                    |
| Duplex configuration                | Possible                                                                                                                          |
| Power supply                        | Supply voltage                                                                                                                    |
|                                     | 5 V DC±5%                                                                                                                         |
|                                     | Current dissipation                                                                                                               |
|                                     | Max. 500 mA                                                                                                                       |
| Weight                              | 0.2 kg                                                                                                                            |
| Size                                | Dimensions (W x H x D)                                                                                                            |
|                                     | 32.8 x 130 x 107.5 mm                                                                                                             |
|                                     | Occupying slots                                                                                                                   |
|                                     | 1                                                                                                                                 |
| Implementable base module           | NFBU200<br>N2BU051<br>N2BU030                                                                                                     |
| Slots to be installed in            | Single E2 bus                                                                                                                     |
|                                     | NFBU200: Slot No. 10<br>N2BU051: Slot No. 5<br>N2BU030: Slot No. 3                                                                |
|                                     | Duplexed E2 bus                                                                                                                   |
|                                     | NFBU200: Slot No. 9 and 10<br>N2BU051: Slot No. 4 and 5<br>N2BU030: Control Unit: Unavailable<br>Extension unit :Slot No. 2 and 3 |
| Ports                               | Master module                                                                                                                     |
|                                     | Connectable two line with port1/port2                                                                                             |
|                                     | Slave module                                                                                                                      |
|                                     | PORT1/UP: To Upstream (master side)<br>PORT2/DOWN: To Downstream                                                                  |
| Available CPU module                | NFCP501/NFCP502 Style S2 or later                                                                                                 |
| Unit number setting (rotary switch) | 0: Invalid<br>1: Control unit (master module)<br>2 to 9: Unit number of extension unit (slave module)                             |

### ● LEDs

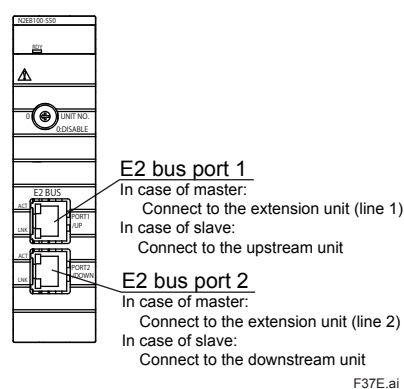
#### Operation Status Indicators

| LED Indicator | Color | Description                                                                        |
|---------------|-------|------------------------------------------------------------------------------------|
| RDY           | Green | Lights when the hardware is normal.<br>Blinks when the rotary switch setting error |

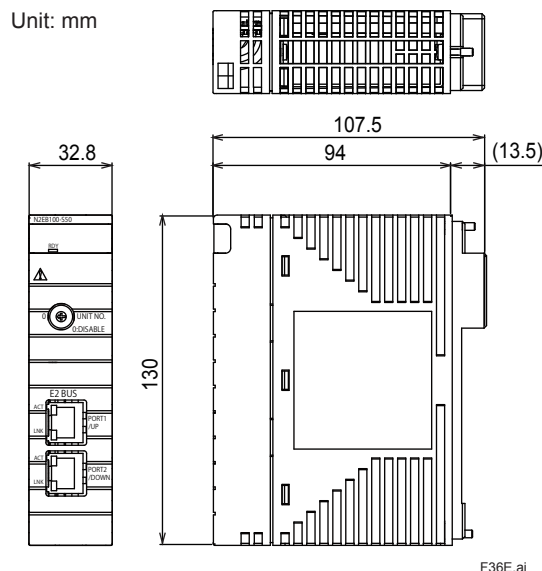
#### E2 bus Status Indicators

| LED Indicator   | Color | Description                                   |
|-----------------|-------|-----------------------------------------------|
| ACT (each port) | Green | Lights when the transmission/reception is on. |
| LNK (each port) | Green | Lights when the connection is normal          |

### ● Appearances



### ● Dimensions



## ■ SB BUS REPEAT MODULE

Used to connect a control unit to I/O extension units.

To duplex the SB bus, install two SB bus repeat modules in each unit.

Each SB bus repeat module is connected to another via a dedicated T-joint and cable.

### ● Model and Suffix Codes

|                     |         | Description                                     |
|---------------------|---------|-------------------------------------------------|
| <b>Model</b>        | NFSB100 | SB bus repeat module for FCN                    |
| <b>Suffix Codes</b> | -S      | Standard model                                  |
|                     | 5       | With no explosion protection                    |
|                     | E       | With explosion protection                       |
|                     | 0       | Basic type                                      |
| <b>Option Codes</b> | 1       | With ISA Standard G3 option                     |
|                     | /SBT01  | With an SB bus T-joint                          |
|                     | /SBT02  | With an SB bus T-joint with built-in terminator |

Note: When connecting a control unit and extension units, install at both ends a T-joint with built-in terminator on each SB bus repeat module.

|               |         | Description                             |
|---------------|---------|-----------------------------------------|
| <b>Models</b> | NFSBT01 | SB bus T-joint                          |
|               | NFSBT02 | SB bus T-joint with built-in terminator |

|                     |         | Description        |
|---------------------|---------|--------------------|
| <b>Model</b>        | NFCB301 | SB bus cable       |
| <b>Suffix Codes</b> | -C030   | Cable length 30 cm |
|                     | -C100   | Cable length 1 m   |
|                     | -C200   | Cable length 2 m   |
|                     | -C400   | Cable length 4 m   |
|                     | -C800   | Cable length 8 m   |

### ● Specifications

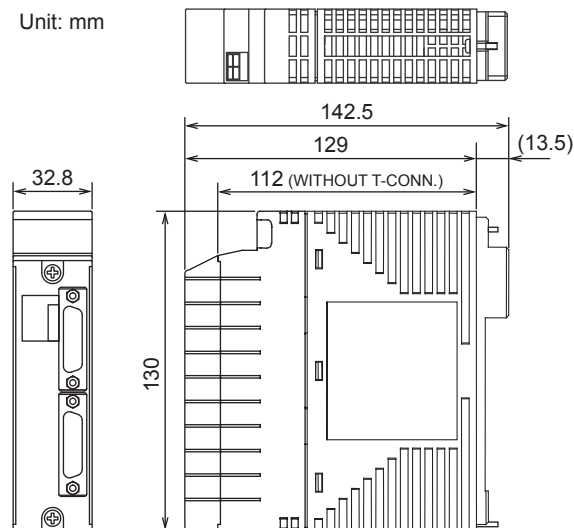
| Item                                                                     | Specification                                      |
|--------------------------------------------------------------------------|----------------------------------------------------|
| Model                                                                    | NFSB100                                            |
| Transmission method                                                      | Serial communication                               |
| Baud rate                                                                | 128 Mbps                                           |
| Transmission distance                                                    | Max. 8 m per line                                  |
| Extension units                                                          | Max. 2 units<br>(3 units including a control unit) |
| Duplex configuration                                                     | Possible                                           |
| Power supply                                                             | Supply voltage                                     |
|                                                                          | 5 V DC±5%                                          |
| Current dissipation                                                      | Max. 500 mA                                        |
|                                                                          |                                                    |
| Weight                                                                   | 0.2 kg                                             |
| Size                                                                     | Dimensions (W x H x D)                             |
|                                                                          | 32.8 x 130 x 142.5 mm                              |
| Slots to be installed in                                                 | Occupying slots                                    |
|                                                                          | 1                                                  |
| Slot No. 10 (for single SB bus) Slot Nos. 9 and 10 (for duplexed SB bus) |                                                    |

### ● LEDs

| LED Indicator | Color | Description                         |
|---------------|-------|-------------------------------------|
| STATUS        | Green | Lights when the hardware is normal. |
| SND           | Green | Lights when the transmission is on. |
| RCV           | Green | Lights when the reception is on.    |

### ● Dimensions

Unit: mm



F09E.ai

## I/O MODULE

An autonomous controller FCN supports versatile I/O modules. For details, refer to the following general specifications:

- GS 34P02Q31-01E Analog I/O Modules
- GS 34P02Q35-01E Digital I/O Modules
- GS 34P02Q36-01E Serial Communication Module
- GS 34P02Q55-01E Foundation Fieldbus Communication Module
- GS 34P02Q57-01E PROFIBUS-DP Communication Module
- GS 34P02Q58-01E CANopen Communication Module
- GS 34P02Q04-02E Turbomachinery Controller Overview (FCN-500/FCN-RTU)

### List of FCN's Modules and Compliant Standards, Installation Limitations

Table List of FCN's Modules and Compliant Standards, Installation Limitations (1/4)

| Type                    | Model        | Function                                                                                                                  | Installation Limitations |              |
|-------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|
|                         |              |                                                                                                                           | Temperature [°C]         | Altitude [m] |
| Base module             | NFBU200      | Base module (long)                                                                                                        | -20 to +70               | 2000         |
|                         | N2BU051      | Base module (short, for E2 bus)                                                                                           | -20 to +70               |              |
|                         | NFBU050      | Base module (short)                                                                                                       | -20 to +70               |              |
|                         | N2BU030      | Base module (compact)                                                                                                     | -20 to +70               |              |
| Power supply module     | NFPW441      | Power supply module (100 - 120 V AC input)                                                                                | 0 to +55                 |              |
|                         | NFPW442      | Power supply module (220 - 240 V AC input)                                                                                | 0 to +55                 |              |
|                         | NFPW444      | Power supply module (24 V DC input)                                                                                       | -20 to +70 (*6)          |              |
| CPU module              | NFCP501      | CPU module for FCN (with 2 Ethernet ports)                                                                                | -                        |              |
|                         | -□0□         | Standard type                                                                                                             | 0 to +55                 |              |
|                         | -□1□         | With Extended Temperature range option                                                                                    | -20 to +70               |              |
|                         | NFCP502      | CPU module for FCN (with 4 Ethernet ports)                                                                                | -                        |              |
|                         | -□0□         | Standard type                                                                                                             | 0 to +55                 |              |
|                         | -□1□         | With Extended Temperature range option                                                                                    | -20 to +70               |              |
| E2 bus interface module | N2EB100      | E2 bus interface module                                                                                                   | -20 to +70               |              |
| SB bus repeat module    | NFSB100      | SB bus repeat module for FCN                                                                                              | 0 to +55                 |              |
| Analog I/O Modules (*1) | NFAI141      | Analog Input Module (4 to 20 mA, 16-channel, Non-Isolated)                                                                | -20 to +70               |              |
|                         | NFAV141      | Analog Input Module (1 to 5 V: differential input, 16-channel, Non-Isolated)                                              | 0 to +55                 |              |
|                         | NFAI841      | Analog I/O Module (4 to 20 mA input, 4 to 20 mA output, 8-channel input /8-channel output, Non-Isolated)                  | -20 to +70 (*7)          |              |
|                         | NFAB841      | Analog I/O Module (1 to 5 V input: differential input, 4 to 20 mA output, 8-channel input/8-channel output, Non-Isolated) | 0 to +55                 |              |
|                         | NFAI143      | Analog Input Module (4 to 20 mA, 16-channel, Isolated)                                                                    | -20 to +70               |              |
|                         | NFAI543      | Analog Output Module (4 to 20 mA, 16-channel, Isolated)                                                                   | -20 to +70 (*7)          |              |
|                         | NFAV144      | Analog Input Module (-10 to +10 V, 16-channel, Isolated)                                                                  | -20 to +70 (*3)          |              |
|                         | NFAV544      | Analog Output Module (-10 to +10 V, 16-channel, Isolated)                                                                 | 0 to +55                 |              |
|                         | NFAT141      | TC/mV Input Module (16-channel, Isolated)                                                                                 | 0 to +55                 |              |
|                         | NFAR181      | RTD Input Module (12-channel, Isolated)                                                                                   | -                        |              |
|                         | -S□0<br>-S□1 | Basic type                                                                                                                | 0 to +55                 |              |
|                         | -S□4<br>-S□5 | With Extended Temperature Range option                                                                                    | -20 to +70 (*5)          |              |
|                         | NFAI135      | Analog Input Module (4 to 20 mA, 8-channel, Isolated channels)                                                            | -20 to +70               |              |
|                         | NFAI835      | Analog I/O Module (4 to 20 mA, 4-channel input/4-channel output, Isolated channels)                                       | -20 to +70 (*7)          |              |
|                         | NFAP135      | Pulse Input Module (8-channel, Pulse count, 0 to 10 kHz, Isolated channels)                                               | -                        |              |
|                         | -S□0<br>-S□1 | Basic type                                                                                                                | 0 to +55                 |              |
|                         | -S□4<br>-S□5 | With Extended Temperature Range option                                                                                    | -20 to +70(*5)           |              |
|                         | NFAF135      | Frequency Input Module (8-channel, 0.1 Hz to 10 kHz, Isolated channels)                                                   | 0 to +55                 |              |

Table List of FCN's Modules and Compliant Standards, Installation Limitations (2/4)

| Type                          | Model        | Function                                                                                                                                                         | Installation Limitations |              |
|-------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|
|                               |              |                                                                                                                                                                  | Temperature [°C]         | Altitude [m] |
| Digital I/O Modules (*1)      | NFDV151      | Digital Input Module (32-channel, 24 V DC, Isolated)                                                                                                             | -20 to +70               | 2000         |
|                               | NFDV161      | Digital Input Module (64-channel, 24 V DC)                                                                                                                       | 0 to +55                 |              |
|                               | NFDV532      | Pulse Width Output Module (4-channel : Up Pulse/Down Pulse, 24 V DC, Isolated)                                                                                   | 0 to +55                 |              |
|                               | NFDV551      | Digital Output Module (32-channel, 24 V DC, Isolated)                                                                                                            | -20 to +70               |              |
|                               | NFDV561      | Digital Output Module (64-channel, 24 V DC)                                                                                                                      | 0 to +55                 |              |
|                               | NFDR541-T□□  | Relay Output Module (16-channel, 24 to 125 V DC/100 to 240 V AC, Isolated)                                                                                       | -20 to +70 (*3)(*4)      |              |
| Turbomachinery I/O Modules    | NFGS813      | Servo Module                                                                                                                                                     | 0 to +55                 |              |
|                               | NFGP813      | High Speed Protection Module                                                                                                                                     | 0 to +55                 |              |
| Communication Modules         | NFLC121      | CANopen Communication Module(1-port, 10 kbps to 1 Mbps)                                                                                                          | 0 to +55                 |              |
|                               | NFLF111      | Foundation fieldbus communication module (4-port)                                                                                                                | -                        |              |
|                               | -S□0<br>-S□1 | Basic type                                                                                                                                                       | 0 to +55                 |              |
|                               | -S□4<br>-S□5 | With Extended Temperature Range option                                                                                                                           | -20 to +70 (*5)          |              |
|                               | NFLP121      | PROFIBUS-DP Communication Module (1-port, 9.6 kbps to 12 Mbps)                                                                                                   | 0 to +55                 |              |
|                               | NFLR111      | RS-232-C Communication Module (2-port, 300 bps to 115.2 kbps)                                                                                                    | 0 to +55                 |              |
|                               | NFLR121      | RS-422/RS-485 Communication Module (2-port, 300 bps to 115.2 kbps)                                                                                               | -20 to +70               |              |
| Pressure Clamp Terminal Block | NFTA4S       | Pressure Clamp Terminal Block for Analog (16-channel)                                                                                                            | -20 to +70               |              |
|                               | NFTT4S       | Pressure Clamp Terminal Block for Thermocouple/mV (16-channel)                                                                                                   | 0 to +55                 |              |
|                               | NFTR8S       | Pressure Clamp Terminal Block for RTD (12-channel)                                                                                                               | -20 to +70               |              |
|                               | NFTB5S       | Pressure Clamp Terminal Block for Digital Input (32-channel)                                                                                                     | -20 to +70               |              |
|                               | NFTD5S       | Pressure Clamp Terminal Block for Digital Output (32-channel)                                                                                                    | -20 to +70               |              |
|                               | NFTI3S       | Pressure Clamp Terminal Block for Isolated Analog Module and Pulse Module (for NFAI135, NFAP135, NFAF135: 8-channel, NFAI835: 4-channel input, 4-channel output) | -20 to +70               |              |
|                               | NFTC4S       | Pressure Clamp Terminal Block for Digital (16-channel, with dedicated connector, without surge absorber)                                                         | 0 to +55                 |              |
|                               | NFTF9S       | Pressure Clamp Terminal Block for Foundation Fieldbus                                                                                                            | -20 to +70               |              |
| Terminal Block                | TAS40        | MIL Connector Terminal Block (40 Pole Plug Types)                                                                                                                | -20 to +70               |              |
|                               | TAS50        | MIL Connector Terminal Block (50 Pole Plug Types)                                                                                                                | -20 to +70               |              |
| Cable                         | NFCB301      | SB Bus Cable                                                                                                                                                     | 0 to +55                 |              |
|                               | KMS40        | MIL Connector Cable (40 Pole Plug Types)                                                                                                                         | -20 to +70               |              |
|                               | KMS50        | MIL Connector Cable (50 Pole Plug Types)                                                                                                                         | -20 to +70               |              |
| SB Bus T-joint                | NFSBT01      | SB Bus T-joint                                                                                                                                                   | 0 to +55                 |              |
|                               | NFSBT02      | SB Bus T-joint with Built-in Terminator                                                                                                                          | 0 to +55                 |              |
| Dummy Cover                   | NFDCV01      | Dummy Cover for I/O Module Slot                                                                                                                                  | -20 to +70               |              |
|                               | NFDCV02      | Dummy Cover for Power supply Module Slot                                                                                                                         | -20 to +70               |              |
|                               | NFCCC01      | MIL Cable Connector Cover                                                                                                                                        | -20 to +70               |              |

Table List of FCN's Modules and Compliant Standards, Installation Limitations (3/4)

| Standards<br>Model | Safety                   | EMC                            |     | Explosion protection          |                              |                                  | Marine<br>(*10) |      | Hazardous<br>Substances     |
|--------------------|--------------------------|--------------------------------|-----|-------------------------------|------------------------------|----------------------------------|-----------------|------|-----------------------------|
|                    | CSA<br>CE<br>UKCA<br>EAC | CSA<br>CE<br>UKCA<br>KC<br>EAC | RCM | US (FM) NI<br>Canada (CSA) NI | ATEX Ex "ec"<br>UKEX Ex "ec" | IECEx Ex "ec"<br>ECAS-Ex Ex "ec" | ABS<br>BV<br>LR | DNV  | RoHS<br>UK RoHS<br>UAE RoHS |
| NFBU200            | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| N2BU051            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFBU050            | X                        | X                              | X   | X                             | X                            | X                                | N.A.            | N.A. | X                           |
| N2BU030            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFPW441            | X                        | X                              | —   | X                             | N.A.                         | N.A.                             | X               | X    | X                           |
| NFPW442            | X                        | X                              | X   | N.A.                          | N.A.                         | N.A.                             | X               | X    | X                           |
| NFPW444            | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| NFCP501            |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -□0□               | X                        | X                              | X   | X                             | X                            | X                                | N.A.            | N.A. | X                           |
| -□1□               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| NFCP502            |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -□0□               | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| -□1□               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| N2EB100            | X                        | X                              | X   | X                             | X                            | N.A.                             | X               | X    | X                           |
| NFSB100            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAI141            | X                        | X                              | X   | XX (*2)                       | X                            | X                                | X               | X    | X                           |
| NFAV141            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAI841            | X                        | X                              | X   | XX (*2)                       | X                            | X                                | X               | X    | X                           |
| NFAB841            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAI143            | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| NFAI543            | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| NFAV144            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAV544            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAT141            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |
| NFAR181            |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□0               | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| -S□1               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□4               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□5               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| NFAI135            | X                        | X                              | X   | X                             | X                            | N.A.                             | X               | X    | X                           |
| NFAI835            | X                        | X                              | X   | X                             | X                            | X                                | X               | X    | X                           |
| NFAP135            |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□0               | X                        | X                              | X   | X                             | X                            | N.A.                             | X               | X    | X                           |
| -S□1               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□4               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| -S□5               |                          |                                |     |                               |                              |                                  |                 |      |                             |
| NFAF135            | X                        | X                              | X   | X                             | X                            | N.A.                             | N.A.            | N.A. | X                           |

Table List of FCN's Modules and Compliant Standards, Installation Limitations (4/4)

| Standards<br>Model | Safety                              | EMC                                 |     |                                | Explosion protection         |                                  |                 | Marine<br>(*10) | Hazardous<br>Substances     |
|--------------------|-------------------------------------|-------------------------------------|-----|--------------------------------|------------------------------|----------------------------------|-----------------|-----------------|-----------------------------|
|                    | C <sub>A</sub><br>CE<br>UKCA<br>EAC | C <sub>A</sub><br>CE<br>UKCA<br>EAC | RCM | US (FIM) NI<br>Canada (CSA) NI | ATEX Ex "ec"<br>UKEX Ex "ec" | IECEx Ex "ec"<br>ECAS-Ex Ex "ec" | ABS<br>BV<br>LR | DNV             | RoHS<br>UK RoHS<br>UAE RoHS |
| NFDV151            | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| NFDV161            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFDV532            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFDV551            | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| NFDV561            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFDR541<br>-T□□    | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| NFGS813            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFGP813            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFLC121            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | N.A.            | N.A.            | X                           |
| NFLF111            |                                     |                                     |     |                                |                              |                                  |                 |                 |                             |
| -S□0<br>-S□1       | X                                   | X                                   | X   | X                              | X                            | N.A.                             | X               | X               | X                           |
| -S□4<br>-S□5       |                                     |                                     |     |                                |                              |                                  |                 |                 |                             |
| NFLP121            | X                                   | X                                   | X   | N.A.                           | N.A.                         | N.A.                             | X               | X               | X                           |
| NFLR111            | X                                   | X                                   | X   | X                              | X                            | N.A.                             | X               | X               | X                           |
| NFLR121            | X                                   | X                                   | X   | X                              | X                            | N.A.                             | X               | X               | X                           |
| NFTA4S             | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |
| NFTT4S             | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| NFTR8S             | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |
| NFTB5S             | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |
| NFTD5S             | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |
| NFTI3S             | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |
| NFTC4S             | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| NFTF9S             | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| TAS40              | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| TAS50              | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| NFCB301            | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| KMS40              | X                                   | X                                   | X   | X                              | X                            | X                                | X               | N.R. (*11)      | X                           |
| KMS50              | X                                   | X                                   | X   | X                              | X                            | X                                | X               | N.R. (*11)      | X                           |
| NFSBT01            | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| NFSBT02            | X                                   | X                                   | X   | X                              | X                            | N.A.                             | N.A.            | N.A.            | X                           |
| NFDCV01            | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| NFDCV02            | X                                   | X                                   | X   | X                              | X                            | X                                | X               | X               | X                           |
| NFCCC01            | X                                   | X                                   | X   | X                              | X                            | X                                | N.A.            | N.A.            | X                           |

X: Conforming

XX: Conforming conditionally

N.A.: Not applicable

N.R.: Not Relevant

\*1: To use modules as hazardous location equipment (non-incendive), use the specified pressure-clamp terminal blocks or MIL connector cables (KMS40, KMS50) / MIL connector terminal blocks (TAS40 and TAS50) .

\*2: I/O modules with suffix code "with HART communication" do not conform to the explosion-proof standards.

\*3: When ambient temperature is higher than 55°C, a blank slot on one side is required to NFAV144 and NFDR541 modules.

\*4: When ambient temperature is higher than 55°C, available channels of NFDR541 are up to eight.

\*5: When ambient temperature is higher than 55°C, NFAR181, NFAP135 and NFLF111 modules cannot be installed in next slot of the NFAI841.

\*6: When ambient temperature is higher than 55°C, NFPW444 module is restricted to 75% of rated output current.

\*7: NFAI841, NFAI543 and NFAI835 modules are restricted to the external load and module installation. Refer to "Table Module Arrangement and Restrictions on Installation."

\*10: Please inquire about marine standards conformity to each country/region.

\*11: Although this cable components does not comply with DNV certification as a cable component, it can be used to build the system for DNV certification.

## ■ RESTRICTIONS AND PRECAUTIONS ON INSTALLATION

See Installation Guide for "STARDOM FCN/FCJ Installation Guide" (TI 34P02Q91-01E).

### ● Limitations of Installation for using in the wide temperature range (-20 to +70°C) environments

Main components of FCN (NFCP501/NFCP502-□1□, NFPW444, base modules, N2EB100) can operate in the wide temperature range (-20 to +70°C) environments.

The I/O Modules which are marked up on table "List of FCN's Modules and Installation Limitations" can operate in the wide temperature range environments.

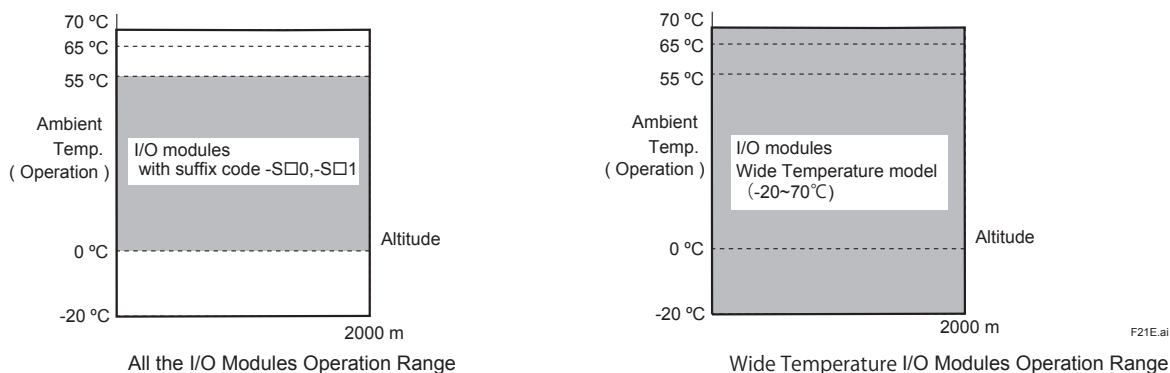


Figure Ambient Temperature and Altitude of I/O modules

### ● I/O Module Arrangement and Restriction for using ambient temperature is higher than 55°C

Table Module Arrangement and Restrictions on Installation (when ambient temperature is higher than 55°C)

| Model   | Left-side slot  | Right-side slot                   | Limitations                                                 |
|---------|-----------------|-----------------------------------|-------------------------------------------------------------|
| NFAI841 | X (*1)          | X (*1)                            | External load (Analog Output): 200-750Ω                     |
|         | X               | N.A.                              |                                                             |
|         | N.A.            | X                                 |                                                             |
| NFAI543 | N.A.            | N.A.                              | External load (Analog Output): 0-400Ω                       |
|         | N.A.            | X (*1)                            | Up to 12 channels<br>External load (Analog Output): 0-400Ω, |
| NFDR541 | X               | N.A.                              | Required a vacant slot on one side<br>Up to 8 channels      |
|         | N.A.            | X                                 |                                                             |
| NFAI835 | X               | N.A.                              | External load (Analog Output): 200-750Ω                     |
|         | X               | X                                 | External load (Analog Output): 200-500Ω                     |
| NFAV144 | X               | N.A.                              | Required a vacant slot on one side                          |
|         | N.A.            | X                                 |                                                             |
| NFPW444 | N.A. or NFPW444 | N.A. or NFPW444 / NFCP501/NFCP502 | Up to 75% of rated output current                           |

X: Any module (arbitrary)

\*1: Except NFAI841

N.A.: Blank or Not allowed

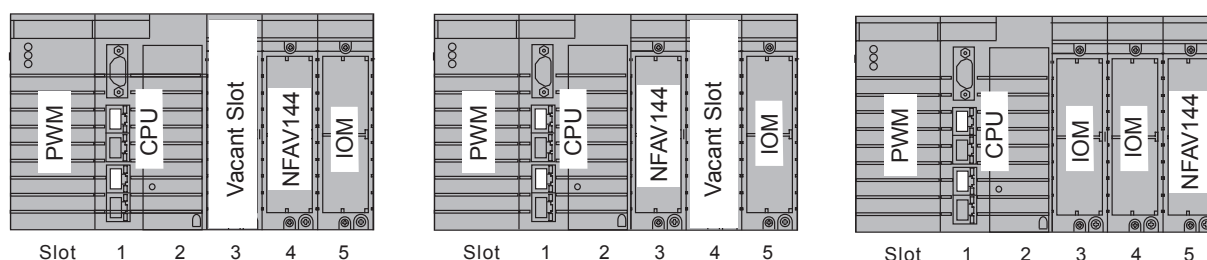


Figure Installation Example of using NFAV144

### ● Pulse Input Module with extend temp. option (NFAP135-S□4, -S□5)'s Ambient Temperature and Limitation of Installations depend on Input Mode

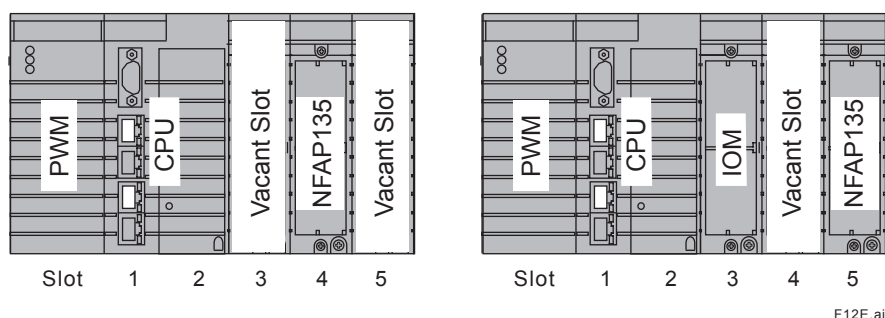
There are some conditions depending on using input mode and ambient temperature.

**Table Input Mode, Ambient Temp. (operating) and Installation Requirement of NFAP135-S□4, -S□5**

| Input Mode (*1)                               |                             | Ambient Temp. [°C] | Installation Requirement                                                     |
|-----------------------------------------------|-----------------------------|--------------------|------------------------------------------------------------------------------|
| Voltage pulse                                 |                             | -20 to +70         | When ambient temperature is higher than 55°C, ensure space on both side (*2) |
| Dry contact pulse                             |                             | -20 to +65         | When ambient temperature is higher than 55°C, ensure space on both side (*2) |
| 2-wire transmitter current pulse (4 to 20 mA) | with 200 Ω shunt resistance | -20 to +65         | When ambient temperature is higher than 55°C, ensure space on both side (*2) |
|                                               | with 500 Ω shunt resistance | -20 to +55         | Ensure space on one side (*2)<br>Or use within 4 points or less              |
| 3-wire transmitter voltage pulse              |                             | -20 to +65         | When ambient temperature is higher than 55°C, ensure space on both side (*2) |

\*1: Refer to Analog I/O Modules, GS 34P02Q31-01Es

\*2: See Figure Installation Examples of using NFAP135



**Figure Installation Example of using NFAP135**

### ● Limitations of Installation for NFAT141 (the combination of Thermocouple input and Pressure clamp terminal)

To keep the reference junction compensation accuracy (GS 34P02Q31-01E), make sure to meet the following conditions. The pressure clamp terminal should not be affected by radiated heat.

- Do not install a heat-radiating unit beneath the NFAT141 installed unit.
- Do not install NFAT141 in a place where airflow impinges directly.
- Do not install NFAT141 next to the CPU modules (NFCP501/NFCP502), power supply modules (NFPW44x).
- The installable modules next to the NFAT141 are as follows. When installing other than following I/O modules, make an empty slot (one or more) in each side.  
Installable modules: NFAT141, NFAR181, NFAV141, NFAV144

### ● Limitations of Installation for Communication Modules

- A total of up to eight NFLR111/NFLR121 can be installed for each FCN-500.
- A total of up to eight NFLF111/NFLC121/NFLP121 (or up to eight duplexed pairs of NFLF111) can be installed for each FCN-500.

### ● Limitations of Installation for I/O Modules

When you install the following I/O modules, ensure that the required power volume does not exceed the rated power output of the power supply module. For the amount of power supply that each I/O module requires (5 V DC and 24 V DC), refer to the applicable general specifications.

### ● About Use of N2BU051, NFBU050 or N2BU030

- NFBU050 is dedicated to control unit. It cannot be used as extension unit.
- SB bus repeat module cannot be mounted on N2BU051, NFBU050 or N2BU030.
- E2 bus interface module cannot be mounted on NFBU050.

### ● Precaution on NFPW426 (Power Supply Module for FCN-RTU)

NFPW426 (Power supply module for FCN-RTU) cannot be used for FCN-500. Only NFPW441, NFPW442 or NFPW444 can be used for FCN-500.

## ■ CABLE SPECIFICATIONS

The following describes the specifications required for the power and grounding cables used. For field signal wiring cables, see "Field Connections" (GS 34P02Q30-01E).

### ● Applicable Cables

Insulated cables for industrial equipment such as:

- 600 V polyvinyl chloride insulated wires (IV); JIS C3307
- Polyvinyl chloride insulated wires for electrical apparatus (KIV); JIS C3316
- 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV); JIS C3317
- Heatproof vinyl insulated wires VW-1 (UL1015/UL1007)
- Control cables (vinyl insulated vinyl sheath cable) (CVV); JIS C3401

### ● Recommended Sizes

Power cable: AWG20 to 14 (0.5 to 2 mm<sup>2</sup>) with ring tongue terminal

Grounding cable: AWG14 to 13 (2 to 2.6 mm<sup>2</sup>) with ring tongue terminal

### ● Recommended Solderless Terminals

Power cable: Insulated M4 solderless terminals, 8.5 mm wide or less

Grounding cable: Insulated M4 solderless terminal, 8.5 mm wide or less

Follow the specifications required by the M4 solderless terminals used.

## ■ ORDERING INFORMATION

Specify the model and suffix codes.

## ■ TRADEMARK ACKNOWLEDGMENTS

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