



# INVERTER

Plug-in option

# FR-A7NS

# INSTRUCTION MANUAL

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## *SSCNET III communication function*

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Thank you for choosing this Mitsubishi Inverter plug-in option. This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum. Please forward this manual to the end user.

## This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this product until you have read through this instruction manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.


In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

### **WARNING**

Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

### **CAUTION**

Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that even the  **CAUTION** level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

## SAFETY INSTRUCTIONS

### 1. Electric Shock Prevention

#### **WARNING**

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed. Otherwise, you may access the exposed high-voltage terminals and charging part and get an electric shock.
- If power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, check to make sure that the indication of the inverter operation panel is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the plug-in option before wiring. Otherwise, you may get an electric shock or be injured.
- Do not touch the plug-in option with wet hands. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.

## 2. Injury Prevention

### CAUTION

- Apply only the voltage specified in the instruction manual to each terminal. Otherwise, burst, damage, etc. may occur.
- Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc. Otherwise, burst, damage may occur.
- While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

## 3. Additional Instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.

### 1) Transportation and mounting

### CAUTION

- Do not install or operate the plug-in option if it is damaged or has parts missing.
- Do not stand or rest heavy objects on the product.
- Check that the mounting orientation is correct.
- Prevent other conductive bodies such as screws and metal fragments or other flammable substance such as oil from entering the inverter.

### 2) Trial run

### CAUTION

- Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

## 3) Usage

### WARNING

- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the inverter.

### CAUTION

- When parameter clear or all parameter clear is performed, reset the required parameters before starting operations. Each parameter returns to the initial value.
- For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

### 4) Maintenance, inspection and parts replacement

### CAUTION

- Do not test the equipment with a megger (measure insulation resistance).

### 5) Disposal

### CAUTION

- Treat as industrial waste.

### 6) General instruction

All illustrations given in this manual may have been drawn with covers or safety guards removed to provide in-depth description. Before starting operation of the product, always return the covers and guards into original positions as specified and operate the equipment in accordance with the manual.

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# 1 PRE-OPERATION INSTRUCTIONS

## 1.1 Inverter Type

The inverter type, 55K and 75K stated in this Instruction Manual differs according to each -NA, -EC, -CH(T) versions. Refer to the following correspondence table for each inverter type. (*Refer to the instruction manual of each inverter for the inverter type.*)

For example, "for the 75K or more" indicates "for the FR-A740-01440-NA or more" in the case of FR-A740 of NA version.

		NA	EC	CH
A700	FR-A720-55K	FR-A720-02150-NA	—	—
	FR-A720-75K	FR-A720-02880-NA	—	—
	FR-A740-55K	FR-A740-01100-NA	FR-A740-01800-EC	FR-A740-55K-CHT
	FR-A740-75K	FR-A740-01440-NA	FR-A740-02160-EC	FR-A740-75K-CHT

## 1.2 Unpacking and Product Confirmation

Take the plug-in option out of the package, check the unit name, and confirm that the product is as you ordered and intact.

This product is a plug-in option for the FR-A700 series inverter assembled in and after January 2007.

Refer to the table below to check the SERIAL (Serial No.) indicated on the inverter rating plate or package.

### (1) NA specification

#### ●200V class

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A720-00030-NA	Without	G5	Q71
FR-A720-00050-NA			P71
FR-A720-00080/ 00110-NA	Without	G5	Q71
	<G>	G7	D71
FR-A720-00175-NA	Without	G5	R71
	<G>	G7	D71

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A720-00240/ 00330-NA	Without	G5	Q71
FR-A720-00460-NA			P71
FR-A720-00610 to 00900-NA			R71
FR-A720-01150 to 01750-NA			Q71
FR-A720-02150-NA			P71
FR-A720-02880/ 03460-NA			M71



●400V class

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-00015 to 00310-NA	Without	G5	Q71
	<G>	G7	E71
FR-A740-00380/00440-NA	Without	G5	Q71
	<G>	G7	F71
FR-A740-00570 to 00860-NA	Without	G5	P71
	<G>	G7	E71
FR-A740-01100-NA	Without	G5	P71
	<G>	G7	D71
FR-A740-01440 to 02660-NA	Without	G5	M71
	<G>	G7	E71
FR-A740-03250-NA	Without	G5	N71
	<G>	G7	F71
FR-A740-03610-NA	Without	G5	M71
	<G>	G7	F71
FR-A740-04320/04810-NA	Without	G5	M71
	<G>	G7	E71
FR-A740-05470-NA	Without	G5	N71
	<G>	G7	E71

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-06100-NA	Without	G5	M71
	<G>	G7	D71
FR-A740-06830-NA	Without	G5	J71
	<G>	G7	D71
FR-A740-07700/08600-NA	Without	G5	M71
	<G>	G7	D71
FR-A740-09620-NA	Without	G5	N71
	<G>	G7	D71

1

## (2) EC specification

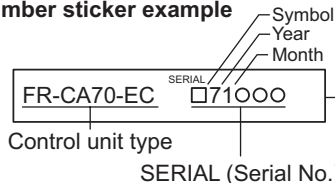
Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-00023 to 00126-EC	Without	G5 or G6	M71
	<G>	G7 or G8	F71
FR-A740-00170/00250-EC	Without	G5 or G6	N71
	<G>	G7 or G8	F71

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-00310/00380-EC	Without	G5 or G6	M71
	<G>	G7 or G8	F71
FR-A740-00470/00620-EC	Without	G5	N71
	<G>	G7	G71
FR-A740-00770 to 12120-EC*	—	—	L71 or F71

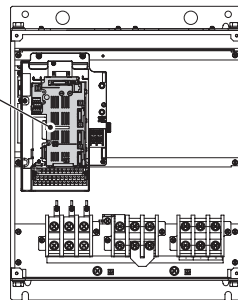
\* For the FR-A740-00770 to 12120-EC

Check the SERIAL indicated on the Serial number sticker shown below.

### Serial number sticker example



The SERIAL consists of 1 version symbol, 2 numeric characters or 1 numeric character and 1 alphabet letter indicating year and month, and 3 numeric characters indicating control number. Month is indicated as 1 to 9, X (October), Y (November), and Z (December).



To check the SERIAL, the front cover must be removed.  
For the removal of the front cover, refer to the inverter manual.

**(3) CHT specification**

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-0.4K/ 0.75K-CHT	Without	G5 or G6	S71
	<G>	G7 or G8	E71
FR-A740-1.5K to 15K-CHT	Without	G5 or G6	T71
	<G>	G7 or G8	E71
FR-A740-18.5K/ 22K-CHT	Without	G5 or G6	U71
	<G>	G7 or G8	F71
FR-A740-30K to 45K-CHT	Without	G5 or G6	Q71
	<G>	G7 or G8	E71
FR-A740-55K-CHT	Without	G5 or G6	Q71
	<G>	G7 or G8	D71
FR-A740-75K to 132K-CHT	Without	G5	M71
	<G>	G7	E71
FR-A740-160K-CHT	Without	G5	N71
	<G>	G7	F71
FR-A740-185K-CHT	Without	G5	M71
	<G>	G7	F71
FR-A740-220K/ 250K-CHT	Without	G5	M71
	<G>	G7	E71

Inverter Type	Label on Product Package Identification Symbol	Lower Third and Second Number of TC Number on Rating Plate	SERIAL (Upper Three Numbers of SERIAL)
FR-A740-280K-CHT	Without	G5	N71
	<G>	G7	E71
FR-A740-315K-CHT	Without	G5	M71
	<G>	G7	D71
FR-A740-355K-CHT	Without	G5	K71
	<G>	G7	D71
FR-A740-400K-CHT	Without	G5	M71
	<G>	G7	D71
FR-A740-450K-CHT	Without	G5	M71
FR-A740-500K-CHT	Without	G5	N71

**1**

## ● SERIAL number check

Refer to the inverter manual for the location of the rating plate.

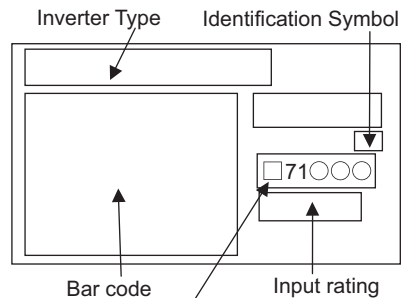
### Rating plate example

<u>□</u>	<u>7</u>	<u>1</u>	<u>○○○○○○</u>	} SERIAL (Serial No.)
Symbol	Year	Month	Control number	
TC○○○A○○○G○○				} TC number

The SERIAL consists of 1 version symbol, 2 numeric characters or 1 numeric character and 1 alphabet letter indicating year and month, and 6 numeric characters indicating control number.

Month is indicated as 1 to 9, X (October), Y (November), and Z (December).

### Label on the product package

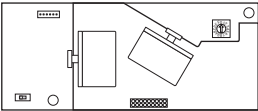


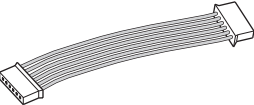
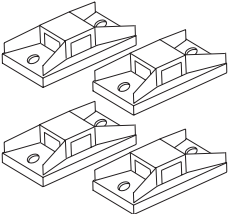
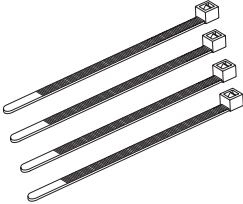


### SERIAL (Serial No.)

The SERIAL (Serial No.) indicated on the label of the product package consists of six digits including the first three digits of the control number and a symbol.

### 1.2.1 Packing confirmation

Check the enclosed items.

<p>Plug-in option ..... 1</p> 	<p>Mounting screw (M3 × 6mm) ..... 2 (Refer to page 13.)</p> 	<p>Hex-head screw for option mounting (5.5mm) ..... 1 (Refer to page 13.)</p> 
<p>FR-A7AP connection cable ..... 1 (Refer to page 14.)</p> 	<p>Cable clamp ..... 4 (Refer to page 30.)</p> 	<p>Cable tie ..... 4 (Refer to page 30.)</p> 

**1**

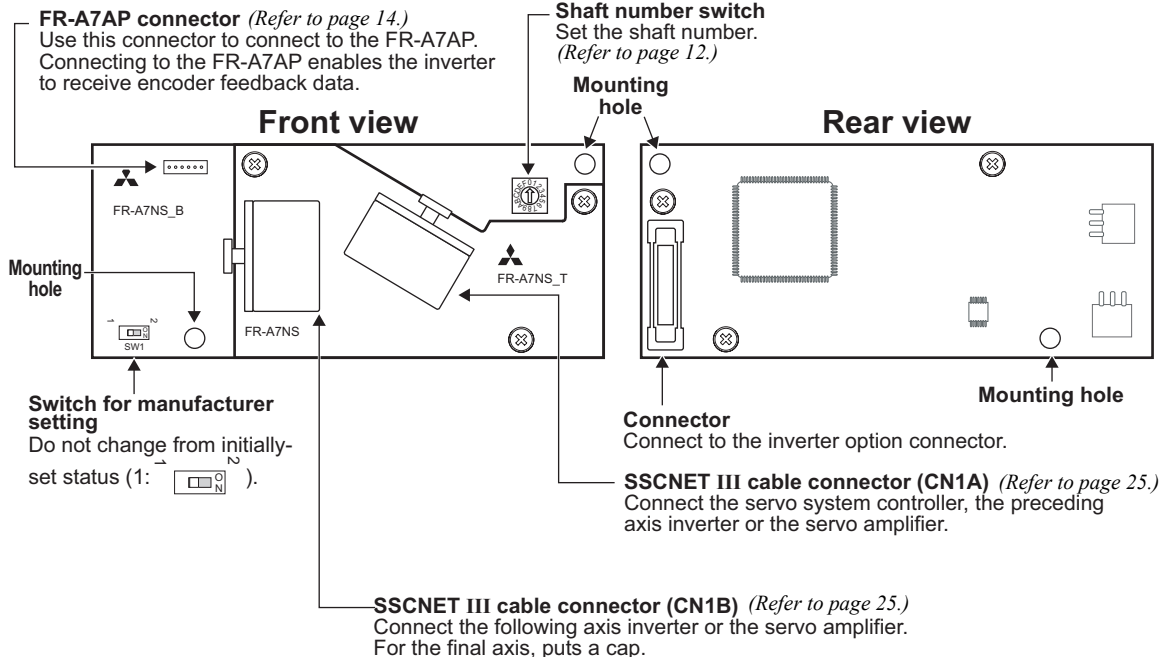
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The formal name of Windows® 2000 is Microsoft® Windows® 2000 operating system.

The formal name of Windows® XP is Microsoft® Windows® XP operating system.

Company and product names herein are the trademarks or registered trademarks of their respective owners.

## 1.2.2 Parts



### **1.3 Caution**

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(1) Refer to the following manuals or software HELP for full information on the servo system controller.

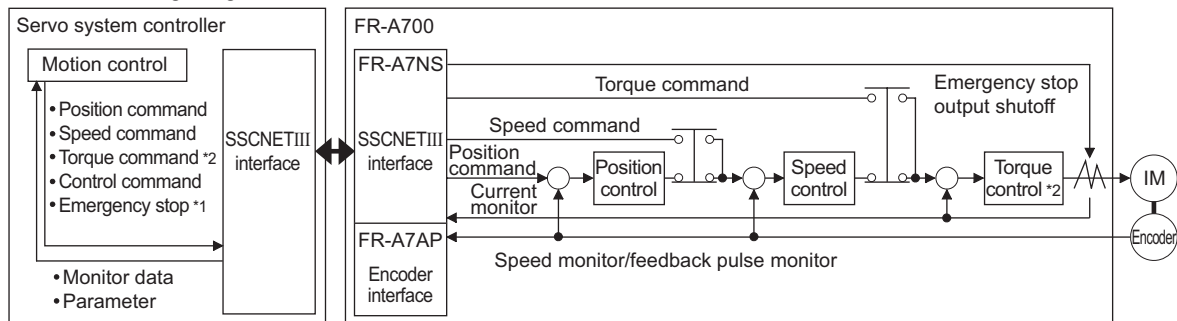
- Q173HCPU/Q172HCPU user's manual ..... IB-0300110
- Q173HCPU/Q172HCPU motion controller (SV13/SV22)  
programming manual (real mode version)..... IB-0300113
- Q173HCPU/Q172HCPU motion controller  
programming manual (common mode version)..... IB-0300111
- Q173HCPU/Q172HCPU motion controller (SV13/SV22)  
programming manual (Motion SFC version)..... IB-0300112

(2) Servo System Controller NETwork III is abbreviated to SSCNET III in this manual.

## 1.4 Operation Overview

In communication with the Mitsubishi servo system controller, the inverter operation (speed control or position control or torque control under vector control with encoder), monitoring, or parameter setting can be performed from a program on the servo system controller.

Application of optical communication method greatly improved the communication speed and noise resistance of the SSCNET III as compared with the conventional SSCNET. In addition, 50m of the maximum wiring length between stations is realized.



\*1 When the emergency stop signal is input, the inverter shuts off the output and the motor coasts.

\*2 Please contact your sales representative when performing torque control.

### CAUTION

**Mounting both the FR-A7NS and FR-A7AP and performing vector control enables SSCNET III communication. When operating the inverter with the FR-A7NS mounted and without FR-A7AP, option alarm (E.OPT) occurs.**

*(Refer to page 75.) Also option alarm (E.OPT) occurs when the FR-A7AP and FR-A7NS are not connected with the FR-A7AP connection cable during a stop of the inverter. (Refer to page 75.) An alarm such as overcurrent shut off (E.OC3) and position error large (E.OD) may occur depending on the status of the motor current and droop pulses during inverter operation.*

**(Note that when Pr.800 Control method selection = "9" (vector control test operation) or Pr.499 SSCNET III input filter setting = "9999" (Operation invalid mode), option alarm (E.OPT) does not occur.) (Refer to page 48.)**




## 2 INSTALLATION

### 2.1 Pre-Installation Instructions

Make sure that the input power of the inverter is off.

#### CAUTION

 With input power on, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.

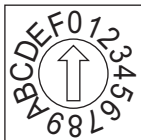


## 2.2 Shaft number Setting

### •Setting with shaft number switch

Set the shaft number between "0H to FH" using shaft number switches on the FR-A7NS (*refer to page 8*). The setting is reflected at the next power-on or inverter reset.

Set the arrow (↑) of the corresponding switches to the number and alphabet to set a desired shaft number.



Initial status

No.	Definition	No.	Definition
0	1st axis	8	9th axis
1	2nd axis	9	10th axis
2	3rd axis	A	11th axis
3	4th axis	B	12th axis
4	5th axis	C	13th axis
5	6th axis	D	14th axis
6	7th axis	E	15th axis
7	8th axis	F	16th axis

### CAUTION

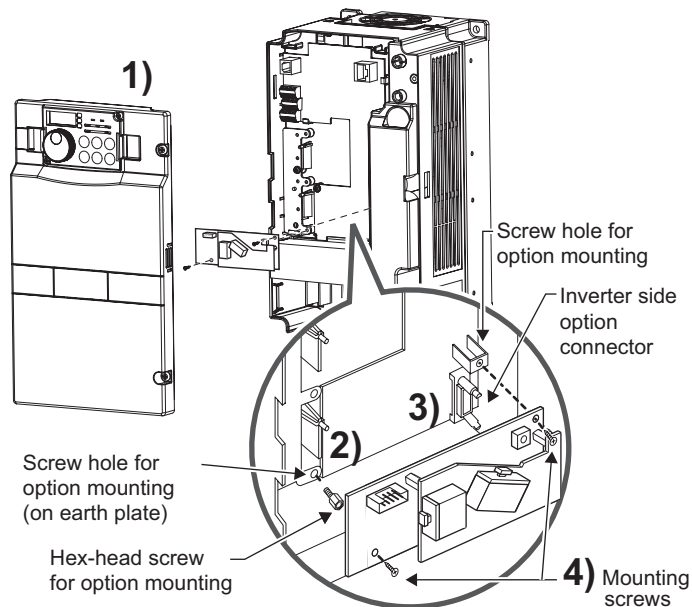
- Set the shaft number switch to the switch number (alphabet) position correctly. If the switch is set between numbers, normal data communication can not be made.

Good example      Bad example



- You cannot set the same shaft number to other devices on the network. (Doing so disables proper communication.)
- Set the inverter shaft number before switching on the inverter and do not change the setting while power is on. Otherwise you may get an electric shock.

## 2.3 Installation Procedure



- 1) Remove the inverter front cover.
- 2) Mount the hex-head screw for option mounting into the inverter screw hole (on earth plate). (size 5.5mm, tightening torque 0.56N·m to 0.75N·m)
- 3) Securely fit the connector of the plug-in option to the inverter connector along the guides.
- 4) Securely fix the both right and left sides of the plug-in option to the inverter with the accessory mounting screws. If the screw holes do not line-up, the connector may not have been plugged snugly. Check for loose plugging.

2

### REMARKS

After removing two screws on the right and left places, remove the plug-in option.  
(The plug-in option is easily removed if the control circuit terminal block is removed before.)



## CAUTION

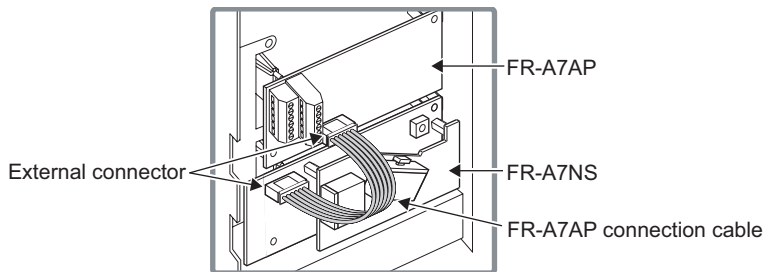
- When using this option unit, mount it in the "option connector 3 (lowermost connector)" of the inverter.

If it is fitted in option connector 1 or 2, "E. 1" or "E. 2" (option alarm) is displayed and the inverter will not function. In addition, when the inverter can not recognize that the option is mounted due to improper installation, etc.,

"E. 3" (option alarm) is displayed even if the option is fitted in the option connector 3.

- Mount the FR-A7AP to the "option connector 2" of the inverter.
- After mounting both the FR-A7NS and FR-A7AP, connect each external connector using the FR-A7AP connection cable (Refer to page 7).

Mounting Position	Error Display
Connector 1	E. 1
Connector 2	E. 2
Connector 3	E. 3

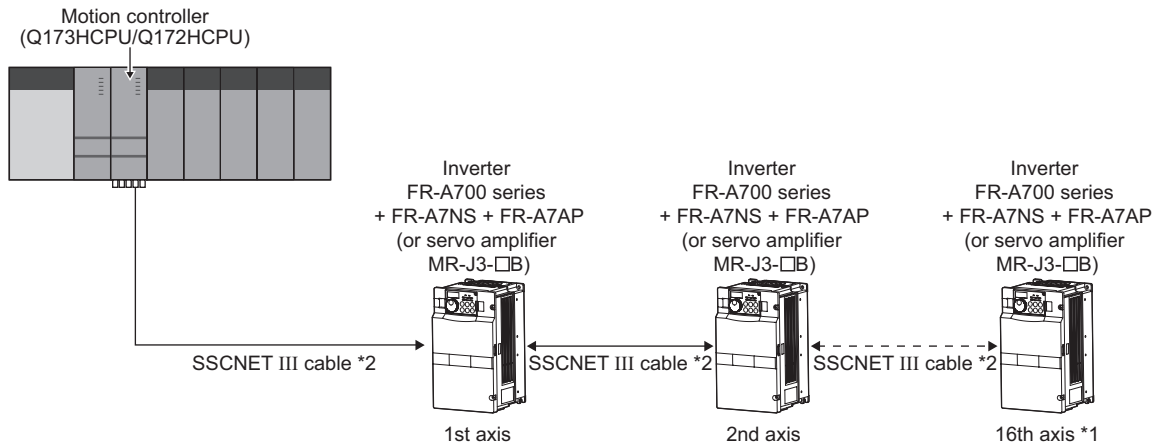


- Take care not to drop a hex-head screw for option mounting or mounting screw during mounting and removal.
- Pull out the option straight to remove. Otherwise, the connector may be damaged by some applied force.

# 3 WIRING

## 3.1 System configuration

### ●Connecting with the motion controller



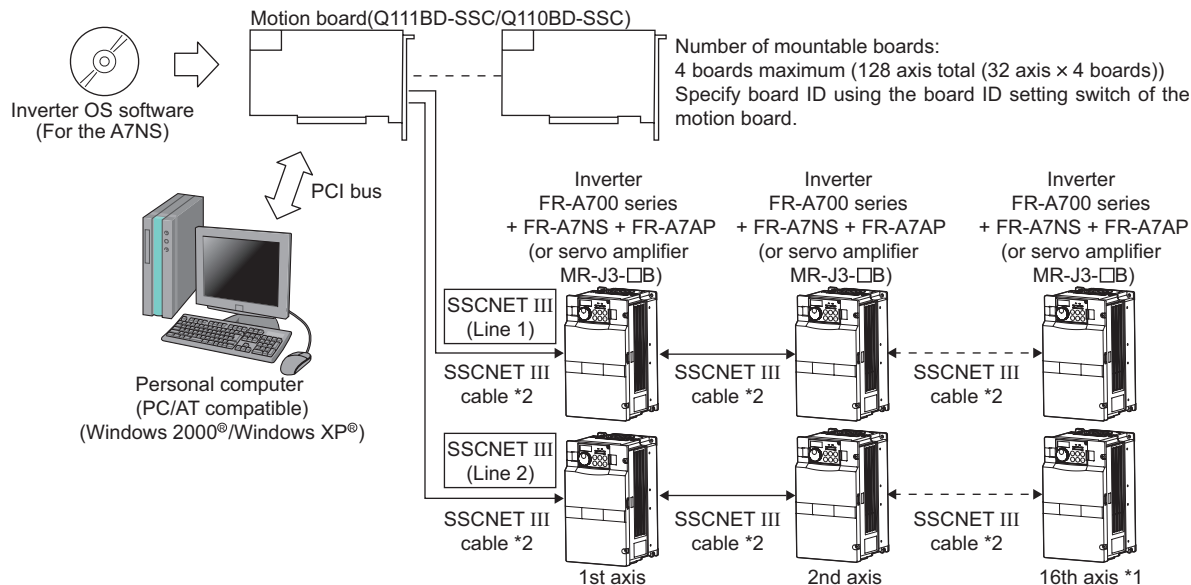
\*1 The maximum number of inverter (or servo amplifier) connected differs depending on the type of motion controller (Q173HCPU/Q172HCPU).

\*2 For the distance between electrodes of SSCNET III cable, refer to the following table.

Cable Model Name	Type	Cable Length (m)	Distance Between Electrodes (m)	Applications
MR-J3BUS□M	POF	0.15 to 3	20	Standard code inside panel
MR-J3BUS□M-A		5 to 20		Standard cable outside panel
MR-J3BUS□M-B	HPCF	30 to 50	50	Long-distance cable



## ●Connecting with the motion board



\*1 The maximum number of inverter (or servo amplifier) connected differs depending on the type of motion board (Q111BD-SSC/Q110BD-SSC).

\*2 For the distance between electrodes of SSCNET III cable, refer to the following table.

Cable Model Name	Type	Cable Length (m)	Distance Between Electrodes (m)	Application
MR-J3BUS□M	POF	0.15 to 3	20	Standard code inside panel
MR-J3BUS□M-A		5 to 20		Standard cable outside panel
MR-J3BUS□M-B	HPCF	30 to 50	50	Long-distance cable

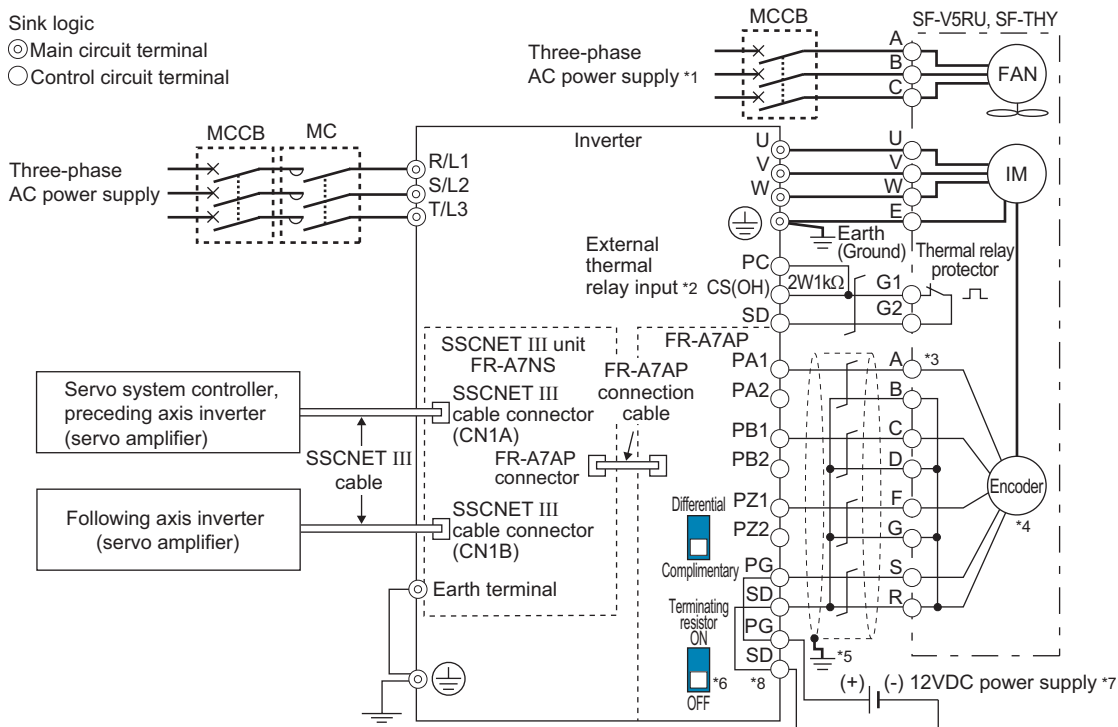
## 3.2 Wiring example

● Vector control dedicated motor (SF-V5RU, SF-THY), 12V complimentary

Sink logic

⊙ Main circuit terminal

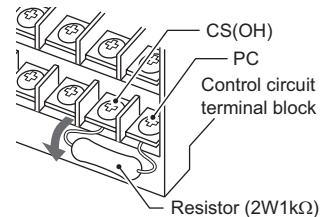
○ Control circuit terminal



3



- \*1 For the fan of the 7.5kW or less dedicated motor, the power supply is single phase. (200V/50Hz, 200 to 230V/60Hz)
- \*2 Assign OH (external thermal input) signal to the terminal CS. (Set "7" in Pr. 186 )  
Connect a 2W1kΩ resistor between the terminal PC and CS (OH). Install the resistor pushing against the bottom part of the terminal block so as to avoid a contact with other cables.  
*Refer to FR-A700 Instruction Manual (Applied) for details of Pr.186 CS terminal function selection.*



- \*3 The pin number differs according to the encoder used.  
Speed control and torque control are properly performed even without connecting Z phase.
- \*4 Connect the encoder so that there is no looseness between the motor and motor shaft. Speed ratio should be 1:1.
- \*5 Earth (Ground) the shielded cable of the encoder cable to the enclosure with a P clip, etc.  
*(Refer to FR-A7AP Instruction Manual.)*
- \*6 For the complementary, set the terminating resistor selection switch to off position.  
*(Refer to FR-A7AP Instruction Manual.)*
- \*7 A separate power supply of 5V/12V/15V/24V is necessary according to the encoder power specification.  
When performing orientation control together, an encoder and power supply can be shared.
- \*8 For terminal compatibility of the FR-JCBL, FR-V7CBL and FR-A7AP, refer to FR-A7AP Instruction Manual.



### 3.3 SSCNET III cable

Use our optional SSCNET III connection cables.

#### (1) Cable type

Cable Model Name *1	Type	Cable Length (m)	Flex Life	Application
MR-J3BUS□M	POF	0.15, 0.3, 0.5, 1, 3	Standard	Standard code inside panel
MR-J3BUS□M-A		5, 10, 20	Standard	Standard cable outside panel
MR-J3BUS□M-B *2	HPCF	30, 40, 50	Long flex	Long-distance cable

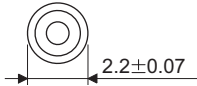
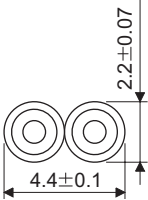
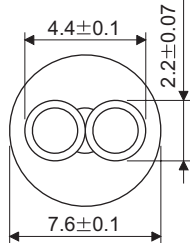
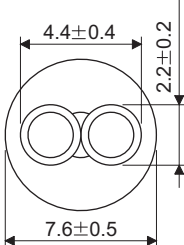
\*1 □ in the type represents the cable length.

Symbol	015	03	05	1	3	5	10	20	30	40	50
Cable Length (m)	0.15	0.3	0.5	1	3	5	10	20	30	40	50

\*2 For cable of 30m or less, contact our company.



## (2) Specifications

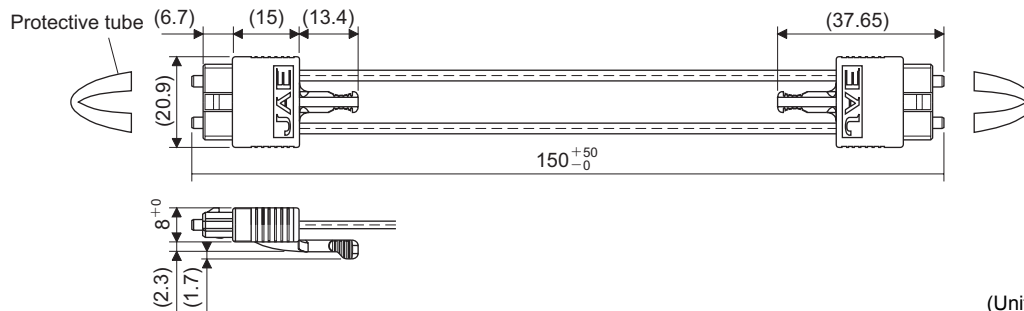
		MR-J3BUS□M		MR-J3BUS□M-A	MR-J3BUS□M-B
Cable Length (m)		0.15	0.3 to 3	5 to 20	30 to 50
Optical Cable (Cord)	Minimum Bend Radius (mm) *1	25		Enforced covering cord: 50 Cord: 25	Enforced covering cord: 50 Cord: 30
	Tension Strength	70N	140N	420N (Enforced covering cord)	980N (Enforced covering cord)
	Temperature Range For Use *2	40 to 85°C			20 to 70°C
	Ambient	Indoors (no direct sunlight) No solvent or oil			
	External appearance (mm)				

\*1 Make sure to lay the cable with greater radius than the minimum bend radius. Do not press the cable to edges of equipment or others.

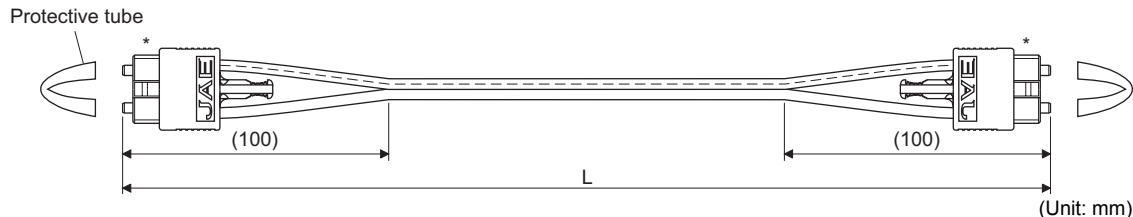
\*2 This temperature range for use is the value for optical cable (cord) only. Temperature condition for the connector is the same as that for inverter.

### (3) Outline drawings

#### ●MR-J3BUS015M



#### ●MR-J3BUS03M to MR-J3BUS3M

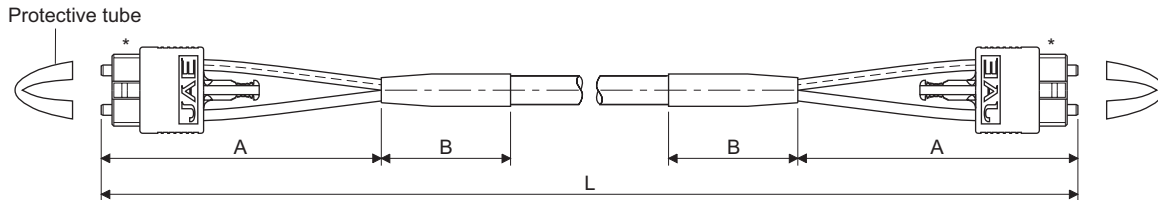


\* Dimension of connector part is the same as that of MR-J3BUS015M.

Cable Model Name	MR-J3BUS03M	MR-J3BUS05M	MR-J3BUS1M	MR-J3BUS3M
Cable Length (L) (m)	0.3	0.5	1	3



●MR-J3BUS5M-A to MR-J3BUS20M-A, MR-J3BUS30M-B to MR-J3BUS50M-B



\* Dimension of connector part is the same as that of MR-J3BUS015M.

Cable Model Name	MR-J3BUS5M-A	MR-J3BUS10M-A	MR-J3BUS20M-A	MR-J3BUS30M-B	MR-J3BUS40M-B	MR-J3BUS50M-B
Cable Length (A) (mm)	100			150		
Cable Length (B) (mm)	30			50		
Cable Length (L) (m)	5	10	20	30	40	50

## CAUTION

**Do not see directly the light generated from the end of SSCNET III cable. When the light gets into eye, you may feel something is wrong for eye. (The light source of SSCNET III corresponds to class1 defined in IEC60825-1.)**

### 3.3.1 SSCNET III cable laying

SSCNET III cable is made of optical fiber. Application of a power, such as a major shock, lateral pressure, haul, and abrupt bending or twisting, to the optical fiber will deform or break the inside, disabling optical transmission. Especially, the optical fibers of the MR-J3BUS□M, MR-J3BUS□M-A which is made of synthetic resin will melt down if exposed to fire and high temperature. Therefore, avoid the cable from contacting with the hot section such as heatsink of the inverter and an option for regeneration.

Read described item of this subsection carefully and handle it with caution.

#### (1) Minimum bend radius

Make sure to lay the cable with greater radius than the minimum bend radius. Do not press the cable to edges of equipment or others. For SSCNET III cable, the appropriate length should be selected with due consideration for the dimensions and arrangement of inverter. Ensure that the cable bend will not become smaller than the minimum bend radius if the SSCNET III cable is pressed down when the door of the enclosure is closed.

For the minimum bend radius, refer to *page 20*.

#### (2) Bundle fixing

Use the accessory cable tie to bundle the SSCNET III cable outside the inverter, and fix the bundled cable to the installation surface of the inverter. Fix the SSCNET III cable using a cable tie by gently slackening the optical code with keeping a larger radius than the minimum bend radius, and it should not be twisted. (*Refer to page 30.*) When binding the cable with a cable tie other than the provided one, use a cushioning material such as plasticizer-free sponge and rubber to fix it.

Never use vinyl tape for cord. Plasticizing material in vinyl tape goes into optical fiber and lowers the optical characteristic. At worst, it may cause wire breakage. If using adhesive tape for cable laying, the fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.

If laying with other wires, do not make the cable touched wires or cables made from soft polyvinyl chloride (PVC), polyethylene resin (PE), teflon (Fluorocarbon resin) or nylon which contains plasticizing material.



### **(3) Tension**

Applied tension to fiber optics causes external force to concentrate in the section where fiber optics are fixed and an optical connector is connected, increasing transmission loss. If a larger pressure is further applied, this could cause a disconnection of optical fibers and a damage to the optical connector. For cable laying, handle without putting forced tension. For the tension strength, refer to *page 20*.

### **(4) Lateral pressure**

Applying a lateral pressure to the fiber cable deforms the cable itself and applies pressure to the internal fiber, resulting in increase in transmission loss. Moreover, if a larger pressure is further applied, the optical cable may be disconnected in the worst case. As the same condition also occurs at cable laying, do not tighten up optical cable with a thing such as nylon band (TY-RAP).

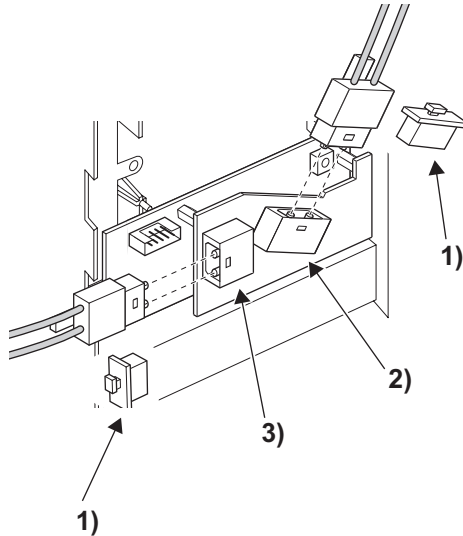
Do not trample it down or tuck it down with the door of enclosure or others.

### **(5) Twisting**

If optical fiber is twisted, it will become the same stress added condition as when local lateral pressure or bend is added. This could increase a transmission loss. Moreover, if a larger pressure is further applied, the optical cable may be disconnected in the worst case.

## 3.4 Wiring

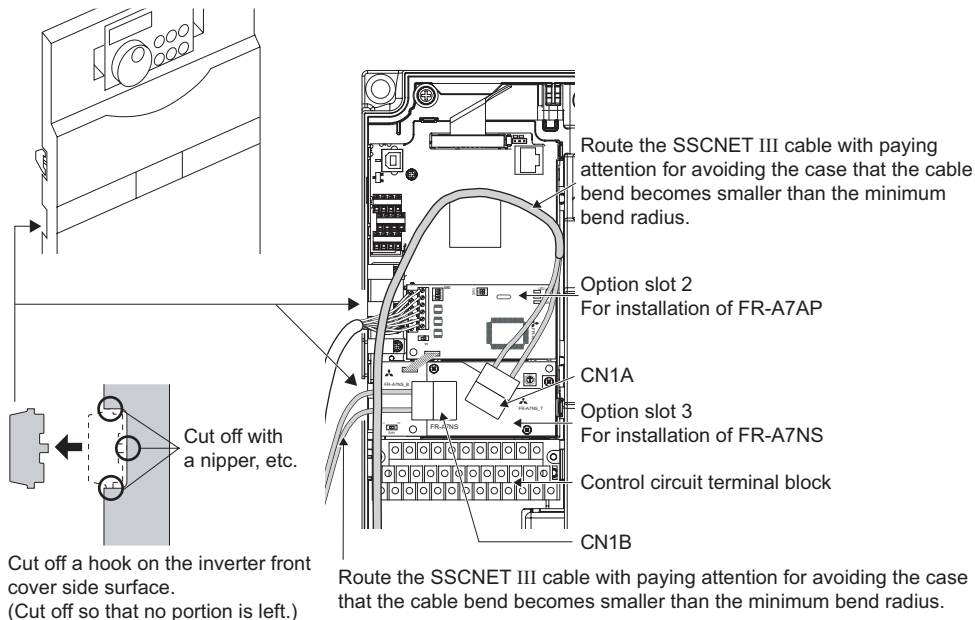
- (1) Open the inverter front cover, remove the cap of FR-A7NS's connector (CN1A, CN1B) for SSCNET III cable connection, and insert a SSCNET III cable.  
Refer to *page 19* for types of SSCNET III cable.



- 1) **Cap for the connector**
- 2) **SSCNET III cable connector (CN1A)**  
Connect the servo system controller, the preceding axis inverter or the servo amplifier.
- 3) **SSCNET III cable connector (CN1B)**  
Connect the following axis inverter or the servo amplifier. For the final axis, puts a cap.



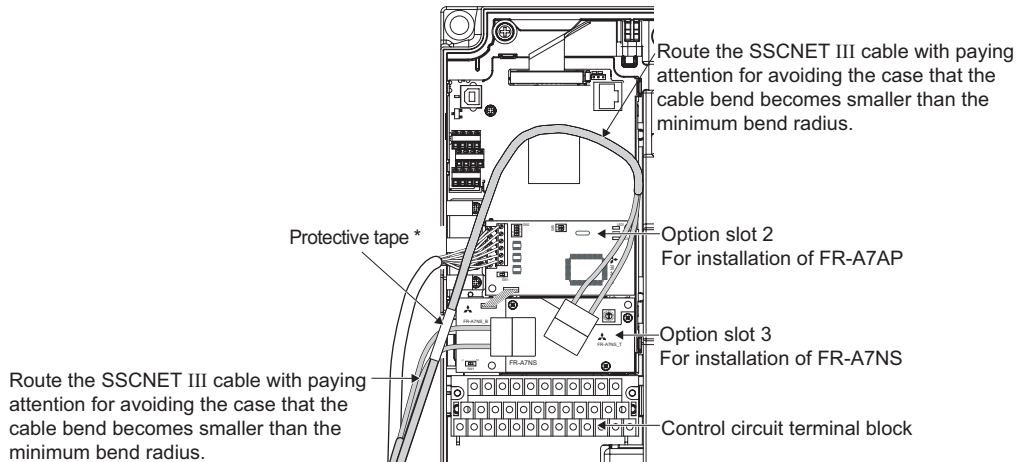
- (2) Route the wires for the **FREQROL-A700 series (22K or less)** as shown below. For the cables connected to the SSCNET III cable connector (CN1A), route them between the control circuit terminal block and front cover.





**REMARKS**

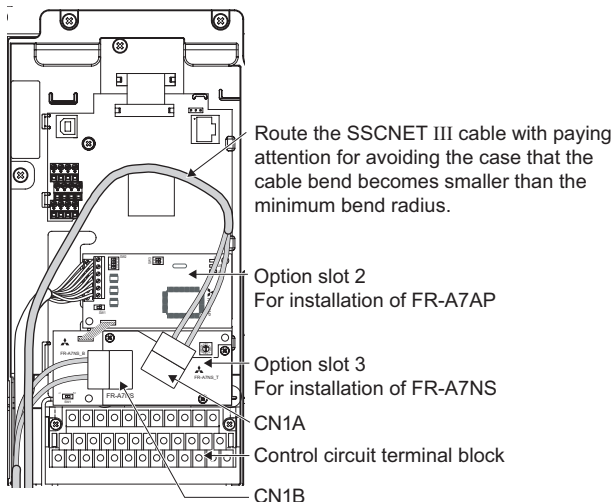
- When the hook of the inverter front cover is cut off for wiring, the protective structure (JEM1030) changes to open type (IP00).
- The SSCNET III cable connected to CN1B of FREQROL-A700 series (22K or less) must be pulled out to the left side of the inverter. Therefore, leave enough space on the left side of the inverter in consideration of the minimum cable bend radius.
- In a vibration-free environment, the cables connected to the SSCNET III cable connector (CN1A) can be pulled out from the side surface of the inverter. Use the space that will be made by cutting off the hook of the front cover.



- \* Since the SSCNET III cable touches the edge of the inverter case, wind the protective tape around the cable to protect it.



- (3) For wiring of **FREQROL-A700 series (30K or more)**, use the space on the left side of the control circuit terminal block.

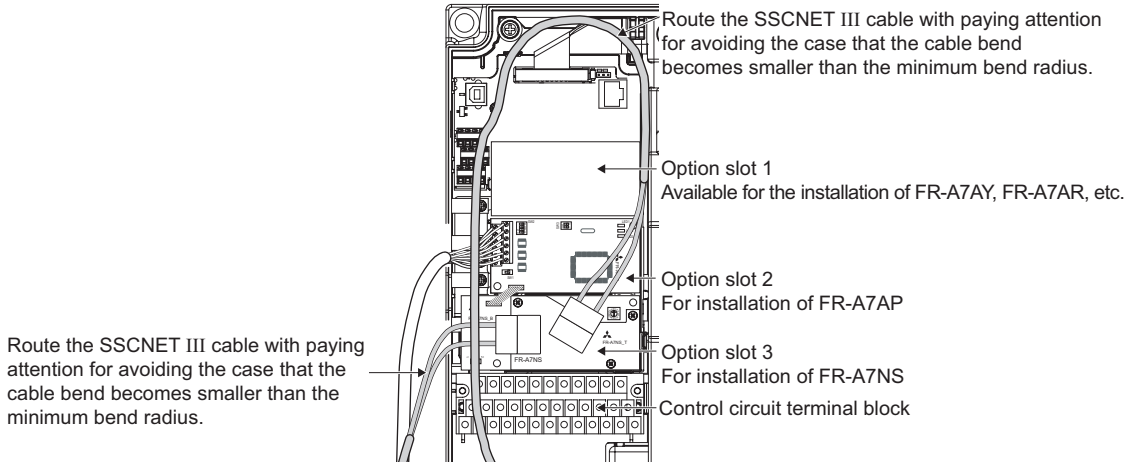


## REMARKS

The inverter type of 22K and 30K of FR-A700 series in each -NA, -EC versions are as follows.

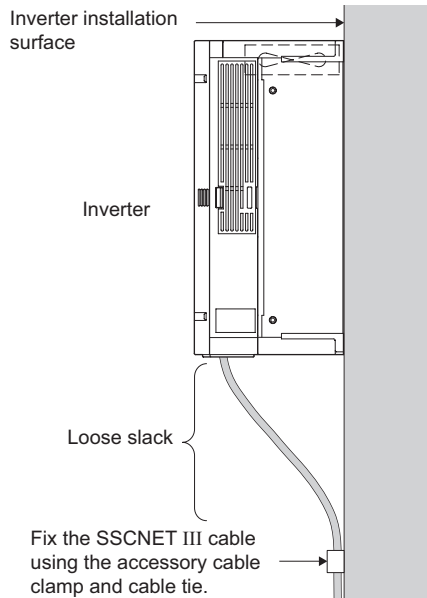
	NA	EC
FR-A720-22K	FR-A720-00900-NA	—
FR-A740-22K	FR-A740-00440-NA	FR-A740-00620-EC
FR-A720-30K	FR-A720-01150-NA	—
FR-A740-30K	FR-A740-00570-NA	FR-A740-00770-EC

- (4) When three plug-in options are installed, one of them must be installed in the option slot 1 and therefore the wiring described in (2) or (3) cannot be performed. Use the space above the option slot 1.





- (5) Fixing the SSCNET III cable with a cable tie  
 Fix the SSCNET III cable to the installation surface of the inverter using the accessory cable tie to prevent the SSCNET III cable from getting a damage caused by vibration, etc. Gently slacken the cable with keeping a larger radius than the minimum bend radius, and it should not be twisted.



## ⚠ CAUTION

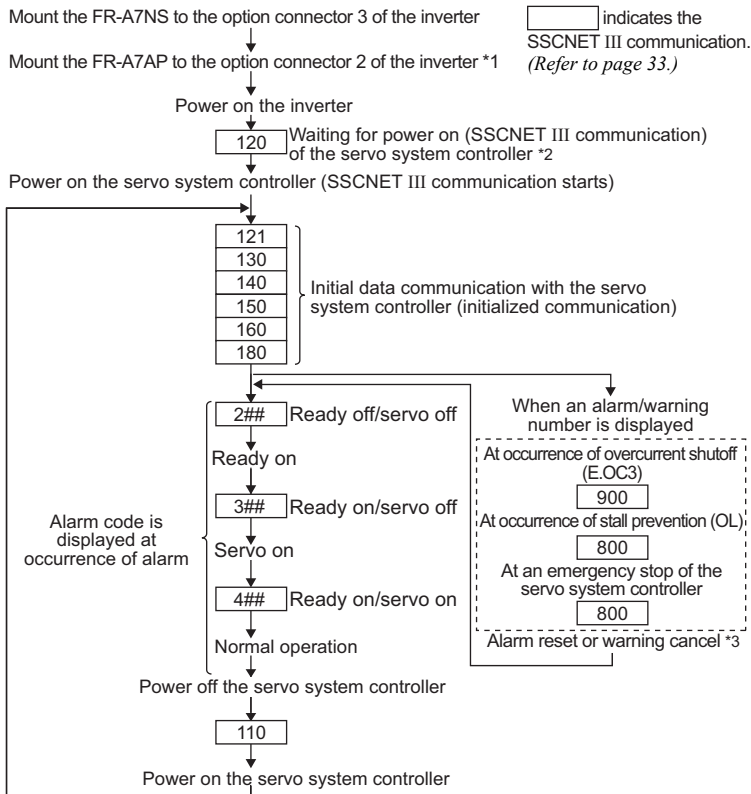
- ⚠ When performing wiring using the space between the inverter front cover and control circuit terminal block, run the cable keeping the minimum bend radius or more so as not to subject the cable to stress. In addition, take care that cables do not contact with the hot section. (Refer to page 23.)
- ⚠ After wiring, wire offcuts must not be left in the inverter. They may cause an error, failure or malfunction.

## 4 SSCNET III COMMUNICATION STATUS

When power is turned on with the SSCNET III communication unit (FR-A7NS) mounted to the option connector 3 and FR-A7AP mounted to the option connector 2, the inverter goes in standby of initialization of the SSCNET III communication. Then, the status shifts to SSCNET III operation mode, changing to the external operation mode and PU operation mode is not enabled. In addition, *Pr.79 Operation mode selection* setting is made invalid. The following shows the communication description of SSCNET III communication. The status of communication with the servo system controller can be monitored as a SSCNET III communication status.

For monitoring, set "39" (SSCNET III communication status monitor) in *Pr.52 DU/PU main display data selection* and select output voltage monitor with the PU (FR-DU07/FR-PU07/FR-PU04). (Refer to page 47.)

The figure in the *page 32* shows the status transition during communication from the motion board to the inverter. The list of SSCNET III communication status is shown on *page 33*.



- \*1 If the FR-A7AP is not mounted to the option connector 2, the inverter displays an option alarm (E.OPT). (Note that an option alarm (E.OPT) will not occur when *Pr.800 Control method selection* = "9" or *Pr.499 SSCNET III operation selection* = "9999".)
- \*2 Inverter operation mode changes to "SSCNET III operation mode" and can not be changed to external operation and PU operation. In addition, operation mode setting of the *Pr.79 Operation mode selection* is made invalid.
- \*3 Refer to *page 42* for the reset method of the inverter protective function. In addition, if the inverter protective function is reset by powering off and on the inverter power, the inverter recovers in the communication waiting condition after powering on again.

SSCNET III Communication Status	Operation	Description	
110	During initialization *	<ul style="list-style-type: none"> <li>When the power of the servo system controller turned off after SSCNET III communication establishment.</li> <li>When <i>Pr. 499 SSCNET III operation selection</i> = "9999" (Operation invalid mode).</li> </ul>	
120		When the SSCNET III communication status displays "120", possible causes are as follows. <ul style="list-style-type: none"> <li>When the inverter power is on when the servo system controller power is off.</li> <li>When an inverter failure or a communication error with the servo system controller occurs. The display of the SSCNET III communication status at this time is as follows: "120"→"130"→"140"→"120"</li> <li>When the servo system controller is in faulty.</li> <li>When initialization has never completed after powering on the power.</li> </ul>	
121		<ul style="list-style-type: none"> <li>During initial setting of the communication specifications</li> <li>When the shaft numbers set by the servo system controller and the inverter shaft number switch are not the same.</li> </ul> The display of the SSCNET III communication status at this time is as follows: "120"→"121"→"120"→"120"	
130		When communication initialization setting has completed and the inverter is in synchronization with the servo system controller.	
140		During preliminary communication with the servo system controller.	
150		During motor and encoder data communication with the servo system controller.	
160		During initial signal data communication with the servo system controller.	
180		During completion operation of initial data communication with the servo system controller.	
2##		Ready off	Ready off was received.
3##		Servo on	Servo off was received.
4##	Servo off	Servo on was received.	
800	Warning	Warning ("Minor fault"/"alarm" of the inverter alarm)	
900	Alarm	Inverter alarm ("Major fault" of the inverter alarm)	

\* During initialization, "CF" (CF warning) may be displayed on the operation panel. Moreover, "CF" and the communication status number are displayed alternately on the SSCNET III communication status monitor. (Refer to page 47 for the SSCNET III communication status monitor.)

# 5 INVERTER SETTING AND DISPLAY

## 5.1 Parameter List

The following parameters are used for the plug-in option (FR-A7NS).  
Set the values according to need.

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Refer to Page
52	DU/PU main display data selection	0, 5 to 14, 17, 18, 20, 23 to 25, 32 to 34, 39, 50 to 57, 100	1	0	47
185	JOG terminal function selection	0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 76, 9999	1	5	48
379 *1, 2	SSCNET III rotation direction selection	0, 1	1	0	46
449 *1	SSCNET III input filter setting	0 to 4	1	4	47
499 *1, 3	SSCNET III operation selection	0, 1, 9999	1	0	41
800 *4	Control method selection	0 to 5, 9, 10, 11, 12, 20	1	20	48

\*1 Parameters which can be displayed when the plug-in option (FR-A7NS) is mounted.

\*2 The setting is reflected after the CPU reset of the servo system controller or at the next power-on.

\*3 When a value set in *Pr. 499* is changed from "a value other than 9999" to "9999" or from "9999" to "a value other than 9999", the setting is reflected after the inverter reset or at the next power-on.

\*4 When a value set in *Pr. 800* is changed from "a value other than 9" to "9" or from "9" to "a value other than 9", the setting is reflected after the inverter reset or at the next power-on.



## 5.2 Operation Mode Setting

The inverter mounted with a communication option has three operation modes.

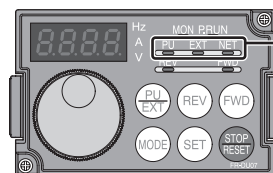
- (1) PU operation [PU]..... Controls the inverter from the key of the operation panel (FR-DU07) mounted on the inverter.
- (2) External operation [EXT] ... Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.  
(The inverter is factory-set to this mode.)
- (3) Network operation [NET] ... Controls the inverter with instructions from the network via the communication option.

*Pr. 79, Pr. 338, Pr. 339, Pr. 340 and Pr. 550 are invalid during SSCNET III operation.*

Operation mode is displayed as "NET" during SSCNET III operation.

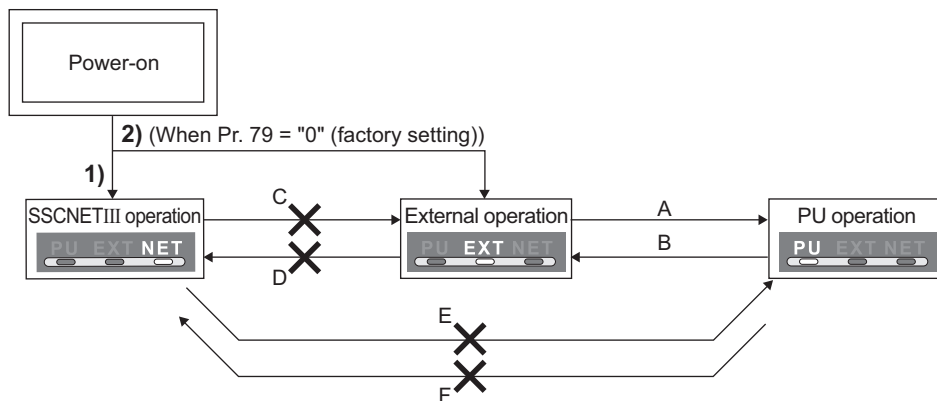
### 5.2.1 Operation mode indication

FR-DU07



Operation mode indication  
(The inverter operates according to the LED lit mode.)  
 PU: PU operation mode  
 EXT: External operation mode  
 NET: SSCNET III operation mode




## 5.2.2 Operation mode switchover method




### (1) Starting operation mode

Symbol	Switchover Type	Switchover Method
1)	SSCNET III operation mode	Turning on the servo system controller and inverter power with the FR-A7NS and FR-A7AP mounted starts the inverter in SSCNET III operation mode, starting initialize communication from the servo system controller. SSCNET III operation is enabled at completion of initialize communication. (When initialized communication has not completed, the inverter displays [ F . )
2)	External operation (Pr. 79 = 0 (factory setting))	Powering on the inverter without the FR-A7NS mounted starts the inverter in external operation mode.

## (2) Operation mode switchover (When Pr. 79 = "0")

Symbol	Switchover Type	Switchover Method
A	External operation → PU operation	Press the  of the PU (FR-DU07/FR-PU07/FR-PU04)
B	PU operation → External operation	
C	SSCNET III operation → External operation	<ul style="list-style-type: none"> <li>The operation mode can not be switched in power-on status. After powering off the inverter, remove the FR-A7NS, then power on the inverter again.</li> <li>Set "9999" in Pr.499 SSCNET III operation selection. Then, restart the inverter again by making a power-on reset or reset using the RES signal.</li> </ul>
D	External operation → SSCNET III operation	The operation mode can not be switched in power-on status. After powering off the inverter, mount the FR-A7NS to the option connector 3 and FR-A7AP to the option connector 2, then power on the inverter again.
E	SSCNET III operation → PU operation	<ul style="list-style-type: none"> <li>The operation mode can not be switched in power-on status. After powering off the inverter, remove the FR-A7NS, then power on the inverter again. Then, press the  of the PU (FR-DU07/FR-PU07/FR-PU04).</li> <li>Set "9999" in Pr.499 SSCNET III operation selection, then restart the inverter by making a power-on reset or resetting the inverter using the RES signal. Then, press the  of the PU (FR-DU07/FR-PU07/FR-PU04).</li> </ul>
F	PU operation → SSCNET III operation	The operation mode can not be switched in power-on status. After powering off the inverter, mount the FR-A7NS to the option connector 3 and FR-A7AP to the option connector 2, then power on the inverter again.

### CAUTION

- In the SSCNET III operation mode, the *Pr. 79 Operation mode selection* setting is invalid.
- Changes in the shaft number are reflected only at the next power-on. Therefore, if the shaft number is changed, make sure to power off and on the inverter power.
- Even if SSCNET III operation is being performed,  of the PU (FR-DU07/FR-PU07) can be used to make a stop (when *Pr. 75 Reset selection/disconnected PU detection/PU stop selection* = "14 (factory setting) to 17"). At this time, the deceleration time is 0s. Refer to the inverter manual for *Pr. 75*.  
In addition, "P5" is displayed in the PU. However, an alarm output is not provided. (Refer to page 74.)

### REMARKS

During SSCNET III operation, "NET" is displayed to indicate the operation mode.

## 5.3 Operation at Communication Error Occurrence

### 5.3.1 Alarm and measures

(1) The inverter operates as follows at alarm occurrences.

Alarm Location	Status		Operation Mode		
			SSCNET III Operation	External Operation	PU Operation
Inverter	Inverter operation		<b>Inverter trip</b>	Inverter trip	Inverter trip
	Data communication		<b>Continued</b>	Continued	Continued
Communication line	Inverter operation		<b>Inverter trip</b>	Continued	Continued
	Data communication		<b>Stop</b>	Stop	Stop
Communication option	Communication option connection error	Inverter operation	<b>Inverter trip</b>	Inverter trip	Inverter trip
		Data communication	<b>Continued</b>	Continued	Continued
	Error of communication option itself	Inverter operation	<b>Inverter trip</b>	Continued	Continued
		Data communication	<b>Stop</b>	Stop	Stop

(2) Measures at alarm occurrences

Alarm Indication	Alarm Definition	Measures
E.OP3	Communication line error	Inspect the master. (Refer to page 76.)
E.1, E.2	Option alarm	Fit the communication option in the option connector 3. (Refer to page 14.)
E.3		Check the connection between the inverter and option unit for poor contact, etc. and remove the cause of the error. (Refer to page 14.)

When alarms other than the above are displayed, refer to the inverter manual and remove the cause of the alarm.

## **5.4 Inverter Reset**

The following inverter reset is enabled during SSCNET III communication (SSCNET III operation mode).

- Reset from the servo system controller at inverter alarm (Reset can be made only when the protective function of the inverter is activated.)
- CPU reset of the servo system controller
- Turn on the terminal RES (RES signal)
- Switch off inverter power
- Inverter reset from the PU
- Reset from the PU/DU at inverter alarm

### **REMARKS**

Refer to *Pr. 499 SSCNET III operation selection (page 41)* for the operation of inverter reset from the servo system controller.

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### **CAUTION**

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- **When the inverter reset occurs with the FR-A7NS mounted, the inverter restarts in the SSCNET III operation mode in the initial status.**
  - **The inverter can not be controlled for about 1s after release of a reset command .**
- 
-

## 5.5 Setting SSCNET III communication function

### 5.5.1 Pr.499 SSCNET III operation selection

Operation at occurrence of communication disconnection can be selected and operation mode during SSCNET III communication can be disabled.

Pr.499 Setting	Operation mode	SSCNET III Operation at communication disconnection	Alarm reset by CPU reset of the servo system controller	Description
0 (initial value)	Normal operation mode	Output shutoff (coasting) *1	Valid	*1 The inverter output is shutoff at occurrence of communication disconnection. (If a communication disconnection occurs after the inverter alarm is activated, reset the inverter.)
1		Output shutoff (coasting) → communication option alarm (E.OP3) *2	Invalid	*2 The inverter output is shutoff at occurrence of communication disconnection, and the communication option alarm (E.OP3) is displayed. (Refer to page 76) (Inverter reset is necessary to restart inverter operation.)
9999	Operation invalid mode *3	—	—	*3 SSCNET III communication is invalid. (The inverter operates as same as when the FR-A7NS is not mounted.) Since mounting the FR-A7NS restricts the inverter operation mode, parameters, etc., set "9999" to cancel the restrictions applied by the FR-A7NS. (Communication is made valid after inverter reset.)

#### REMARKS

- If communication data is in a CRC error etc., communication option alarm (E.OP3) occurs regardless of the Pr. 499 setting.
- Refer to page 42 for the reset method of the inverter alarm.
- "E.OP3" is displayed at occurrence of communication disconnection if "1" is set in Pr. 499 SSCNET III operation selection. If "E.OP3" cannot be reset with the inverter reset, reset the CPU of the servo controller system.

● Reset method of the inverter alarm

The reset methods of the inverter alarm are as follows: (O: Valid, ×: Invalid)

- When Pr. 499 = "0 (initial value)"

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.OC3 *1	Overcurrent shut-off	○	○	○
E.OV3 *1	Regenerative overvoltage shut-off	○	○	○
E.THT *1	Inverter overload shut-off (electronic thermal relay function)	○	○	○
E.THM *1	Motor overload shut-off (electronic thermal relay function)	○	○	○
E.FIN	Fin overheat	○	○	○
E.IPF	Instantaneous power failure	○	○	○
E.UVT	Undervoltage	○	○	○
E.ILF	Input phase failure	○	×	×
E.OLT *1	Stall prevention	○	○	○
E.BE	Brake transistor alarm detection	○	×	×

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.GF	Output side earth (ground) fault overcurrent	○	×	×
E.LF	Output phase failure	○	×	×
E.OHT *1	External thermal relay operation	○	○	○
E.PTC *1	PTC thermistor operation	○	○	○
E.OPT	Option alarm	○	×	×
E.OP3	Communication option alarm	○	○	○
E.PE	Parameter storage device alarm	○	×	×
E.PUE	PU disconnection	○	○	○
E.PE2	Parameter storage device alarm	○	×	×
E.CPU	CPU error	○	×	×



Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	○	×	×
E.P24	24VDC power output short circuit	○	×	×
E.CDO	Output current detection value exceeded	○	○	○
E.IOH	Inrush current limit circuit alarm	○	×	×
E.SER	Communication error (inverter)	○	○	○
E.AIE	Analog input error	○	×	×
E.USB	USB communication error	○	○	○
E.OS	Overspeed occurrence	○	○	○
E.OSD	Speed deviation excess detection	○	○	○
E.ECT	Open cable detection	○	×	×
E.OD	Excessive position error	○	○	○

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.EP	Encoder phase error	○	×	×
E.1	Option alarm	○	×	×
E.2		○	×	×
E.3		○	×	×
E.6	CPU error	○	×	×
E.7		○	×	×

- When Pr. 499 = "1"

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.OC3 *1	Overcurrent shut-off	○	○	×
E.OV3 *1	Regenerative overvoltage shut-off	○	○	×
E.THT *1	Inverter overload shut-off (electronic thermal relay function)	○	○	×
E.THM *1	Motor overload shut-off (electronic thermal relay function)	○	○	×
E.FIN	Fin overheat	○	○	×
E.IPF	Instantaneous power failure	○	○	×
E.UVT	Undervoltage	○	○	×
E.ILF	Input phase failure	○	○	×
E.OLT *1	Stall prevention	○	○	×
E.BE	Brake transistor alarm detection	○	○	×
E.GF	Output side earth (ground) fault overcurrent	○	○	×

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.LF	Output phase failure	○	○	×
E.OHT *1	External thermal relay operation	○	○	×
E.PTC *1	PTC thermistor operation	○	○	×
E.OPT	Option alarm	○	○	×
E.OP3	Communication option alarm	○	○	×
E.PE	Parameter storage device alarm	○	○	×
E.PUE	PU disconnection	○	○	×
E.PE2	Parameter storage device alarm	○	○	×
E.CPU	CPU error	○	○	×
E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	○	○	×

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.P24	24VDC power output short circuit	○	○	×
E.CDO	Output current detection value exceeded	○	○	×
E.IOH	Inrush current limit circuit alarm	○	○	×
E.SER	Communication error (inverter)	○	○	×
E.AIE	Analog input error	○	○	×
E.USB	USB communication error	○	○	×
E.OS	Overspeed occurrence	○	○	×
E.OSD	Speed deviation excess detection	○	○	×
E.ECT	Open cable detection	○	○	×
E.OD	Excessive position error	○	○	×
E.EP	Encoder phase error	○	○	×

Display	Name	Inverter Reset *2	Servo System Controller	
			Error Reset	CPU Reset
E.1	Option alarm	○	○	×
E.2		○	○	×
E.3		○	○	×
E.6	CPU error	○	○	×
E.7		○	○	×

\*1 Before resetting the inverter alarm, remove the cause of the error and wait until the motor cools down.

\*2 The inverter can be reset by powering off and on the power, turning on the terminal RES (RES signal), or

pressing the  key on the PU.

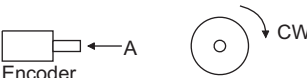
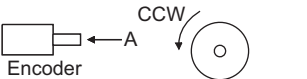
### 5.5.2 Pr.379 SSCNET III rotation direction selection

The rotation direction of the motor can be changed.

Before setting *Pr.379 SSCNET III rotation direction selection*, always match the *Pr.359 Encoder rotation direction* setting (0/1) and rotation direction (CW/CCW) of the encoder as viewed from the load side of the motor.

Pr.359 Setting	Pr.379 Setting	Motor rotation direction (as viewed from the load side) *	
		When positioning address becomes greater	When positioning address becomes smaller
1 (initial value)	0 (initial value)	CCW	CW
	1	CW	CCW
0	0 (initial value)	CW	CCW
	1	CCW	CW

\* The motor direction (CW, CCW) is as follows:

Motor Rotation Direction	Description
CW	 <p>Encoder Clockwise direction as viewed from A is forward rotation</p>
CCW	 <p>Encoder Counter clockwise direction as viewed from A is forward rotation</p>

### 5.5.3 Pr.449 SSCNET III input filter setting

Filter to the following input signal can be selected using position feed filter.

- Upper stroke limit (when Pr.178 STF terminal function selection = "60 (initial value)")
- Lower stroke limit (when Pr.179 STR terminal function selection = "61 (initial value)")
- Proximity dog input (when Pr.185 JOG terminal function selection = "76")

Pr.449 Setting	Input signal filter (maximum)
0	Disabled (0.88ms sampling)
1	0.88ms
2	1.77ms
3	2.66ms
4 (initial value)	3.55ms

\* Change in the Pr.449 setting is immediately reflected.

### 5.5.4 Pr.52 DU/PU main display data selection

SSCNET III communication status can be selected for the PU (FR-DU07/FR-PU07) display.

To display it, set "39" in Pr. 52 and select the voltage monitor (third monitor). Refer to *page 31* for the SSCNET III communication status.

At the occurrence of the CF warning, the SSCNET III communication status and "CF" are displayed alternately. (*Refer to page 73* for CF warning.)

Parameter Number	Name	Setting Range	Remarks
52	DU/PU main display data selection	0, 5 to 14, 17, 18, 20, 23 to 25, 32 to 34, 39, 50 to 57, 100	When "39" is set, "SSCNET III communication status monitor" is displayed instead of the voltage monitor.

#### REMARKS

For the set values of other than "39", refer to the inverter manual.

### 5.5.5 Pr.185 JOG terminal function selection

To make a home position return using a dog for SSCNET III communication, set "76" (proximity dog) in Pr.185.

Parameter Number	Name	Setting Range	REMARKS
185	JOG terminal function selection	0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 76, 9999	When "76" is set, the DOG signal can be input to the servo system controller through the JOG terminal of the inverter.

#### REMARKS

For the set values of other than "76", refer to the inverter manual.

### 5.5.6 Pr.800 Control method selection

Specifications of *Pr.800 Control method selection* when the FR-A7NS is mounted are as follows.

<Selection of control method>

Pr.800 Setting *1	Control Method	Control Mode (speed, torque, position)	Operation without Motor
0 to 5, 10, 11, 12, 20	Vector control	As commanded from the servo system controller	Invalid
9	Vector control test operation *2, 3		Valid

\*1 When a value set in *Pr. 800* is changed from "a value other than 9" to "9" or from "9" to "a value other than 9", reset the inverter. The setting value is valid after resetting the inverter.

\*2 When "9" is set in *Pr. 800*, test operation is enabled without motor.

\*3 When "9" (vector control test operation) is set in *Pr. 800*, it is recommended to set "0" in *Pr. 880 load inertia ratio*. Refer to *FR-A700 Instruction Manual (Applied)* for details of *Pr. 880*.

# 6 RESTRICTIONS ON THE FUNCTIONS

## 6.1 Function Restriction List

The inverter functions made invalid during SSCNET III operation are shown in the table below.

No.	Function Name	Description
1	V/f control, adjustable 5 points V/f, advanced magnetic flux vector control	Inverter operation from the servo system controller allows speed control, torque control and position control under vector control only.
2	Multi-speed operation, JOG operation, remote setting function, PID control, override function, pulse train input	Since speed command is given directly from the servo system controller, speed commands stated on the left are not used for SSCNET III operation.
3	Acceleration/deceleration time, acceleration/deceleration pattern, backlash function	The servo system controller performs cushion processing and provides an acceleration/deceleration pattern to give position and speed commands. Functions are invalid as the inverter always follows the commands from SSCNET III communication.
4	DC injection brake, starting speed	Since a signal for on/off of excitation is given from the servo system controller and the inverter follows the commands from the servo system controller even at acceleration start and during deceleration stop, functions are invalid.
5	Minimum setting, frequency jump, speed display, speed setting, automatic acceleration/deceleration, energy-saving control, brake sequency function, orientation function, deceleration detection function, speed setting filter, torque setting fileter, torque bias function, failure definition, speed limit (runaway prevention)	As the servo system controller performs processing to decide the motor operation, functions are invalid.

## RESTRICTIONS ON THE FUNCTIONS

No.	Function Name	Description
6	Offline auto tuning	As offline auto tuning is performed with the inverter alone, the inverter does not follow commands from the SSCNET III communication. (Perform tuning before operation using SSCNET III communication.)
7	RT signal reflection timing selection, second motor, second and third acceleration/deceleration time, second motor speed control gain	Since SSCNET III communication operation uses only the first motor, the second and third functions are made invalid. (Note that only the second and third output frequency detection are valid.)
8	Selection function related to position control other than SSCNET III	Functions related to position control irrelevant to SSCNET III, such as parameter position control and position command selection, are invalid.
9	Control method selection, torque command, torque command source selection, speed limit during torque control, torque limit input method selection, torque limit level during acceleration/deceleration	As speed, position, and torque control can be switched by the communication data of SSCNET III, control method selection is invalid. As the inverter follows the command given from the servo system controller side during SSCNET III operation, torque command is invalid.
10	Operation mode selection	SSCNET III operation mode set at powering on the inverter (mode can not be changed to other operation mode). When initialized communication from the servo system controller is completed during SSCNET III communication, the inverter operates in accordance with the command from the servo system controller.
11	Forward rotation start, reverse rotation start	Commands from the STF signal and STR signal are made invalid. (Turning on the servo starts excitation)
12	Operation command source, speed command source	Operation command source/speed command source are all invalid, as they are given from the servo system controller side.



No.	Function Name	Description
13	Communication startup mode selection	Invalid as SSCNET III operation mode is always selected when the FR-A7NS is mounted.
14	Magnetic flux command	Analog command is invalid.
15	Stall prevention level and stall prevention operation level at 0V input (includes fast response stall prevention)	Invalid as the inverter follows the commands from SSCNET III operation.
16	Sequence function, electronic bypass sequence function	Functions are used with the inverter alone and the inverter does not follow commands from the SSCNET III operation.
17	Automatic restart after instantaneous power failure operation, retry function, power failure stop function, load torque high speed frequency control	Invalid as the inverter follows the commands from SSCNET III operation.
18	I/O signal, analog input (terminal1, terminal2, terminal4, terminal6 *)	I/O signal used for other communication is not compatible and only the inverter complies. Since analog input is not accepted, input value monitor is 0%.
19	Communication EEPROM write selection	As the data is updated every time, writing running frequency to EEPROM is made disabled to protect EEPROM.
20	Parameter clear	Not available as same as the servo amplifier.
21	Deceleration during torque limit operation under speed control	For operation of the inverter alone, when deceleration is started during torque control, speed command is matched to the actual speed before deceleration. However, the speed command is not matched during SSCNET III operation. (The inverter follows the speed command from SSCNET III communication.)

\* Terminal 6 can be used only when used with the FR-A7AZ.

## 6.2 Inverter Parameter List

Inverter parameters made valid/invalid during SSCNET III communication operation are as follows.

○ indicates the valid parameter, and × the invalid parameter.

Symbols in the table indicate parameters which function when an option is mounted.

**AX** ..... FR-A7AX, **AY** ..... FR-A7AY, **AR** ..... FR-A7AR, **AP** ..... FR-A7AP, **AZ** ..... FR-A7AZ

Parameter	Name	Function Validity
0	Torque boost	×
1	Maximum frequency	○
2	Minimum frequency	×
3	Base frequency	×
4	Multi-speed setting (high speed)	×
5	Multi-speed setting (middle speed)	×
6	Multi-speed setting (low speed)	×
7	Acceleration time	×
8	Deceleration time	×
9	Electronic thermal O/L relay	○
10	DC injection brake operation frequency	×
11	DC injection brake operation time	×
12	DC injection brake operation voltage	×
13	Starting frequency	×
14	Load pattern selection	×
15	Jog frequency	×

Parameter	Name	Function Validity
16	Jog acceleration/deceleration time	×
17	MRS input selection	○
18	High speed maximum frequency	×
19	Base frequency voltage	×
20	Acceleration/deceleration reference frequency	×
21	Acceleration/deceleration time increments	×
22	Stall prevention operation level (Torque limit level )	○
23	Stall prevention operation level compensation factor at double speed	×
24	Multi-speed setting (speed 4)	×
25	Multi-speed setting (speed 5)	×
26	Multi-speed setting (speed 6)	×
27	Multi-speed setting (speed 7)	×
28	Multi-speed input compensation selection	×
29	Acceleration/deceleration pattern selection	×

Parameter	Name	Function Validity
30	Regenerative function selection	○
31	Frequency jump 1A	×
32	Frequency jump 1B	×
33	Frequency jump 2A	×
34	Frequency jump 2B	×
35	Frequency jump 3A	×
36	Frequency jump 3B	×
37	Speed display	○
41	Up-to-frequency sensitivity	×
42	Output frequency detection	○
43	Output frequency detection for reverse rotation	○
44	Second acceleration/deceleration time	×
45	Second deceleration time	×
46	Second torque boost	×
47	Second V/F (base frequency)	×
48	Second stall prevention operation current	×
49	Second stall prevention operation frequency	×
50	Second output frequency detection	○
51	Second electronic thermal O/L relay	×
52	DU/PU main display data selection	○

Parameter	Name	Function Validity
54	FM terminal function selection	○
55	Frequency monitoring reference	○
56	Current monitoring reference	○
57	Restart coasting time	×
58	Restart cushion time	×
59	Remote function selection	×
60	Energy saving control selection	×
61	Reference current	×
62	Reference value at acceleration	×
63	Reference value at deceleration	×
64	Starting frequency for elevator mode	×
65	Retry selection	×
66	Stall prevention operation reduction starting frequency	×
67	Number of retries at alarm occurrence	×
68	Retry waiting time	×
69	Retry count display erase	×
70	Special regenerative brake duty	○
71	Applied motor	○
72	PWM frequency selection	○
73	Analog input selection	×

## RESTRICTIONS ON THE FUNCTIONS

Parameter	Name	Function Validity
74	Input filter time constant	×
75	Reset selection/disconnected PU detection/PU stop selection	○
76	Alarm code output selection	○
77 *1	Parameter write selection	○
78	Reverse rotation prevention selection	○
79 *1	Operation mode selection	×
80	Motor capacity	○
81	Number of motor poles	○
82	Motor excitation current	○
83	Motor rated voltage	○
84	Rated motor frequency	○
89	Speed control gain (magnetic flux vector)	×
90	Motor constant (R1)	○
91	Motor constant (R2)	○
92	Motor constant (L1)	○
93	Motor constant (L2)	○
94	Motor constant (X)	○
95	Online auto tuning selection	○
96	Auto tuning setting/status	×

Parameter	Name	Function Validity
100	V/F1(first frequency)	×
101	V/F1(first frequency voltage)	×
102	V/F2(second frequency)	×
103	V/F2(second frequency voltage)	×
104	V/F3(third frequency)	×
105	V/F3(third frequency voltage)	×
106	V/F4(fourth frequency)	×
107	V/F4(fourth frequency voltage)	×
108	V/F5(fifth frequency)	×
109	V/F5(fifth frequency voltage)	×
110	Third acceleration/deceleration time	×
111	Third deceleration time	×
112	Third torque boost	×
113	Third V/F (base frequency)	×
114	Third stall prevention operation current	×
115	Thrid stall prevention operation frequency	×
116	Third output frequency detection	○
117	PU communication station number	○
118	PU communication speed	○
119	PU communication stop bit length	○
120	PU communication parity check	○

Parameter	Name	Function Validity
121	Number of PU communication retries	○
122	PU communication check time interval	○
123	PU communication waiting time setting	○
124	PU communication CR/LF presence/absence selection	○
125	Terminal 2 frequency setting gain frequency	×
126	Terminal 4 frequency setting gain frequency	×
127	PID control automatic switchover frequency	×
128	PID action selection	×
129	PID proportional band	×
130	PID integral time	×
131	PID upper limit	×
132	PID lower limit	×
133	PID action set point	×
134	PID differential time	×
135	Electronic bypass sequence selection	×
136	MC switchover interlock time	×
137	Start waiting time	×
138	Bypass selection at an alarm	×
139	Automatic switchover frequency from inverter to bypass operation	×

Parameter	Name	Function Validity
140	Backlash acceleration stopping frequency	×
141	Backlash acceleration stopping time	×
142	Backlash deceleration stopping frequency	×
143	Backlash deceleration stopping time	×
144	Speed setting switchover	○
145	PU display language selection	○
148	Stall prevention level at 0V input	×
149	Stall prevention level at 10V input	×
150	Output current detection level	○
151	Output current detection signal delay time	○
152	Zero current detection level	○
153	Zero current detection time	○
154	Voltage reduction selection during stall prevention operation	×
155	RT signal function validity condition selection	×
156	Stall prevention operation selection	○
157	OL signal output timer	○
158	AM terminal function selection	○
159	Automatic switchover frequency range from bypass to inverter operation	×
160	User group read selection	○

## RESTRICTIONS ON THE FUNCTIONS

Parameter	Name	Function Validity
161	Frequency setting/key lock operation selection	○
162	Automatic restart after instantaneous power failure selection	×
163	First cushion time for restart	×
164	First cushion voltage for restart	×
165	Stall prevention operation level for restart	×
166	Output current detection signal retention time	○
167	Output current detection operation selection	○
170	Watt-hour meter clear	○
171	Operation hour meter clear	○
172	User group registered display/batch clear	×
173	User group registration	×
174	User group clear	×
178 *2	STF terminal function selection	○
179 *2	STR terminal function selection	○
180 *2	RL terminal function selection	○
181 *2	RM terminal function selection	○
182 *2	RH terminal function selection	○
183 *2	RT terminal function selection	○
184 *2	AU terminal function selection	○
185 *2	JOG terminal function selection	○

Parameter	Name	Function Validity
186 *2	CS terminal function selection	○
187 *2	MRS terminal function selection	○
188 *2	STOP terminal function selection	○
189 *2	RES terminal function selection	○
190 *2	RUN terminal function selection	○
191 *2	SU terminal function selection	○
192 *2	IPF terminal function selection	○
193 *2	OL terminal function selection	○
194 *2	FU terminal function selection	○
195 *2	ABC1 terminal function selection	○
196 *2	ABC2 terminal function selection	○
232	Multi-speed setting (speed 8)	×
233	Multi-speed setting (speed 9)	×
234	Multi-speed setting (speed 10)	×
235	Multi-speed setting (speed 11)	×
236	Multi-speed setting (speed 12)	×
237	Multi-speed setting (speed 13)	×
238	Multi-speed setting (speed 14)	×
239	Multi-speed setting (speed 15)	×
240	Soft-PWM operation selection	○
241	Analog input display unit switchover	×

Parameter	Name	Function Validity
242	Terminal 1 added compensation amount (terminal 2)	×
243	Terminal 1 added compensation amount (terminal 4)	×
244	Cooling fan operation selection	○
245	Rated slip	×
246	Slip compensation time constant	×
247	Constant-power region slip compensation selection	×
250	Stop selection	×
251	Output phase failure protection selection	○
252	Override bias	×
253	Override gain	×
255	Life alarm status display	○
256	Inrush current limit circuit life display	○
257	Control circuit capacitor life display	○
258	Main circuit capacitor life display	○
259	Main circuit capacitor life measuring	○
260	PWM frequency automatic switchover	○
261	Power failure stop selection	×
262	Subtracted frequency at deceleration start	×
263	Subtraction starting frequency	×
264	Power-failure deceleration time 1	×

Parameter	Name	Function Validity
265	Power-failure deceleration time 2	×
266	Power failure deceleration time switchover frequency	×
267	Terminal 4 input selection	×
268	Monitor decimal digits selection	○
270	Stop-on contact/load torque high-speed frequency control selection	×
271	High-speed setting maximum current	×
272	Middle-speed setting minimum current	×
273	Current averaging range	×
274	Current averaging filter time constant	×
275	Stop-on contact excitation current low-speed multiplying factor	×
276	PWM carrier frequency at stop-on contact	×
278	Brake opening frequency	×
279	Brake opening current	×
280	Brake opening current detection time	×
281	Brake operation time at start	×
282	Brake operation frequency	×
283	Brake operation time at stop	×
284	Deceleration detection function selection	×
285	Overspeed detection frequency (Excessive speed deviation detection frequency)	×

## RESTRICTIONS ON THE FUNCTIONS

Parameter	Name	Function Validity
286	Droop gain	○
287	Droop filter time constant	○
288	Droop function activation selection	○
291	Pulse train I/O selection	○ *6
292	Automatic acceleration/deceleration	×
293	Acceleration/deceleration time individual calculation selection	×
294	UV avoidance voltage gain	×
299	Rotation direction detection selection at restarting	×
300	BCD input bias <input type="checkbox"/> AX	×
301	BCD input gain <input type="checkbox"/> AX	×
302	BIN input bias <input type="checkbox"/> AX	×
303	BIN input gain <input type="checkbox"/> AX	×
304	Digital input and analog input compensation enable/disable selection <input type="checkbox"/> AX	×
305	Read timing operation selection <input type="checkbox"/> AX	×
306 *2	Analog output signal selection <input type="checkbox"/> AY	○
307	Setting for zero analog output <input type="checkbox"/> AY	○
308	Setting for maximum analog output <input type="checkbox"/> AY	○
309	Analog output signal voltage/current switchover <input type="checkbox"/> AY	○

Parameter	Name	Function Validity
310	Analog meter voltage output selection <input type="checkbox"/> AY	○
311	Setting for zero analog meter voltage output <input type="checkbox"/> AY	○
312	Setting for maximum analog meter voltage output <input type="checkbox"/> AY	○
313 *2	DO0 output selection <input type="checkbox"/> AY	○
314 *2	DO1 output selection <input type="checkbox"/> AY	○
315 *2	DO2 output selection <input type="checkbox"/> AY	○
316 *2	DO3 output selection <input type="checkbox"/> AY	○
317 *2	DO4 output selection <input type="checkbox"/> AY	○
318 *2	DO5 output selection <input type="checkbox"/> AY	○
319 *2	DO6 output selection <input type="checkbox"/> AY	○
320 *2	RA1 output selection <input type="checkbox"/> AR	○
321 *2	RA2 output selection <input type="checkbox"/> AR	○
322 *2	RA3 output selection <input type="checkbox"/> AR	○
323	AM0 0V adjustment <input type="checkbox"/> AY	○
324	AM1 0mA adjustment <input type="checkbox"/> AY	○
329	Digital input unit selection <input type="checkbox"/> AX	×
331	RS-485 communication station	×
332	RS-485 communication speed	×
333	RS-485 communication stop bit length	×



Parameter	Name	Function Validity
334	RS-485 communication parity check selection	×
335	RS-485 communication retry count	×
336	RS-485 communication check time interval	×
337	RS-485 communication waiting time setting	×
338	Communication operation command source	×
339	Communication speed command source	×
340	Communication startup mode selection	×
341	RS-485 communication CR/LF selection	×
342	Communication EEPROM write selection	○ +7
343	Communication error count	×
349	Communication reset selection	×
350	Stop position command selection [AP]	×
351	Orientation speed [AP]	×
352	Creep speed [AP]	×
353	Creep switchover position [AP]	×
354	Position loop switchover position [AP]	×
355	DC injection brake start position [AP]	×
356	Internal stop position command [AP]	×
357	Orientation in-position zone [AP]	×
358	Servo torque selection [AP]	×

Parameter	Name	Function Validity
359	Encoder rotation direction [AP]	○
360	16 bit data selection [AP]	×
361	Position shift [AP]	×
362	Orientation position loop gain [AP]	×
363	Completion signal output delay time [AP]	×
364	Encoder stop check time [AP]	×
365	Orientation limit [AP]	×
366	Recheck time [AP]	×
367	Speed feedback range [AP]	×
368	Feedback gain [AP]	×
369	Number of encoder pulses [AP]	○
374	Overspeed detection level [AP]	○
376	Encoder signal loss detection enable/disable selection [AP]	○
379	SSCNET III rotation direction selection	○
380	Acceleration S-pattern 1	×
381	Deceleration S-pattern 1	×
382	Acceleration S-pattern 2	×
383	Deceleration S-pattern 2	×
384	Input pulse division scaling factor	×
385	Frequency for 0 input pulse	×

## RESTRICTIONS ON THE FUNCTIONS

Parameter	Name	Function Validity
386	Frequency for maximum input pulse	×
393	Orientation selection <span>[AP]</span>	×
396	Orientation speed gain (P term) <span>[AP]</span>	×
397	Orientation speed integral time <span>[AP]</span>	×
398	Orientation speed gain (D term) <span>[AP]</span>	×
399	Orientation deceleration ratio <span>[AP]</span>	×
406	High resolution analog input selection <span>[AZ]</span>	×
407	Motor temperature detection filter <span>[AZ]</span>	○
408	Motor thermistor selection <span>[AZ]</span>	○
414 *3	PLC function operation selection	×
415 *3	Inverter operation lock mode setting	×
416 *3	Pre-scale function selection	×
417 *3	Pre-scale setting value	×
419	Position command source selection <span>[AP]</span>	×
420	Command pulse scaling factor numerator <span>[AP]</span>	×
421	Command pulse scaling factor denominator <span>[AP]</span>	×
422	Position loop gain <span>[AP]</span>	○
423	Position feed forward gain <span>[AP]</span>	○

Parameter	Name	Function Validity
424	Position command acceleration/ deceleration time constant <span>[AP]</span>	×
425	Position feed forward command filter <span>[AP]</span>	○
426	In-position width <span>[AP]</span>	○
427	Excessive level error <span>[AP]</span>	○
428	Command pulse selection <span>[AP]</span>	×
429	Clear signal selection <span>[AP]</span>	×
430	Pulse monitor selection <span>[AP]</span>	○
447	Digital torque command bias <span>[AX]</span>	×
448	Digital torque command gain <span>[AX]</span>	×
449	SSCNET III input filter setting	○
450	Second applied motor	×
451	Second motor control method selection	×
453	Second motor capacity	×
454	Number of second motor poles	×
455	Second motor excitation current	×
456	Rated second motor voltage	×
457	Rated second motor frequency	×
458	Second motor constant (R1)	×
459	Second motor constant (R2)	×
460	Second motor constant (L1)	×

Parameter	Name	Function Validity
461	Second motor constant (L2)	×
462	Second motor constant (X)	×
463	Second motor auto tuning setting/status	×
464	Digital position control sudden stop deceleration time [AP]	×
465	First position feed amount lower 4 digits [AP]	×
466	First position feed amount upper 4 digits [AP]	×
467	Second position feed amount lower 4 digits [AP]	×
468	Second position feed amount upper 4 digits [AP]	×
469	Third position feed amount lower 4 digits [AP]	×
470	Third position feed amount upper 4 digits [AP]	×
471	Fourth position feed amount lower 4 digits [AP]	×
472	Fourth position feed amount upper 4 digits [AP]	×
473	Fifth position feed amount lower 4 digits [AP]	×
474	Fifth position feed amount upper 4 digits [AP]	×
475	Sixth position feed amount lower 4 digits [AP]	×
476	Sixth position feed amount upper 4 digits [AP]	×
477	Seventh position feed amount lower 4 digits [AP]	×
478	Seventh position feed amount upper 4 digits [AP]	×
479	Eighth position feed amount lower 4 digits [AP]	×
480	Eighth position feed amount upper 4 digits [AP]	×

Parameter	Name	Function Validity
481	Ninth position feed amount lower 4 digits [AP]	×
482	Ninth position feed amount upper 4 digits [AP]	×
483	Tenth position feed amount lower 4 digits [AP]	×
484	Tenth position feed amount upper 4 digits [AP]	×
485	Eleventh position feed amount lower 4 digits [AP]	×
486	Eleventh position feed amount upper 4 digits [AP]	×
487	Twelfth position feed amount lower 4 digits [AP]	×
488	Twelfth position feed amount upper 4 digits [AP]	×
489	Thirteenth position feed amount lower 4 digits [AP]	×
490	Thirteenth position feed amount upper 4 digits [AP]	×
491	Fourteenth position feed amount lower 4 digits [AP]	×
492	Fourteenth position feed amount upper 4 digits [AP]	×
493	Fifteenth position feed amount lower 4 digits [AP]	×
494	Fifteenth position feed amount upper 4 digits [AP]	×
495	Remote output selection	○
496	Remote output data 1	○
497	Remote output data 2	○
498 *3	PLC function flash memory clear	×
499	SSCNET III operation selection	○
500	Communication error execution waiting time	×

## RESTRICTIONS ON THE FUNCTIONS

















Parameter	Name	Function Validity
501	Communication error occurrence count display	×
502	Stop mode selection at communication error	×
503	Maintenance timer	○
504	Maintenance timer alarm output set time	○
505	Speed setting reference	○
506 *3	Parameter 1 for user	×
507 *3	Parameter 2 for user	×
508 *3	Parameter 3 for user	×
509 *3	Parameter 4 for user	×
510 *3	Parameter 5 for user	×
511 *3	Parameter 6 for user	×
512 *3	Parameter 7 for user	×
513 *3	Parameter 8 for user	×
514 *3	Parameter 9 for user	×
515 *3	Parameter 10 for user	×
516	S-pattern time at a start of acceleration	×
517	S-pattern time at a completion of acceleration	×
518	S-pattern time at a start of deceleration	×
519	S-pattern time at a completion of deceleration	×



Parameter	Name	Function Validity
539	Modbus-RTU communication check time interval	×
547	USB communication station number	×
548	USB communication check time interval	×
549	Protocol selection	×
550	NET mode operation command source selection	×
551	PU mode operation command source selection	×
555	Current average time	○
556	Data output mask time	○
557	Current average value monitor signal output reference current	○
563	Energization time carrying-over times	○
564	Operating time carrying-over times	○
569	Second motor speed control gain	×
570	Multiple rating setting	○
571	Holding time at a start	×
573 *3	4mA input check selection	×
574	Second motor online auto tuning	×
575	Output interruption detection time	×
576	Output interruption detection level	×
577	Output interruption cancel level	×

Parameter	Name	Function Validity
592 *4	Traverse function selection	×
593 *4	Maximum amplitude amount	×
594 *4	Amplitude compensation amount during deceleration	×
595 *4	Amplitude compensation amount during acceleration	×
596 *4	Amplitude acceleration time	×
597 *4	Amplitude deceleration time	×
598 *5	Undervoltage level	○
611	Acceleration time at a restart	×
665	Regeneration avoidance frequency gain	×
684	Tuning data increments switchover	○
800	Control method selection	×
802	Pre-excitation selection <input type="checkbox"/> AP	○
803	Constant power range torque characteristic selection	○
804	Torque command source selection	×
805	Torque command value (RAM)	×
806	Torque command value (RAM,EEPROM)	×
807	Speed limit selection	×
808	Forward rotation speed limit	×
809	Reverse rotation speed limit	×

Parameter	Name	Function Validity
810	Torque limit input method selection	×
811	Set resolution switchover	× *8
812	Torque limit level (regeneration)	×
813	Torque limit level (3rd quadrant)	×
814	Torque limit level (4th quadrant)	×
815	Torque limit level 2	×
816	Torque limit level during acceleration	×
817	Torque limit level during deceleration	×
818	Easy gain tuning response level setting	○
819	Easy gain tuning selection	○
820	Speed control P gain 1	○
821	Speed control integral time 1	○
822	Speed setting filter 1	○
823	Speed detection filter 1 <input type="checkbox"/> AP	×
824	Torque control P gain 1	○
825	Torque control integral time 1	○
826	Torque setting filter 1	×
827	Torque detection filter 1	○
828	Model speed control gain	○
830	Speed control P gain 2	○
831	Speed control integral time 2	○
832	Speed setting filter2	×

## RESTRICTIONS ON THE FUNCTIONS










Parameter	Name	Function Validity
833	Speed detection filter 2 	×
834	Torque control P gain 2	○
835	Torque control integral time 2	○
836	Torque setting filter2	×
837	Torque detection filter 2	×
838	DA1 terminal function selection 	○
839	DA1 output filter 	○
840	Torque bias selection 	×
841	Torque bias 1 	×
842	Torque bias 2 	×
843	Torque bias 3 	×
844	Torque bias filter 	×
845	Torque bias operation time 	×
846	Torque bias balance compensation  	×
847	Fall-time torque bias terminal 1 bias  	×
848	Fall-time torque bias terminal 1 gain  	×
849	Analog input off set adjustment	×
850	Control operation selection	×
853	Speed deviation time 	○

Parameter	Name	Function Validity
854	Excitation ratio	○
857	DA1-0V adjustment 	○
858	Terminal 4 function assignment	×
859	Torque current	○
860	Second motor torque current	×
862	Notch filter time constant	○
863	Notch filter depth	○
864	Torque detection	○
865	Low speed detection	○
866	Torque monitoring reference	○
867	AM output filter	○
868	Terminal 1 function assignment	×
869 *4	Current output filter	○
872	Input phase failure protection selection	○
873	Speed limit 	×
874	OLT level setting	○
875	Fault definition	×
877	Speed feed forward control/model adaptive speed control selection	○
878	Speed feed forward filter	○
879	Speed feed forward torque limit	○
880	Load inertia ratio	○
881	Speed feed forward gain	○

Parameter	Name	Function Validity
882	Regeneration avoidance operation selection	×
883	Regeneration avoidance operation level	×
884	Regeneration avoidance at deceleration detection sensitivity	×
885	Regeneration avoidance compensation frequency limit value	×
886	Regeneration avoidance voltage gain	×
888	Free parameter 1	○
889	Free parameter 2	○
891	Cumulative power monitor digit shifted times	○
892	Load factor	○
893	Energy saving monitor reference (motor capacity)	○
894	Control selection during commercial power-supply operation	○
895	Power saving rate reference value	○
896	Power unit cost	○
897	Power saving monitor average time	○
898	Power saving cumulative monitor clear	○
899	Operation time rate (estimated value)	○
C0(900)	FM terminal calibration *9	○
C1(901)	AM terminal calibration	○
C2(902)	Terminal 2 frequency setting bias frequency	×

Parameter	Name	Function Validity
C3(902)	Terminal 2 frequency setting bias	×
125(903)	Terminal 2 frequency setting gain frequency	×
C4(903)	Terminal 2 frequency setting gain	×
C5(904)	Terminal 4 frequency setting bias frequency	×
C6(904)	Terminal 4 frequency setting bias	×
126(905)	Terminal 4 frequency setting gain frequency	×
C7(905)	Terminal 4 frequency setting gain	×
C8(930) *4	Current output bias signal	×
C9(930) *4	Current output bias current	×
C10(931) *4	Current output gain signal	×
C11(931) *4	Current output gain current	×
C12(917)	Terminal 1 bias frequency (speed)	×
C13(917)	Terminal 1 bias frequency (speed)	×
C14(918)	Terminal 1 gain frequency (speed)	×
C15(918)	Terminal 1 gain (speed)	×
C16(919)	Terminal 1 bias command (torque/magnetic flux)	×
C17(919)	Terminal 1 bias (torque/magnetic flux)	×
C18(920)	Terminal 1 gain command (torque/magnetic flux)	×

## RESTRICTIONS ON THE FUNCTIONS

Parameter	Name	Function Validity
C19(920)	Terminal 1 gain (torque/magnetic flux)	×
C29(925)	Motor temperature detection calibration (analog input) 	○
C30(926)	Terminal 6 bias frequency (speed) 	×
C31(926)	Terminal 6 bias (speed) 	×
C32(927)	Terminal 6 gain frequency (speed) 	×
C33(927)	Terminal 6 gain (speed) 	×
C34(928)	Terminal 6 bias command (torque) 	×
C35(928)	Terminal 6 bias (torque) 	×
C36(929)	Terminal 6 gain command (torque) 	×
C37(929)	Terminal 6 gain (torque) 	×
C38(932)	Terminal 4 bias command (torque/magnetic flux)	×
C39(932)	Terminal 4 bias (torque/magnetic flux)	×
C40(933)	Terminal 4 gain command (torque/magnetic flux)	×
C41(933)	Terminal 4 gain (torque/magnetic flux)	×

Parameter	Name	Function Validity
989	Parameter copy alarm release	○
990	PU buzzer control	○
991	PU contrast adjustment	○

- \*1 Read and write from communication with PU connector only is enabled.
- \*2 Some functions of the I/O signals set using these parameters are invalid. Refer to *page 67*.
- \*3 Setting can be made only for the EC and NA versions.
- \*4 Setting can be made only for the EC and CH versions.
- \*5 Setting can be made only for the CH versions.
- \*6 Note that pulse train input is invalid.
- \*7 Note that only RS-485 communication from PU port is valid.
- \*8 Setting increments is always the same. (Note that a value can be displayed.)
- \*9 When EC or CH version is used, this parameter is "CA terminal function selection".



## 6.3 Inverter I/O Terminal Function List

The following shows ○ : validity, × : invalidity of I/O terminal function during SSCNET III communication operation.

The following symbols are I/O terminal that functions when used with an option.

[AY] .....FR-A7AY, [AR] .....FR-A7AR

### 6.3.1 Input terminal function

Setting	Signal Name	Function Name		Function Validity
0	RL	Pr. 59 = 0 (initial value)	Low-speed operation command	×
		Pr. 59 = 1, 2 *1	Remote setting (setting clear)	×
		Pr. 270 = 1, 3 *2	Stop-on-contact selection 0	×
1	RM	Pr. 59 = 0 (initial value)	Middle-speed operation command	×
		Pr. 59 = 1, 2 *1	Remote setting (deceleration)	×
2	RH	Pr. 59 = 0 (initial value)	High-speed operation command	×
		Pr. 59 = 1, 2 *1	Remote setting (acceleration)	×
3	RT	Second function selection		×
		Pr. 270 = 1, 3 *2	Stop-on-contact selection 1	×
4	AU	Terminal 4 input selection		×
5	JOG	Jog operation selection		×

Setting	Signal Name	Function Name		Function Validity
6	CS	Selection of automatic restart after instantaneous power failure, flying start		×
		Commercial power supply-inverter switchover function		×
7	OH	External thermal relay input *3		○
8	REX	15 speed selection (combination with three speeds RL, RM, RH)		×
9	X9	Third function selection		×
10	X10	Inverter operation enable signal (FR-HC, MT-HC, FR-CV connection)		○
11	X11	FR-HC or MT-HC connection, instantaneous power failure detection		○
12	X12	PU operation external interlock		×
13	X13	External DC injection brake operation start *7		×
14	X14	PID control valid terminal		×
15	BRI	Brake opening completion signal		×

## RESTRICTIONS ON THE FUNCTIONS

Setting	Signal Name	Function Name	Function Validity
16	X16	PU-external operation switchover	×
17	X17	Load pattern selection forward/reverse rotation boost	×
18	X18	V/F switchover (V/F control is exercised when X18 ON)	×
19	X19	Load torque high-speed frequency	×
20	X20	S-shaped acceleration/deceleration C switching terminal	×
22	X22	Orientation command *4	×
23	LX	Pre-excitation/servo on *5	×
24	MRS	Output stop	○
		Commercial power supply-inverter switchover function	×
25	STOP	Start self-holding selection	×
26	MC	Control mode changing	×
27	TL	Torque limit selection	×
28	X28	Start-time tuning start external input	×
37	X37	Traverse function selection *6	×
44	X44	P/PI control switchover	×
50	SQ	Sequence start *7	×
60	STF	Forward rotation command (assigned to STF terminal (Pr. 178) only)	$\Delta$ *8

Setting	Signal Name	Function Name	Function Validity
61	STR	Reverse rotation command (assigned to STR terminal (Pr. 179) only)	$\Delta$ *8
62	RES	Inverter reset	○
63	PTC	PTC thermistor input (assigned to AU terminal (Pr. 184) only)	○
64	X64	PID forward/reverse action switchover	×
65	X65	PU-NET operation switchover	×
66	X66	External-NET operation switchover	×
67	X67	Command source switchover	×
68	NP	Conditional position pulse train sign	×
69	CLR	Conditional position droop pulse clear	×
70	X70	DC feeding operation permission	○
71	X71	DC feeding cancel	○
74	X74	Magnetic flux decay output shutoff signal	×
76	X76	Proximity dog	○
9999	—	No function	○

- \*1 When *Pr. 59 Remote function selection* = "1 or 2", the functions of the RL, RM and RH signals change as listed above.
- \*2 When *Pr. 270 Stop-on contact/load torque high-speed frequency control selection* = "1 or 3", the functions of the RL and RM signals change as listed above.
- \*3 The OH signal turns on when the relay contact "opens".
- \*4 The FR-A7AX (16-bit digital input) is needed to externally input a stop position under orientation control.
- \*5 Servo ON is made valid during position control under vector control operation.
- \*6 Setting can be made only for the EC and CH versions.
- \*7 Setting can be made only for the EC and NA versions.
- \*8 Although run command is invalid as a start signal since it depends on SSCNET III communication, terminal function as upper/lower stroke limit is valid.


### 6.3.2 Output terminal function

Setting		Signal Name	Function Name	Function Validity
Positive Logic	Negative Logic			
0	100	RUN	Inverter running *1	○
1	101	SU	Up to frequency *2, 3	×
2	102	IPF	Instantaneous power failure/undervoltage	○
3	103	OL	Overload alarm	○
4	104	FU	Output frequency detection *3	○
5	105	FU2	Second output frequency detection *3	○
6	106	FU3	Third output frequency detection *3	○
7	107	RBP	Regenerative brake prealarm	○
8	108	THP	Electronic thermal relay function prealarm	○
10	110	PU	PU operation mode	×
11	111	RY	Inverter operation ready	○
12	112	Y12	Output current detection	○
13	113	Y13	Zero current detection	○
14	114	FDN	PID lower limit	×
15	115	FUP	PID upper limit	×
16	116	RL	PID forward/reverse rotation output	×
17	—	MC1	Electronic bypass MC1	×
18	—	MC2	Electronic bypass MC2	×

Setting		Signal Name	Function Name	Function Validity
Positive Logic	Negative Logic			
19	—	MC3	Electronic bypass MC3	×
20	120	BOF	Brake opening request	×
25	125	FAN	Fan fault output	○
26	126	FIN	Heatsink overheat pre-alarm	○
27	127	ORA	Orientation in-position	×
28	128	ORM	Orientation error	×
30	130	Y30	Forward rotation output	○
31	131	Y31	Reverse rotation output	○
32	132	Y32	Regenerative status output	○
33	133	RY2	Operation ready 2	○
34	134	LS	Low speed output	○
35	135	TU	Torque detection	○
36	136	Y36	In-position *4	○
39	139	Y39	Start time tuning completion	×
41	141	FB	Speed detection	○
42	142	FB2	Second speed detection	○
43	143	FB3	Third speed detection	○
44	144	RUN2	Inverter running *1	○
45	145	RUN3	Inverter running and start command is on	○
46	146	Y46	During deceleration at occurrence of power failure (retained until release)	×

Setting		Signal Name	Function Name	Function Validity
Positive Logic	Negative Logic			
47	147	PID	During PID control activated	×
64	164	Y64	During retry	×
70	170	SLEEP	PID output interruption	×
84	184	RDY	Position control preparation ready	○
85	185	Y85	DC feeding	○
86	186	Y86	Control circuit capacitor life [AY] [AR]	○
87	187	Y87	Main circuit capacitor life [AY] [AR]	○
88	188	Y88	Cooling fan life [AY] [AR]	○
89	189	Y89	Inrush current limit circuit life [AY] [AR]	○
90	190	Y90	Life alarm	○
91	191	Y91	Alarm output 3 (power-off signal)	○
92	192	Y92	Energy saving average value updated timing	○
93	193	Y93	Current average value monitor signal	○
94	194	ALM2	Alarm output 2 *5	○
95	195	Y95	Maintenance timer signal	○
96	196	REM	Remote output	○
97	197	ER	Minor fault output 2	○
98	198	LF	Minor fault output	○

Setting		Signal Name	Function Name	Function Validity
Positive Logic	Negative Logic			
99	199	ALM	Alarm output	○
9999		—	No function	○

- \*1 RUN and RUN2 turn on when speed command from SSCNET III is not "0" at turning on the servo during speed control and torque control.  
Turning the servo on turns the terminals on during position control.
- \*2 Note that when the frequency setting is varied using an analog signal or  of the operation panel (FR-DU07), the output of the SU (up to frequency) signal may alternate on and off depending on that varying speed and the timing of the varying speed due to acceleration/deceleration time setting. (The output will not alternate on and off when the acceleration/deceleration time setting is "0s".)
- \*3 Up to frequency SU, frequency detection FU, FU2, FU3 under encoder feed back control or vector control signals are as below.  
SU, FU: Output when the actual speed (frequency) by the encoder feedback signal exceeds detected specification frequency.  
FU2, FU3: Output when the inverter output frequency exceeds detected specification frequency.
- \*4 The signal is on even when the servo is off during SSCNET III communication operation.
- \*5 When a power supply reset is performed, the alarm output 2 signal (ALM2) turns off as soon as the power supply switches off.

## 7 PRECAUTIONS


- During SSCNET III communication, the inverter parameter can not be changed from the servo system controller. Note that, even if the mode has changed to SSCNET III operation mode, setting "2" in *Pr.77 Parameter write selection* allows parameter setting change from the PU (FR-DU07/FR-PU07/FR-PU04). In such case, *Pr.CL Parameter clear* and *ALLC All parameter clear* can not be made.
- The usable encoder pulses are 1000 to 4096 pulses.
- Start and stop commands are given from SSCNET III side and STF signal and STR signal are made invalid. Instead, upper stroke limit signal can be assigned to STF terminal and lower stroke limit signal to STR terminal. (Refer to *page 67* for input terminal function validity/invalidity.)
- Before starting operation, always give the servo ON signal from the host controller to put the motor in the servo lock status, and then start operation.
- Running speed depends on the command from the servo system controller.  
(The rotation direction depends on the setting of *Pr. 379 SSCNET III rotation direction selection*.)
- When "0, 10" (droop control is disabled during acceleration/deceleration) is set in *Pr.288 Droop function activation selection*, droop control can not be performed. Set "1, 11" or "2".  
(For details, refer to the inverter manual.)
- E.OC3 and E.OV3 are displayed when the inverter stops due to "overcurrent shut-off" or "regenerative overvoltage shut-off" during SSCNET III operation. (For details, refer to the inverter manual.)
- Restrictions of I/O signal (*Refer to page 67*) are the same even when used with other options (FR-A7AX, FR-A7AY, FR-A7AR, etc).
- Offline auto tuning cannot be performed from the servo system controller. Perform it using the PU or the setup software (FR Configurator FR-SW2-SETUP-WE) before starting communication.
- Before shutting off the communication temporarily by resetting the inverter power, disconnecting the SSCNET III cable, or other methods, it is necessary to perform the disconnection/reconnection function for the servo system controller. Refer to "Q173HCPU/Q172HCPU motion controller programming manual (common mode version)" for details.
- When the MRS signal is on, create a motion SFC program that turns on the servo off command of the target shaft. Before resetting the MRS signal (ON to OFF) or turning off the servo off command, make sure that the motor speed is 20r/min or less.

# 8 ALARM INDICATION DEFINITIONS AND CORRECTIVE ACTIONS

This section provides the definitions of the alarm indications and their corrective actions.




## (1) Alarm

When the protective function is activated, the output is not shut off.

Operation panel indication	CF		FR-PU07	CF
<b>Name</b>	Initialize communication waiting status			
<b>Description</b>	<ul style="list-style-type: none"> <li>• If the communication with the servo system controller is not established even after the inverter with FR-A7NS and FR-A7AP installed is powered on, the CF warning is displayed in FR-DU07 (or FR-PU07). The CF warning is also displayed when the communication is established and then shut off. The display of the CF warning is reset when the communication is established with the servo system controller. Then the inverter becomes ready for operation.</li> <li>• The CF warning is displayed during initialization (when the display of SSCNET III communication status is "110" to "180"). (Refer to page 32, 33.)</li> <li>• When Pr. 499 SSCNET III operation selection = "9999" (Operation invalid mode), the CF warning is not displayed.</li> </ul>			
<b>Check point</b>	<ul style="list-style-type: none"> <li>• Check the communication cable for a fault.</li> <li>• Check that the communication equipment (personal computer) and motion controller have not been powered off.</li> </ul>			
<b>Corrective action</b>	<ul style="list-style-type: none"> <li>• Change the communication cable.</li> <li>• Power on the communication equipment (personal computer) and motion controller.</li> </ul>			

# ALARM INDICATION DEFINITIONS AND CORRECTIVE ACTIONS



<b>Operation Panel Indication</b>	PS	PS	FR-PU04 FR-PU07	PS
<b>Name</b>	PU stop			
<b>Description</b>	Stop with  of the PU is set in <i>Pr: 75 Reset selection/disconnected PU detection/PU stop selection.</i> (For <i>Pr: 75</i> , refer to <i>FR-A700 Instruction Manual (applied).</i> )			
<b>Check point</b>	Check for a stop made by pressing  of the operation panel.			
<b>Corrective action</b>	Turn off the servo and reset using  .			



## (2) Major Faults

When any of the protective functions is activated, the inverter shuts off the output and outputs the corresponding alarm.

When the protective function is activated, refer to the inverter manual to take the appropriate corrective action and reset the inverter to perform operation again.

Operation panel indication	E.OPT	<i>E.OPT</i>	FR-PU04 FR-PU07	Option Fault
<b>Name</b>	Option alarm			
<b>Description</b>	Displayed when the FR-A7AP is not mounted or a cable for FR-A7AP connection is not correctly connected between the FR-A7NS and FR-A7AP (except when <i>Pr.800 Control method selection = "9"</i> (vector control test operation) or <i>Pr.499 SSCNET III operation selection = "9999"</i> ).			
<b>Check point</b>	<ul style="list-style-type: none"> <li>• Check that the FR-A7AP is mounted to the option slot 2.</li> <li>• Check that a cable for FR-A7AP connection is connected between the FR-A7NS and FR-A7AP.</li> </ul>			
<b>Corrective action</b>	<ul style="list-style-type: none"> <li>• Check that the FR-A7AP is mounted to the option slot 2. (<i>Refer to page 14.</i>)</li> <li>• Connect a cable for FR-A7AP connection securely between the FR-A7NS and FR-A7AP. (<i>Refer to page 14.</i>)</li> </ul>			



<b>Operation panel indication</b>	<b>E.OP3</b>	<b>EOP3</b>	<b>FR-PU04</b> <b>FR-PU07</b>	<b>Option slot alarm 3</b>
<b>Name</b>	Communication option alarm			
<b>Description</b>	When the communication line error occurs between the inverter with FR-A7NS installed and the servo system controller or the command frequency from the servo system controller is too high, the output from the inverter is stopped. The output from the inverter is also stopped when the SSCNET III cable between the FR-A7NS and the servo system controller or the preceding axis inverter (servo amplifier) is disconnected with the setting of <i>Pr. 499 SSCNET III operation selection = "1"</i> .			
<b>Check point</b>	<ul style="list-style-type: none"> <li>• Check that the SSCNET III cable is not disconnected.</li> <li>• Check that the surface at the end of the SSCNET III cable is not dirty.</li> <li>• Check that the SSCNET III cable is not damaged or broken.</li> <li>• Check that electromagnetic noise has not entered FR-A7NS or the servo system controller.</li> <li>• Check for too high command frequency from the servo system controller.</li> </ul>			
<b>Corrective action</b>	<ul style="list-style-type: none"> <li>• Connect the SSCNET III cable securely after turning off the inverter power.</li> <li>• Wipe off the dirt on the surface at the end of the SSCNET III cable.</li> <li>• Change the SSCNET III cable.</li> <li>• Take measures against electromagnetic noise for the inverter or the servo system controller.</li> <li>• Review the operation program of the servo system controller.</li> </ul>			

# 9 TROUBLESHOOTING

## Operation mode does not switch to SSCNET III operation mode.

- Check that the FR-A7NS and FR-A7AP are correctly mounted to the inverter. (Check that no contact fault, cable disconnection, etc. occurs.) Check that the FR-A7AP connection cable is correctly connected between the FR-A7NS and FR-A7AP. (Refer to page 14.)
- Check that vector control is performed. (Refer to page 10.)
- Check that the SSCNET III cable is correctly connected to the SSCNET III cable connector (CN1A, CN1B) of FR-A7NS. (Refer to page 25.)
- Check that the *Pr.499 SSCNET III operation selection* setting is not "9999". (Refer to page 41.)

## When "CF" is displayed

- Refer to page 73.

## When "PS" is displayed

- Refer to page 74.

## When "E. OPT" is displayed

- Refer to page 75.

## When "E. OP3" is displayed

- Refer to page 76.

## REVISIONS

\*The manual number is given on the bottom left of the back cover.

<b>Print Date</b>	<b>*Manual Number</b>	<b>Revision</b>
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