



INVERTER

Plug-in option

FR-A8NCA

INSTRUCTION MANUAL

CANopen
communication function

PRE-OPERATION INSTRUCTIONS

1

INSTALLATION

2

WIRING

3

INVERTER SETTING

4

FUNCTIONS

5

CANopen DEFINITIONS

6

SERVICE

7

OBJECT DICTIONARY

8

TROUBLESHOOTING

9

Thank you for choosing this Mitsubishi inverter plug-in option.

This Instruction Manual provides handling information and precautions for use of this product. Incorrect handling might cause an unexpected fault. Before using this product, always read this Instruction Manual carefully to use this product correctly.

Please forward this Instruction Manual to the end user.

Safety instructions

Do not attempt to install, operate, maintain or inspect the 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

Incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Caution

Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.

The  **Caution** level may even lead to a serious consequence according to conditions. Both instruction levels must be followed because these are important to personal safety.

◆ Electric shock prevention



Warning

- While the inverter power is ON, do not remove the front cover or the wiring cover. Do not run the inverter with the front cover or the wiring cover removed. Otherwise you may access the exposed high voltage terminals or the charging part of the circuitry and get an electric shock.
- Do not remove the inverter front cover even if the power supply is disconnected. The only exception for this would be when performing wiring and periodic inspection. You may accidentally touch the charged inverter circuits and get an electric shock.
- Before wiring or inspection, LED indication of the inverter unit operation panel must be switched OFF. Any person who is involved in wiring or inspection should wait for at least 10 minutes after the power supply has been switched OFF and check that there is no residual voltage using a tester or the like. For some time after the power-OFF, a high voltage remains in the smoothing capacitor, and it is dangerous.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The plug-in option must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Do not touch the plug-in option or handle the cables 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.

◆ Injury prevention



Caution

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise a burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise a burst, damage, etc. may occur.
- The polarity (+ and -) must be correct. Otherwise a burst or damage may occur.
- While power is ON or for some time after power OFF, do not touch the inverter as it will be extremely hot. Touching these devices may cause a burn.

◆ Additional instructions

The following instructions must be also followed. If the product is handled incorrectly, it may cause unexpected fault, an injury, or an electric shock.

Caution

Transportation and mounting

- 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.
- The mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- If halogen-based materials (fluorine, chlorine, bromine, iodine, etc.) infiltrate into a Mitsubishi product, the product will be damaged. Halogen-based materials are often included in fumigant, which is used to sterilize or disinfest wooden packages. When packaging, prevent residual fumigant components from being infiltrated into Mitsubishi products, or use an alternative sterilization or disinfection method (heat disinfection, etc.) for packaging. Sterilization or disinfection of wooden package should also be performed before packaging the product.

Trial run

- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

Warning

Usage

- 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 product.

Caution

Usage

- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations. Because all parameters return to their initial values.
- To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.

Maintenance, inspection and parts replacement

- Do not carry out a megger (insulation resistance) test.

Disposal

- The product must be treated as industrial waste.

General instruction

- Many of the diagrams and drawings in this Instruction Manual show the inverter without a cover or partially open for explanation. Never operate the inverter in this manner. The cover must be reinstalled and the instructions in the Instruction Manual must be followed when operating the inverter.

— CONTENTS —

1	PRE-OPERATION INSTRUCTIONS	7
1.1	Unpacking and product confirmation	7
1.1.1	Product confirmation	7
1.1.2	SERIAL number check	8
1.2	Component names	9
1.3	STATUS LED (operation status indication)	10
1.4	Specifications	11
2	INSTALLATION	12
2.1	Pre-installation instructions	12
2.2	Installation procedure	13
2.3	Node address setting	17
3	WIRING	18
3.1	Connection to network	18
3.2	Wiring	19
4	INVERTER SETTING	22
4.1	Parameter list	22
4.2	Parameter for CANopen communication	23
4.2.1	CANopen address (Pr.347)	23
4.2.2	CANopen baud rate (Pr.348)	24
4.3	Operation mode setting	25
4.3.1	Operation mode switching and communication startup mode (Pr.79, Pr.340)	25
4.4	Operation at communication error occurrence	28
4.4.1	Operation selection at communication error occurrence (Pr.500 to Pr.502, Pr.779)	28
4.4.2	Fault and measures	32
4.5	Inverter reset	33

4.6	Frequency and speed settings	35
5	FUNCTIONS	36
5.1	Output from the inverter to the network.....	36
5.2	Input to the inverter from the network.....	37
6	CANopen DEFINITIONS	38
6.1	Communication method.....	38
6.2	Message format	39
6.3	Response level.....	40
6.3.1	Response level of PDO.....	40
6.3.2	Response level of SDO.....	41
7	SERVICE	42
7.1	Process Data Object (PDO).....	42
7.1.1	Receive PDO	42
7.1.2	Transmit PDO	46
7.2	Service Data Object (SDO).....	50
7.2.1	SDO Upload (SDO read)	50
7.2.2	SDO Download (SDO write).....	51
7.2.3	SDO Abort Code (SDO error code).....	52
7.3	SYNC Object.....	54
7.3.1	Bus Synchronization and Sampling	54
7.3.2	Bus Synchronization and Actual	56
7.4	Emergency object.....	58
7.5	Network Management object (NMT).....	61
7.5.1	Status transition of NMT state.....	61
7.5.2	Status transition matrix of NMT state.....	62
7.5.3	Module Control Service.....	63
7.5.4	Error Control Service	64

8.1	Object list	68
8.2	Object Detail of Communication Profile Area	73
8.2.1	(Index H1000) Device Type	73
8.2.2	(Index H1001) Error Register	74
8.2.3	(Index H1002) Manufacturer Status Register	75
8.2.4	(Index H1005) COB-ID SYNC	76
8.2.5	(Index H1008) Manufacturer Device Name	77
8.2.6	(Index H100C) Guard Time	78
8.2.7	(Index H100D) Life Time Factor	79
8.2.8	(Index H1010) store parameters	80
8.2.9	(Index H1011) restore default parameters	82
8.2.10	(Index H1014) COB-ID EMCY	83
8.2.11	(Index H1015) Inhibit Time EMCY	84
8.2.12	(Index H1016) Consumer Heartbeat Time	85
8.2.13	(Index H1017) Producer Heartbeat Time	86
8.2.14	(Index H1018) Identity	87
8.2.15	(Index H1400 to H15FF) Recive PDO Parameters	89
8.2.16	(Index H1600 to H17FF) Recive PDO Mapping	91
8.2.17	(Index H1800 to H19FF) Transmit PDO Parameters	92
8.2.18	(Index H1A00 to H1BFF) Transmit PDO Parameters	95
8.3	Object Detail of Manufacturer Specific Area	96
8.3.1	(Index H2000 to H2063) Monitor of the inverter	96
8.3.2	(Index H2106) Alarm clear	98
8.3.3	(Index H2107) Inverter reset	98
8.3.4	(Index H2108) Parameter Clear	99
8.3.5	(Index H2109) Operation Mode	100
8.3.6	(Index H3000 to H3385, H33AC to H33E7) Parameter Area	101
8.3.7	(Index H3386 to H33AB) Calibration Parameter Area	102
8.3.8	(Index H3400 to H3403) Alarm history 1 to 8	103
8.3.9	(Index H3500 to H36F3) Parameter Area	104
8.3.10	(Index H4000) Control input command (w) / Inverter status (r)	105
8.3.11	(Index H4001) Set frequency (Set Speed) (w) / Output frequency (Running speed) (r)	108
8.3.12	(Index H4002) Set Frequency	110

8.3.13	(Index H4003) Set Speed	111
8.3.14	(Index H4010) Control Input Command (w)	112
8.3.15	(Index H4011) Inverter Status (r)	113
8.3.16	(Index H4012) Set Frequency (w) / Set Speed (w)	114
8.3.17	(Index H4013) Output Frequency (r) / Running Speed (r)	115
8.4	Object detail of Device Profile Area	116
8.4.1	(Index H6040) controlword	116
8.4.2	(Index H6041) statusword	119
8.4.3	(Index H6042) vl_target_velocity	122
8.4.4	(Index H6043) vl_velocity_demand	122
8.4.5	(Index H6044) vl_control_effort	123
8.4.6	(Index H6046) vl_velocity_min_max_amount	124
8.4.7	(Index H6048) vl_velocity_acceleration	126
8.4.8	(Index H6049) vl_velocity_deceleration	128
8.4.9	(Index H604A) vl_velocity_quick_stop	130
8.4.10	(Index H605A) Quick_stop_option_code	132
8.4.11	(Index H67FF) Single_Device_Type	133

9 TROUBLESHOOTING 134

APPENDIX 135

Appendix 1 EDS file.....135

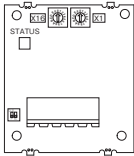
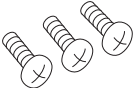
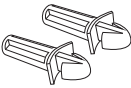
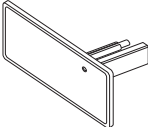

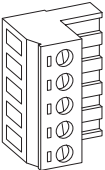
1 PRE-OPERATION INSTRUCTIONS

1.1 Unpacking and product confirmation

Take the plug-in option out of the package, check the product name, and confirm that the product is as you ordered and intact. This product is a plug-in option for the FR-A800 series inverter.

1.1.1 Product confirmation

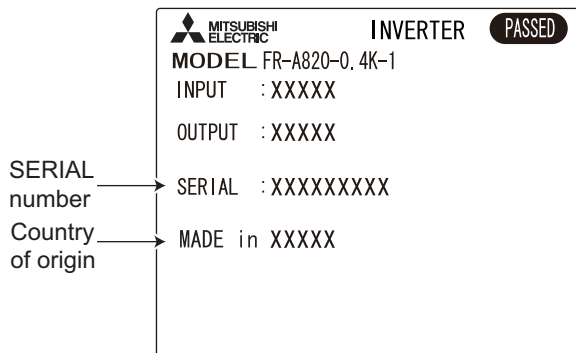
Check the enclosed items.

Plug-in option.....1 	Mounting screw (M3 × 8 mm)...3 (Refer to page 14) 	Spacer.....2 (Refer to page 14) 	Communication option LED display cover.....1 (Refer to page 13) 
Earth plate.....1 (Refer to page 14) 	Terminal block.....1 (Refer to page 21) 		

1.1.2 SERIAL number check

The FR-A8NCA can be used for the inverter models listed below with the following SERIAL number or later. Check the SERIAL number indicated on the inverter rating plate or package.

Rating plate example



Symbol	Year	Month	Control number
□	○	○	○○○○○○

SERIAL

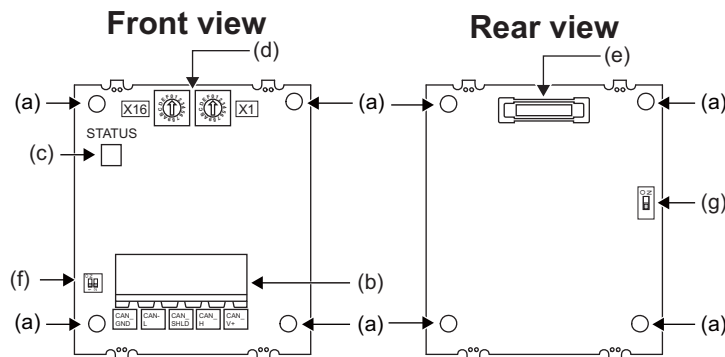
The SERIAL consists of one symbol, two characters indicating the production year and month, and six characters indicating the control number.



The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

FR-A800 series

Model	Country of origin indication	SERIAL number
FR-A820-00046(0.4K) to 04750(90K) FR-A840-00023(0.4K) to 06830(280K) FR-A842-07700(315K) to 12120(500K) FR-A846-00023(0.4K) to 03610(132K)	MADE in Japan	□65○○○○○ or later
	MADE in China	□66○○○○○ or later

1.2 Component names



Symbol	Name	Description	Refer to page
a	Mounting hole	Fixes the option to the inverter with screws, or installs spacers.	14
b	Connector for communication	Mount the accessory terminal block to connect to the network.	21
c	Status LED (communication status indicator)	Stays ON, flickers, or stays OFF to indicate the communication status.	10
d	Node address switch (SW2, SW3)	Set the node address. (In the initial setting, "0" is set for both X16 and X1.)	17
e	Connector	Connect to the inverter option connector.	14
f	Switch for manufacturer setting (SW1)	Switch for manufacturer setting. Do not change from the initially-set status (OFF ).	—
g	Switch for manufacturer setting (SW4)	Switch for manufacturer setting. Do not change from the initially-set status (OFF ).	—

1.3 STATUS LED (operation status indication)




The STATUS LED (RUN, ERR) indicates the operating status of the option unit by its indication status.

Check the position of LED on [page 9](#).

Indicates network status and error status of the product.

LED indicator*2		Status	Description
Off		Power OFF/Reset Hold Without error	Power of the inverter is OFF. Or reset held status. The inverter functions properly.
Green (RUN)	Single flash*1	STOPPED	The network status is "Stopped"
	Blinking*1	PRE-OPERATIONAL	The network status is "Pre-Operational"
	On	OPERATIONAL	The network status is "Operational"
Red (ERR)	Single flash*1	Warning	A network error such as a communication frame error has occurred and a warning was given from a CAN chip. (error passive status)
	Double flash*1	Error control event occurrence	Error control event has occurred. <ul style="list-style-type: none">• Guard message send• Heartbeat message receive
	On	Bus-off	Bus-off state occurred to the CAN chip.

*1 LED flashing patterns are as follows.

LED indicator	Flashing pattern
Blinking	
Single flash	
Double flash	

*2 Red and Green alternately displayed (Double flash of Red during Green is lit) is observed depending on the operating status. Red indicates error status and Green indicates operating status.



- Refer to [page 61](#) for network status.

1.4 Specifications

◆ Communication specifications

Item	Description
Network power supply	Input voltage: 18 to 28 V
Topology	Bus
Communication speed	10 Kbps to 1 Mbps
Transmission distance	25 m (communication speed: 1 Mbps) to 2500 m (communication speed: 10 Kbps) *1
Number of node	127
Communication method	PeerToPeer, broad cast
EDS file	With

*1 A bridge or repeater is necessary when the transmission distance is 1000 m or more.

◆ List of communication service (function)

Item	Description
NMT	Slave
Error Control	Node Guarding, Heartbeat (either can be selected at configuration)
Node ID setting	Node address switches or Pr.347
Number of PDO	RPDO × 3, TPDO × 3
PDO mode	Event Driven Timer Driven Sync Remote Request
PDO Linking	Possible
PDO Mapping	Impossible (Static)
Emergency message	With
Application layer	CiA DS301 V4.01
Profile	CiA DSP402 V2.0

INSTALLATION

2.1 Pre-installation instructions

Check that the inverter's input power and the control circuit power are both 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.
- To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.

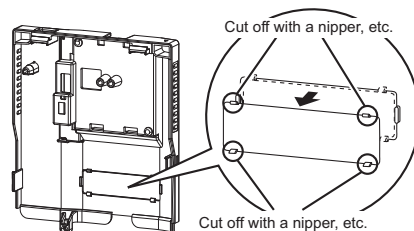
2.2 Installation procedure

◆ Installing the communication option LED display cover

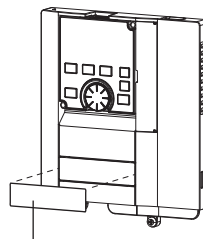
- (1) Remove the inverter front cover. (Refer to Chapter 2 of the Instruction Manual (Detailed) of the inverter for details on how to remove the front cover.)

Mount the cover for displaying the operation status indication LED for the communication option on the inverter front cover.

- (2) Cut off hooks on the rear of the inverter front cover with nipper, etc. and open the window for fitting the LED display cover.



- (3) Fit the communication option LED display cover to the front side of the front cover. Align the LED display cover with the LED position on the circuit board of the option. Push the LED display cover until it is fixed with the hooks.



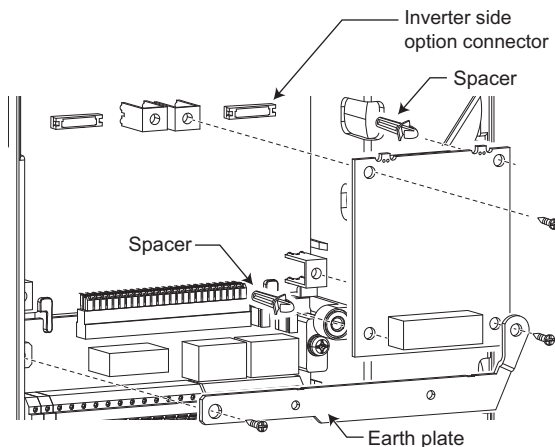
Communication option LED display cover

Caution

- Take care not to hurt your hand and such with portions left by cutting hooks of the rear of the front cover.

◆ Installing the option

- (1) For the two mounting holes (as shown in the next page) that will not be tightened with mounting screws, insert spacers.
- (2) Fit the connector of the plug-in option to the guide of the connector on the inverter unit side, and insert the plug-in option as far as it goes. (Insert it to the inverter option connector 1.)
- (3) Fit the one location on the left of the earth plate (as shown in the next page) securely to the inverter unit by screwing in the supplied mounting screw. (tightening torque 0.33 N·m to 0.40 N·m)
- (4) Fit the one location on the left of the plug-in option securely to the inverter unit and the right of the plug-in option to the inverter unit together with the earth plate by screwing in the supplied mounting screws. (tightening torque 0.33 N·m to 0.40 N·m) If the screw holes do not line up, the connector may not be inserted deep enough. Check the connector.

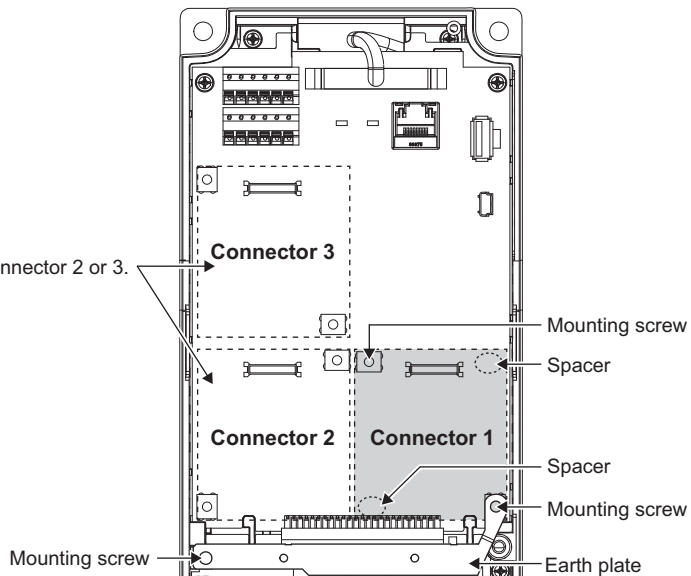


Example of installation to connector 1

NOTE

- When a communication option is installed to the FR-A800-E series inverter, use the earthing (grounding) cable supplied with the inverter instead of the earth plate supplied with the communication option. (For details of the installation method, refer to the Instruction Manual of the inverter.)

Do not insert the plug-in option to the connector 2 or 3.



Insertion positions for screws and spacers

NOTE

- When mounting/removing the plug-in option, hold the sides of the option. Do not press on the parts on the option circuit board. Stress applied to the parts by pressing, etc. may cause a failure.
- Caution must be applied to mounting screws falling off when removing and mounting the plug-in option.
- When using this plug-in option, insert it to the inverter option connector 1. If it is inserted to the option connector 2 or 3, the protective function (E.2 or E.3) is activated and the inverter will not operate.
Even if the option is inserted to the option connector 1, when the inverter cannot recognize that the option is mounted due to improper installation, etc., the protective function (E.1) is activated.

Mounted position	Fault indication
Option connector 1	E. 1
Option connector 2	E. 2
Option connector 3	E. 3

- When removing the plug-in option, remove the two screws on the left and right, then pull it straight out. Pressure applied to the connector and to the option board may break the option.
- Always attach the earth plate because a malfunction due to noises may occur without it.

2.3 Node address setting

◆ Setting with node address switch

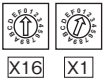
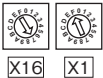
Set the node address between "1 to 127 (H7F)" using the node address switches on the FR-A8NCA board. (Refer to [page 9](#).)

The setting is applied at the next power-ON or inverter reset.

Set **Pr.347 CANopen address** to "0 (initial value)".

Set the arrow (↑) of the corresponding switches to the number (0-9, A-F) corresponding to desired node address.

• Setting example

<p>Node address 1 (H01): Set the "↑" of X16 (SW3) to "0" and the "↑" of X1 (SW2) to "1".</p>		<p>Node address 127 (H7F): Set the "↑" of X16 (SW3) to "7" and the "↑" of X1 (SW2) to "F".</p>	
--	---	--	---

NOTE

- Set the inverter node address before switching ON the inverter and do not change the setting while the power is ON. Otherwise you may get an electric shock.
- Set the node address switch to the switch number position correctly. If the switch is set between numbers, normal data communication can not be made.

Good
example



Bad
example



- When the node address switch is set to values other than "1 to 127", they are regarded as "127".
- You cannot set the same node address to other devices on the network.
(If different devices have the same node address, the communication cannot be established properly.)
- CANopen is a registered trademark of CAN in Automation.

◆ Set with parameter (Pr.347)

Use parameter (**Pr.347**) of the inverter to set. Setting node address with parameter makes the node address switch setting invalid. The setting is reflected at the next power-on or inverter reset. (Refer to [page 23](#))

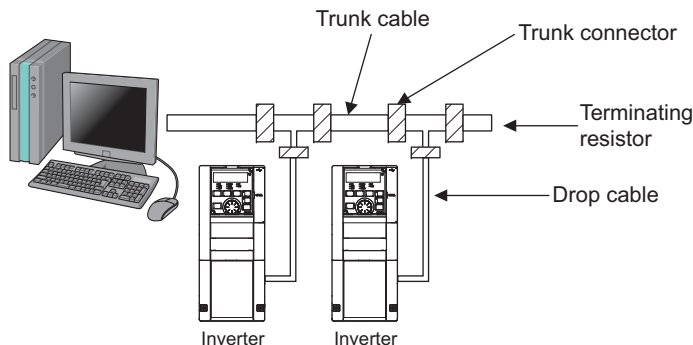
3.1 Connection to network

- (1) Be sure to check the following before connecting the inverter to the network.
 - Check that the FR-A8NCA is securely inserted into the inverter. (Refer to [page 10.](#))
 - Check that the correct node address is set. (Refer to [page 17.](#))
 - Check that a drop cable is firmly connected to the FR-A8NCA. (Refer to [page 19.](#))
- (2) Make sure that the terminating resistor is installed at each end (between CAN_H and CAN_L) of the trunk cable. These resistors must meet the following requirements.

Requirements of terminating resistors

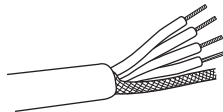
R (resistance value) = 124 Ω	1 % metal film	0.25 W
-------------------------------------	----------------	--------

- (3) Connect drop cables to the trunk cable.
 - If the trunk connector is a CANopen sanctioned pluggable or sealed connector, the connection to the active network can be made at any time whether the inverter is ON or OFF. The option unit automatically detects when the connection is completed.
 - If connecting to the network with free wires, power to the network and inverter should be shut off as a safety precaution in case two or more signal wires are accidentally shorted together.



3.2 Wiring

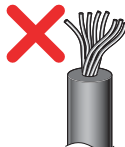
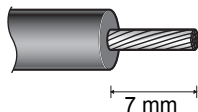
- (1) Strip the sheath back about 40 mm on the free wire end of the drop cable to expose the four colored signal wires and the silver shield wire.



- (2) Strip the sheath back of each signal cable to use. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off.

Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.

Cable stripping length



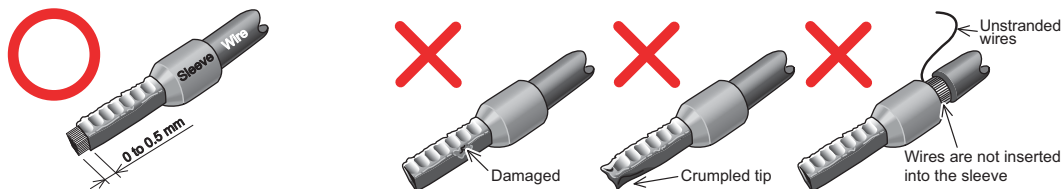
Use a blade type terminal as required.

NOTE

- Blade terminals available on the market (as of February 2016)


Terminal screw size	Wire size (mm ²)	Ferrule terminal model		Manufacturer	Crimping tool name
		With insulation sleeve	Without insulation sleeve		
M3	0.3 to 0.5	Al 0,5-6WH	A 0,5-6	Phoenix Contact Co., Ltd.	CRIMPFOX 6
	0.5 to 0.75	Al 0,75-6GY	A 0,75-6		

Insert wires to a blade terminal, and check that the wires come out for about 0 to 0.5 mm from a sleeve. Check the condition of the blade terminal after crimping. Do not use a blade terminal of which the crimping is inappropriate, or the face is damaged.



- (3) Loosen the terminal screw and insert the cable into the terminal according to the terminal assignment.

Tighten each cable with fixing screws to the recommended tightening torque.

Screw size	Tightening torque	Cable size	Screwdriver
M3	0.5 N·m to 0.6 N·m	0.3 mm ² to 0.75 mm ²	Small  flat-blade screwdriver (Tip thickness: 0.4 mm/ tip width: 2.5 mm)



- Undertightening can cause cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or unit.

- (4) Connect the terminal block to the connector for communication of the communication option mounted on the inverter.

Terminal layout

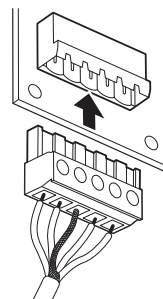
(Black) CAN_GND

(Blue) CAN_L

Shielded cable

(White) CAN_H

(Red) CAN_V+



3

Caution

- After wiring, wire offcuts must not be left in the inverter. They may cause an error, failure or malfunction.

4 INVERTER SETTING

4.1 Parameter list

The following parameters are used for the FR-A8NCA.

Set the values according to need.

Pr.	Pr. group	Name	Setting range	Minimum setting increments	Initial value	Refer to page
79	D000	Operation mode selection	0 to 4, 6, 7	1	0	25
340*2	D001*2	Communication startup mode selection	0, 1, 2, 10, 12	1	0	25
347*1, *2	N202*1, *2	CANopen address	0 to 4095	1	0	23
348*1, *2	N203*1, *2	CANopen baud rate	0 to 4095	1	4	24
349*1	N010*1	Communication reset selection	0, 1	1	0	33
500*1	N011*1	Communication error execution waiting time	0 to 999.8 s	0.1 s	0 s	28
501*1	N012*1	Communication error occurrence count display	0	1	0	29
502	N013	Stop mode selection at communication error	0 to 4	1	0	29
779	N014	Operation frequency during communication error	0 to 590 Hz, 9999	0.01 Hz	9999	29

*1 Parameters which can be displayed when the FR-A8NCA is mounted.

*2 The setting is reflected after inverter reset or at the next power-ON.



NOTE

- Set **Pr.338**, **Pr.339**, **Pr.342**, or **Pr.550** as required. (Refer to the Instruction Manual (Detailed) of the inverter for details.)

4.2 Parameter for CANopen communication

CANopen communication can be set by the inverter parameter.
The parameter setting is applied after an inverter reset or next power-ON.

4.2.1 CANopen address (Pr.347)

Parameter number	Name	Setting range	Minimum setting increments	Initial value
347	CANopen address	0 to 4095	1	0

Node address of CANopen communication can be set.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Address key				Not available *1				Node address							

*1 A value set is ignored.

Bit	Item	Initial value	Setting range	Definition
0 to 6	Node address	0	0 to 127	Node Address of device is set between 1 to 127. Set "0" (initial value) to set node address with node address switch.
12 to 15	Address key	0	0	Set "0" always. When a value other than "0" is set, the inverter operates as when "127" is set in Pr.347 .

Pr.347 setting	Node address switch	Node address
0	0 (H00)	127
	1 to 127 (H7F)	The node address switch setting is valid.
	128 (H80) or more	127
1 to 127	—	The Pr.347 setting is valid regardless of the switch setting.
Other than the above	—	127

4.2.2 CANopen baud rate (Pr.348)

Parameter number	Name	Setting range	Minimum setting increments	Initial value
348	CANopen baud rate	0 to 4095	1	4

Baud rate of CANopen communication can be set.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Baud rate key				Not available *1								Baud rate			

*1 A value set is ignored.

Bit	Item	Initial value	Setting range	Definition
0 to 3	Baud rate	4	0	1 Mbps
			1	800 kbps
			2	500 kbps
			3	250 kbps
			4	125 kbps (Initial value)
			5	Setting can not be made (operates as when an initial value is set)
			6	50 kbps
			7	20 kbps
			8	10 kbps
			9 to 15	Setting can not be made (operates as when an initial value is set)
12 to 15	Baud rate key	0	0	Set "0" always. When a value other than "0" is set, the inverter operates as when "4" (initial value) is set in Pr.348 .

4.3 Operation mode setting

4.3.1 Operation mode switching and communication startup mode (Pr.79, Pr.340)

◆ Operation mode switching conditions

Check the following before switching the operation mode.

- The inverter is at a stop;
- Both the STF and STR signals are off; and
- The **Pr.79 Operation mode selection** setting is correct.
(Check the setting on the operation panel of the inverter.)

◆ Operation mode selection at power ON and at restoration from instantaneous power failure

The operation mode at power ON and at restoration from instantaneous power failure can be selected.

Set a value other than "0" in **Pr.340 Communication startup mode selection** to select the network operation mode.

After started in network operation mode, parameter write from the network is enabled.



- Change of the **Pr.340** setting is valid when powering on or resetting the inverter.
- **Pr.340** can be changed with the operation panel independently of the operation mode.
- Ensure that the communication setting of the inverter is completed before setting **Pr.340** ≠ "0".
- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.79**, **Pr.340**.

Pr.340 setting	Pr.79 setting	Operation mode at power ON or power restoration	Operation mode switchover
0 (initial value)	0 (initial value)	External operation mode	Switching among the External, PU, and NET operation mode is enabled. *1, *4
	1	PU operation mode	PU operation mode fixed
	2	External operation mode	Switching between the External and Net operation mode is enabled. *4 Switching to the PU operation mode is disallowed.
	3, 4	External/PU combined operation mode	Operation mode switching is disallowed.
	6	External operation mode	Switching among the External, PU, and NET operation mode is enabled while running. *4
	7	X12 (MRS) signal ON: external operation mode	Switching among the External, PU, and NET operation mode is enabled. *1, *4
		X12 (MRS) signal OFF: external operation mode	External operation mode fixed (Forcibly switched to External operation mode.)
1, 2 *2	0	NET operation mode	Same as when Pr.340 = "0"
	1	PU operation mode	
	2	NET operation mode	
	3, 4	External/PU combined operation mode	
	6	NET operation mode	
	7	X12 (MRS) signal ON..... NET operation mode	
		X12 (MRS) signal OFF.....external operation mode	

Pr.340 setting	Pr.79 setting	Operation mode at power ON or power restoration	Operation mode switchover
10, 12 *2	0	NET operation mode	Switching between the PU and NET operation mode is enabled. *3, *4
	1	PU operation mode	Same as when Pr.340 = "0"
	2	NET operation mode	NET operation mode fixed
	3, 4	External/PU combined operation mode	Same as when Pr.340 = "0"
	6	NET operation mode	Switching between the PU and NET operation mode is enabled while running. *3, *4
	7	External operation mode	Same as when Pr.340 = "0"

*1 Operation mode can not be directly changed between the PU operation mode and Network operation mode.

*2 The Pr.340 settings "2 or 12" are mainly used for communication operation using the inverter RS-485 terminal.
When a value other than "9999" (selection of automatic restart after instantaneous power failure) is set in Pr.57 Restart coasting time, the inverter will resume the same operation state which was in before after power has been restored from an instantaneous power failure.
When Pr.340 = "1 or 10", a start command turns off if power failure has occurred and then restored during a start command is on.

*3 Switching between the PU and NET operation modes is available with the key on the operation panel or the X65 signal.

*4 Refer to [page 100](#) for a switching method from the network.

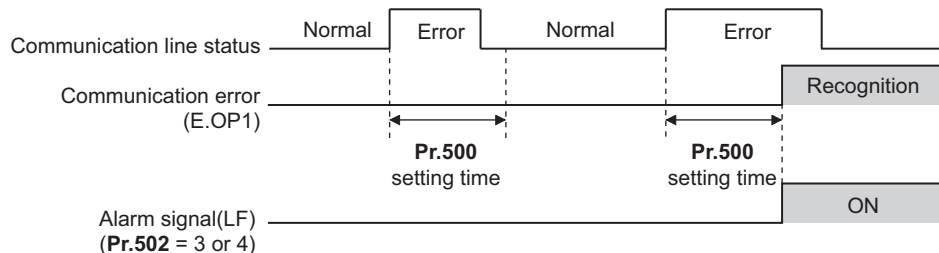
4.4 Operation at communication error occurrence

4.4.1 Operation selection at communication error occurrence (Pr.500 to Pr.502, Pr.779)

You can select operations at communication error occurrences by setting **Pr.500 to Pr.502, Pr.779** under network operation.

◆ Waiting time for the communication line error output after a communication error
Waiting time for the communication error output after a communication line error occurrence can be set.

Pr.	Name	Setting range	Minimum setting increments	Initial value
500	Communication error execution waiting time	0 to 999.8 s	0.1 s	0 s

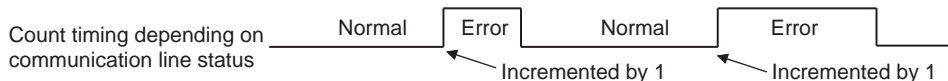


When a communication line error occurs and lasts longer than the time set in **Pr.500**, it is recognized as a communication error. If the communication returns to normal within the time, it is not recognized as a communication error, and the operation continues.

◆ Displaying and clearing the communication error count

The cumulative count of communication error occurrences can be displayed. Write "0" to clear this cumulative count.

Pr.	Name	Setting range	Minimum setting increments	Initial value
501	Communication error occurrence count display	0	1	0



At the point of communication line error occurrence, **Pr.501 Communication error occurrence count display** is incremented by 1.

The cumulative count of communication error occurrences is counted from 0 to 65535. When the count exceeds 65535, the displayed value is cleared and the counting starts over from 0 again.

NOTE

- Communication error count is temporarily stored in the RAM memory. The error count is stored in EEPROM only once per hour. If power reset or converter reset is performed, **Pr.501** setting will be the one that is last stored to EEPROM depending on the reset timing.

◆ Inverter operation at a communication error occurrence

How the inverter operates at a communication line error or an option unit fault can be set.

Pr.	Name	Setting range	Description
502	Stop mode selection at communication error	0 (Initial Value), 1, 2, 3, 4	Refer to page 30 .
779*1	Operation frequency during communication error	0 to 590 Hz	When a communication error occurs, the inverter operates at the set frequency.
		9999 (Initial Value)	The inverter operates at the frequency set before the communication error occurs.

*1 Valid when **Pr.502** = "3 or 4".

- ◆ About setting
- Operation at an error occurrence

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Continued*1	Normal*1	Not output*1
	1			
	2			
	3			
	4			
Communication option	0, 3	Output shutoff	"E. 1"	Provided
	1, 2	Output to decelerate and stop the motor	"E. 1" after stop	Provided after stop
	4	Continued	"CF" warning	Not output

*1 When the communication returns to normal within the time period set in **Pr.500**, the communication option error (E.OP1) does not occur.

- Operation after the time in **Pr.500** elapses after an error occurrence

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output shutoff	"E.OP1"	Provided
	1	Output to decelerate and stop the motor	"E.OP1" after stop	Provided after stop
	2			Not output
	3	Continues operation with the Pr.779 setting.*3	Normal	
	4		"CF" warning	
Communication option itself	0, 3	Output stop status continues.*2	"E.1" kept*2	Kept provided*2
	1, 2			
	4	Continued	"CF" warning	Not output

*2 When an error occurs, the motor is decelerated or coasts to stop, and outputs the fault, independently of the **Pr.500** setting.

*3 Under position control, the operation is continued to the target position.

- Operation at error removal

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output stop status continues.	"E.OP1" kept	Kept provided
	1			
	2	Restart*4	Normal	Not output
	3	Normal		
	4			
Communication option itself	0, 3	Output stop status continues.	"E. 1" kept	Kept provided
	1, 2			
	4	Continued	"CF" warning	Not output

- *4 When the communication error is removed during deceleration, the motor re-accelerates.
Under position control, the motor does not re-accelerates even when the communication error is removed during deceleration.



- The protective function [E.OP1 (fault data: HA1)] is activated at error occurrences on the communication line. The protective function [E.1 (fault data: HF1)] is activated at error occurrences in the communication circuit inside the option.
- Fault output indicates the fault (ALM) signal and fault bit output.
- When the fault output setting is active, fault records are stored in the faults history. (A fault record is written to the faults history at a fault output.)
When the fault output setting is not active, fault record is overwritten to the faults history temporarily but not stored. After the error is removed, the fault indication is reset, changing the display back to normal, and the last fault is displayed in the faults history.
- When **Pr.502** ≠ "0", the normal deceleration time setting (setting in **Pr.8**, **Pr.44**, **Pr.45**, or the like) is applied as the deceleration time.
- The acceleration time at a restart is the ordinary acceleration time setting (e.g. **Pr.7**, **Pr.44**).
- When the **Pr.502** setting is "2, 3, or 4", the operation/speed command at a restart is the one given before the error occurrence.
- When a communication line error occurs at the **Pr.502** setting of "2", removing the error during deceleration causes acceleration to restart at that point. (Acceleration is not restarted if the error is that of the option unit itself.)

⚠ Caution

- When **Pr.502** = "3" and a communication line error occurs, or **Pr.502** = "4" and a communication line error or a communication option fault occurs, the operation continues. When setting "3 or 4" in **Pr.502**, provide a safety stop countermeasure other than via communication. For example, input a signal through an external terminal (RES, MRS, or X92) or press the PU stop on the operation panel.

4.4.2 Fault and measures

◆ Inverter operation in each operation mode at error occurrences

Location	Status		Operation mode		
			Network operation	External operation	PU operation
Inverter	Inverter operation		Inverter trip	Inverter trip	Inverter trip
	Data communication		Continued	Continued	Continued
Communication line	Inverter operation		Inverter trip *1	Continued	Continued
	Data communication		Stop	Stop	Stop
Communication option	Communication option connection error	Inverter operation	Inverter trip *1	Inverter trip *1	Inverter trip *1
		Data communication	Continued	Continued	Continued
	Error of communication option itself	Inverter operation	Inverter trip *1	Continued	Continued
		Data communication	Stop	Stop	Stop

*1 Depends on the **Pr.502** setting.

◆ Measures at error occurrences

Fault indication	Fault description	Measures
E.OP1	Communication line error	<ul style="list-style-type: none"> Check the LED status of the option unit and remove the cause of the alarm (Refer to page 10 for LED indication status). Inspect the master.
E.1	Option fault	<ul style="list-style-type: none"> Insert the communication option to the inverter option connector 1. Check the connection between the inverter and option unit for poor contact, etc. and remove the cause of the error.

*1 When faults other than the above are displayed, refer to the Instruction Manual (Detailed) of the inverter and remove the cause of the error.

4.5 Inverter reset

◆ Operation conditions of inverter reset

Which resetting method is allowed or not allowed in each operation mode is described below.

Resetting method				Operation mode		
				Network operation	External operation	PU operation
Reset from the network	Inverter reset (Index H2107) (Refer to page 98) ^{*1}			Allowed	Disallowed	Disallowed
	Reset node service (Refer to page 63)			Allowed	Disallowed	Disallowed
	Error reset at inverter fault (Refer to page 34) ^{*2}		Pr.349 = 0	Allowed	Allowed	Allowed
					Disallowed	Disallowed
Turn on the inverter RES signal (terminal RES)				Allowed	Allowed	Allowed
Switch off inverter power				Allowed	Allowed	Allowed
Reset from the PU/ DU	Inverter reset			Allowed	Allowed	Allowed
	Reset at inverter fault			Allowed	Allowed	Allowed

*1 Inverter reset can be made any time.

*2 Reset can be made only when the protective function of the inverter is activated.



NOTE

- When a communication line error has occurred, reset cannot be made from the network.
- The inverter is set to the External operation mode if it has been reset in Network operation mode in the initial status. To resume the network operation, the inverter must be switched to the Network operation mode again. Set a value other than "0" in **Pr.340** to start in the Network operation mode. (Refer to [page 25](#).)
- The inverter can not be controlled for about 1 s after release of a reset command.

◆ Error reset operation selection at inverter fault

When used with the communication option (FR-A8NCA), an error reset command*1 from network can be made invalid in the external operation mode or PU operation mode.

Pr.	Name	Initial value	Setting range	Function
349	Communication reset selection	0	0	Error reset is enabled independently of operation mode.
			1	Error reset is enabled only in the network operation mode.

*1 Index H6040 (Refer to [page 116.](#))

4.6 Frequency and speed settings

- For the output/set frequency monitor, frequency setting, and parameter setting through the FR-A8NCA, the unit of 0.01 Hz is always applied regardless of the **Pr.37 Speed display** setting. The setting unit for the running speed (actual speed) monitor depends on the **Pr.37** and **Pr.144 Speed setting switchover** settings as shown in the following table. (The initial values are shown within the thick lines.)

Pr.37 setting	Pr.144 setting	Output frequency monitor	Set frequency monitor	Running speed (actual speed) monitor	Frequency setting, parameter setting
0 (initial value)	0	0.01 Hz	0.01 Hz	1 r/min *1, *2	0.01 Hz
	2 to 12	0.01 Hz	0.01 Hz	1 r/min *1, *2	0.01 Hz
	102 to 112	0.01 Hz	0.01 Hz	1 r/min *1, *2	0.01 Hz
1 to 9998	0	0.01 Hz	0.01 Hz	1 (machine speed *1)	0.01 Hz
	2 to 12	0.01 Hz	0.01 Hz	1 (machine speed *1)	0.01 Hz
	102 to 112	0.01 Hz	0.01 Hz	1 r/min *1, *2	0.01 Hz

*1 Running speed r/min conversion formula: frequency \times 120 / number of motor poles (**Pr.144**)

Machine speed conversion formula: **Pr.37** \times frequency / **Pr.505 Speed setting reference**

For **Pr.144** in the above formula, the value is "**Pr.144** - 100" when "102 to 112" is set in **Pr.144**; and the value is "4" when **Pr.37** = 0 and **Pr.144** = 0.

Pr.505 is always set as frequency (Hz).

*2 Use **Pr.811 Set resolution switchover** to change the increment from 1 r/min to 0.1 r/min.

- When setting a speed through the FR-A8NCA, the speed is calculated with the **Pr.144** setting as shown below.

Speed value (1 r/min *4) = frequency \times 120 / number of motor poles (**Pr.144** *3)

*3 When **Pr.144** = "102 to 112," the formula is calculated with the value of (**Pr.144** - 100). When **Pr.144** = "0", the formula is calculated with 4 poles.

*4 The **Pr.811** setting is invalid. The unit 1 r/min is always applied.



NOTE

- To apply the unit 1 r/min to the running speed (actual speed) monitor, set the initial values in **Pr.37** and **Pr.811**.
- Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.37**, **Pr.144**, **Pr.505** and **Pr.811**.

5.1 Output from the inverter to the network

Main items to be output from the inverter (FR-A8NCA) to the network and their descriptions are explained below.

Item	Description	Refer to page
Inverter monitor	Monitor various items such as inverter output frequency and output current.	96
Operation mode read	Read the operation mode of the inverter.	100
Parameter read	Read parameter settings of the inverter.	101, 102, 104
Inverter status	Monitor the output signal of the inverter.	113
Fault record	Monitor the faults history of the inverter.	103



- Refer to the Instruction Manual (Detailed) of the inverter for functions controllable from the network in each operation mode.

5.2 Input to the inverter from the network

Main items which can be commanded from the network to the inverter and their descriptions are explained below.

Item	Description	Refer to page
Frequency setting	Set the running frequency of the inverter.	108, 110, 114, 115
Operation mode write	Set the operation mode of the inverter.	100
Run command	Set the control input command such as forward operation signal (STF) and reverse rotation signal (STR).	105, 112
Inverter reset	Reset the inverter.	98, 116
Parameter write	Set parameters of the inverter.	101, 102, 104
Parameter clear	Return parameters to the initial values.	99



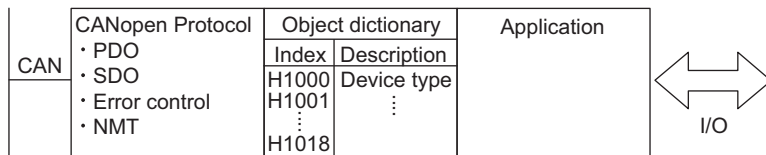
NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for functions controllable from the network in each operation mode.

6.1 Communication method

There are two objects for CANopen data communication objects: Process Data Object (PDO) and Service Data Object (SDO). PDO has features such as transmission of real time data and no response (Ack) requirement, and can be used for general process data transmission. SDO has features such as peer to peer communication and correct communication by response waiting and can handle a large amount of data. Therefore it is used for setting change and diagnosis of device.

Device model of CANopen communication is indicated below.

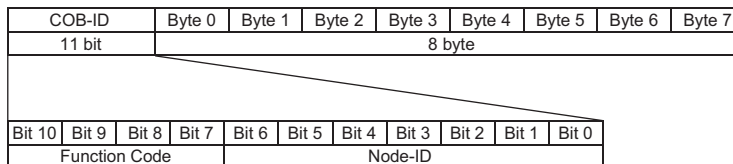


Refer to a CANopen standard material for details.

6.2 Message format

A message format consists of COB-ID and data part.

COB-ID (Communication Object ID) is a message header part and consists of 11 bit length data. In addition, a data part is 8 byte length and data arrangement of word length and long length is little endian (arranged in order from the lowest byte).



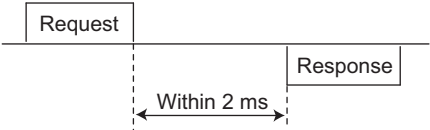
Direction of message	COB-ID		Description	Reference page
From master to slave	H000		Network Management service (NMT)	61
From master to slave	H080		SYNChronisation service (SYNC)	76
From slave to master	H080	+ Node-ID	EMergenCY service (EMCY)	83
From slave to master	H180	+ Node-ID	1st Transmit PDO (Drive Profile TPDO1)	47
From master to slave	H200	+ Node-ID	1st Receive PDO (Drive Profile RPDO1)	43
From slave to master	H280	+ Node-ID	2nd Transmit PDO (Drive Profile TPDO6) *1	48
From master to slave	H300	+ Node-ID	2nd Receive PDO (Drive Profile RPDO6) *1	44
From slave to master	H380	+ Node-ID	3rd Transmit PDO (Manufacture TPDO21) *1	49
From master to slave	H400	+ Node-ID	3rd Receive PDO (Manufacture RPDO21) *1	45
From slave to master	H580	+ Node-ID	Transmit SDO	51
From master to slave	H600	+ Node-ID	Receive SDO	50
From master to slave	H700	+ Node-ID	Network management (NMT, Guarding, Heartbeat)	64
From slave to master			Network management (Bootup protocol)	

*1 This is not available in the initial status. To enable it, refer to the reference page.

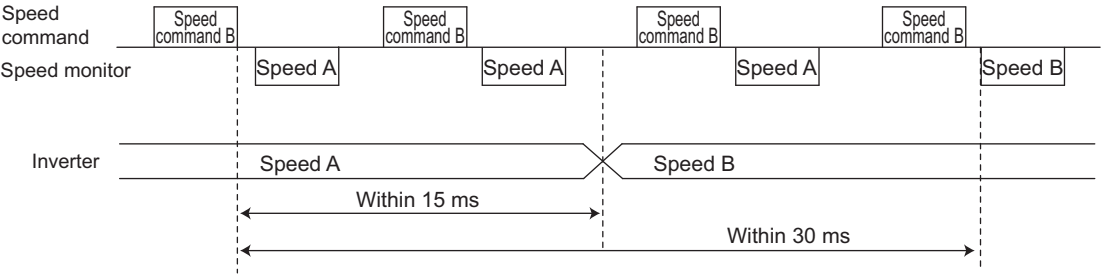
6.3 Response level

6.3.1 Response level of PDO

◆ Response level of CANopen bus

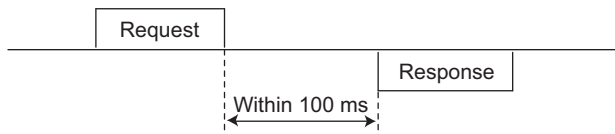


◆ Reflect timing on the actual speed or speed monitor after speed setting

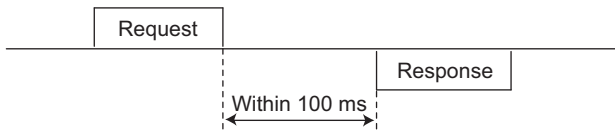


6.3.2 Response level of SDO

◆ Reading



◆ Writing

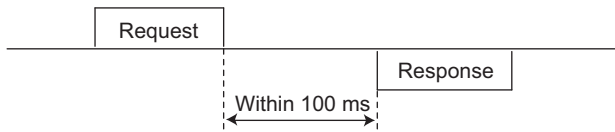


◆ Parameter clearing

The inverter will not respond until the parameter clear processing completes (about 5 s) after sending parameter clear or all parameter clear command.

◆ At inverter reset

Inverter reset processing is executed after sending a response message.



7.1 Process Data Object (PDO)

7.1.1 Receive PDO

Standard				FR-A8NCA support
PDO No.	Mapping object Index	Mapping object name	Description	
1	H6040	control word	Controls the state machine	○ (1st RPDO)
2	H6040 H6060	control word modes_of_operation	Controls the state machine and mode of operation	—
3	H6040 H607A	control word target_position	Controls the state machine and the target position (pp)	—
4	H6040 H60FF	control word target_velocity(pv)	Controls the state machine and the target velocity (pv)	—
5	H6040 H6071	control word target_torque	Controls the state machine and the target torque (tq)	—
6	H6040 H6042	control word target_velocity(vl)	Controls the state machine and the nominal speed (vl)	○ (2nd RPDO)
7	H6040 H60FE	control word digital_outputs	Controls the state machine and the digital outputs	—
8	H6040 H6060	control word modes_of_operation	Controls the state machine and mode of operation (Broadcast PDO)	—
9 to 20	—	—	Reserved	—
21	H4010 H4012	Control input command Set frequency (RAM)	FR-A8NCA-specific format	○ (3rd RPDO)
22 to 64	—	—	Manufacturer specific	—

◆ 1st Receive PDO (PDO No.1)

- Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reset Fault	—	—	—	Enable Operation	Quick Stop	Disable Voltage	Switch On
Byte 1	—	—	—	—	—	—	—	—

(Index H6040-H00)
control word
(Refer to [page 116](#))

- Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1400	H00	number of entries	ro	2
	H01	COB-ID used by PDO	rw	H200 + Node-ID
	H02	transmission type	rw	255
H1600	H00	number of mapped objects	ro	1
	H01	control word	ro	H60400010

◆ 2nd Receive PDO (PDO No.6)

• Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reset Fault	—	—	—	Enable Operation	Quick Stop	Disable Voltage	Switch On
Byte 1	—	—	—	—	—	—	—	—
Byte 2	target_velocity (vl) (L)*1							
Byte 3	target_velocity (vl) (H)*1							

(Index H6040-H00)
control word
(Refer to [page 116](#))

(Index H6042-H00)
target_velocity(vl)
(Refer to [page 122](#))

*1 Forward rotation : target_velocity (vl) > 0
Reverse rotation : target_velocity (vl) < 0

• Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1405	H00	number of entries	ro	2
	H01	COB-ID used by PDO	rw	H80000300 + Node-ID *1
	H02	transmission type	rw	255
H1605	H00	number of mapped objects	ro	2
	H01	control word	ro	H60400010
	H02	target_velocity(vl)	ro	H60420010

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

◆ 3rd Receive PDO (PDO No.21)

• Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	RT	JOG	RL	RM	RH	STR	STF	—
Byte 1	—	—	—	RES	STOP	MRS	CS	AU
Byte 2	Set Frequency (RAM) (L)							
Byte 3	Set Frequency (RAM) (H)							

(Index H4010-H00)
Control input command
(Refer to [page 112](#))

(Index H4012-H01)
Set Frequency (RAM)
(Refer to [page 114](#))

• Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1414	H00	number of entries	ro	2
	H01	COB-ID used by PDO	rw	H80000400 + Node-ID ^{*1}
	H02	transmission type	rw	255
H1614	H00	number of mapped objects	ro	2
	H01	Control input command	ro	H40100010
	H02	Set Frequency (RAM)	ro	H40120110

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

7.1.2 Transmit PDO

Standard				FR-A8NCA support
PDO No.	Mapping object Index	Mapping object name	Description	
1	H6041	status word	Shows status	○ (1st TPDO)
2	H6041 H6061	status word modes_of_operation_display	Shows status and the actual mode of operation	—
3	H6041 H6064	status word position_actual_value	Shows the status and the actual position (pp)	—
4	H6041 H606C	status word velocity_actual_value	Shows the status and the actual velocity (pv)	—
5	H6041 H6077	status word torque_actual_value	Shows the status and the actual torque (tq)	—
6	H6041 H6044	status word vl_control_effort	Shows the status and the actual speed (vl)	○ (2nd TPDO)
7	H6041 H60FD	status word digital_inputs	Shows the status and the digital inputs	—
8 to 20	—	—	Reserved	—
21	H4011 H4013	Inverter status Output frequency	FR-A8NCA-specific format	○ (3rd TPDO)
22 to 64	—	—	Manufacturer specific	—

◆ 1st Transmit PDO (PDO No.1)

- Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	—	Switched On Disabled	Quick Stop	Voltage Disabled	Fault	Operation Enabled	Switched On	Ready to Switch On
Byte 1	—	—	—	—	Internal Limit Active	Target Reached	Remote	—

(Index H6041-H00)
status word
(Refer to [page 119](#))

- Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1800	H00	number of entries	ro	5
	H01	COB-ID used by PDO	rw	H180 + Node-ID
	H02	transmission type	rw	255
	H03	inhibit time	rw	0
	H04	Reserved	—	Without (error response)
	H05	event timer	rw	0
H1A00	H00	number of mapped objects	ro	1
	H01	status word	ro	H60410010

◆ 2nd Transmit PDO (PDO No.6)

• Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
Byte 0	—	Switched On Disabled	Quick Stop	Voltage Disabled	Fault	Operation Enabled	Switched On	Ready to Switch On	(Index H6041-H00) status word (Refer to page 119)
Byte 1	—	—	—	—	Internal Limit Active	Target Reached	Remote	—	
Byte 2	vl_control_effort (L) _{*1}								(Index H6044-H00) vl_control_effort (Refer to page 123)
Byte 3	vl_control_effort (H) _{*1}								

*1 Forward rotation : vl_control_effort > 0

Reverse rotation : vl_control_effort < 0

• Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1805	H00	number of entries	ro	5
	H01	COB-ID used by PDO	rw	H80000280 + Node-ID _{*1}
	H02	transmission type	rw	255
	H03	inhibit time	rw	0
	H04	Reserved	—	Without (error response)
	H05	event timer	rw	0
H1A05	H00	number of mapped objects	ro	2
	H01	status word	ro	H60410010
	H02	vl_control_effort	ro	H60440010

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

◆ 3rd Transmit PDO (PDO No.21)

• Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	(Index H4011-H00) Inverter status (Refer to page 113.)
Byte 0	Error	Frequency detection	IPF	Overload	Up to frequency	During reverse rotation	During forward rotation	Running	
Byte 1	Operation ready	Terminal ABC2 (Pr.196)	Terminal ABC1 (Pr.195)	Terminal FU (Pr.194)	Terminal IPF (Pr.192)	Terminal OL (Pr.193)	Terminal SU (Pr.191)	Terminal RUN (Pr.190)	
Byte 2	Output frequency (L)								(Index H4013-H01) Output frequency (Refer to page 115.)
Byte 3	Output frequency (H)								

• Mapping parameter

Index	Sub Index	Description	Read/write	Default
H1814	H00	number of entries	ro	5
	H01	COB-ID used by PDO	rw	H80000380 + Node-ID *1
	H02	transmission type	rw	255
	H03	inhibit time	rw	0
	H04	Reserved	—	Without (error response)
	H05	event timer	rw	0
H1A14	H00	number of mapped objects	ro	2
	H01	Inverter status	ro	H40110010
	H02	Output frequency	ro	H40130110

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

7.2 Service Data Object (SDO)

7.2.1 SDO Upload (SDO read)

- Request format (master → inverter)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	H40							
Byte 1	Index (L)							
Byte 2	Index (H)							
Byte 3	SubIndex ("0" is set if the Sub Index does not exist.)							
Byte 4	(Blank)							
Byte 5	(Blank)							
Byte 6	(Blank)							
Byte 7	(Blank)							

- Response format (inverter → master)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Refer to the table below.							
Byte 1	Index (L)							
Byte 2	Index (H)							
Byte 3	SubIndex							
Byte 4	Read data (L)							
Byte 5	Read data (ML)							
Byte 6	Read data (MH)							
Byte 7	Read data (H)							

Byte 0	Description
H4F	Data reading (1 byte long)
H4B	Data reading (2 byte long)
H43	Data reading (4 byte long)
H41	Reporting of the byte length for the next transmission (byte length: Byte 4 to 7)

7.2.2 SDO Download (SDO write)

- Request format (master → inverter)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Refer to the table below.							
Byte 1	Index (L)							
Byte 2	Index (H)							
Byte 3	SubIndex ("0" is set if the Sub Index does not exist.)							
Byte 4	Write data (L)							
Byte 5	Write data (ML)							
Byte 6	Write data (MH)							
Byte 7	Write data (H)							

Byte 0	Description
H2F	Data writing (1 byte long)
H2B	Data writing (2 byte long)
H23	Data writing (4 byte long)

- Response format (inverter → master)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	H60							
Byte 1	Index (L)							
Byte 2	Index (H)							
Byte 3	SubIndex							
Byte 4	(Blank)							
Byte 5	(Blank)							
Byte 6	(Blank)							
Byte 7	(Blank)							

7.2.3 SDO Abort Code (SDO error code)

The SDO abort code is returned as a response from the inverter when a setting value cannot be written to the inverter by SDO Download from the master or an access is attempted to a non-existent parameter by SDO Upload. (It is not transmitted when an inverter alarm occurs.)

- Transmission format (inverter → master)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	H80							
Byte 1	Index (L)							
Byte 2	Index (H)							
Byte 3	SubIndex (fixed to 0)							
Byte 4	Abort code (L)							
Byte 5	Abort code (ML)							
Byte 6	Abort code (MH)							
Byte 7	Abort code (H)							

Abort Code	Description
H0503 0000	Toggle bit not alternated
H0601 0000	Unsupported access to an object
H0601 0001	Attempt to read a write only object
H0601 0002	Attempt to write a read only object
H0602 0000	Object does not exist in the object dictionary
H0604 0043	General parameter incompatibility reason
H0607 0010	Data type does not match, length of service parameter does not match
H0607 0012	Data type does not match, length of service parameter too high
H0607 0013	Data type does not match, length of service parameter too low
H0609 0011	SubIndex does not exist
H0609 0030	Value range of parameter exceeded
H0609 0031	Value of parameter written too high
H0609 0032	Value of parameter written too low
H0609 0036	Maximum value is less than minimum value
H0800 0020	Data cannot be transferred or stored to the application
H0800 0021	Data cannot be transferred or stored to the application because of local control
H0800 0022	Data cannot be transferred or stored to the application because of the present device state

7.3 SYNC Object

SYNC object has two types as stated below and uses an object dictionary in the following.

◆ Related object dictionary

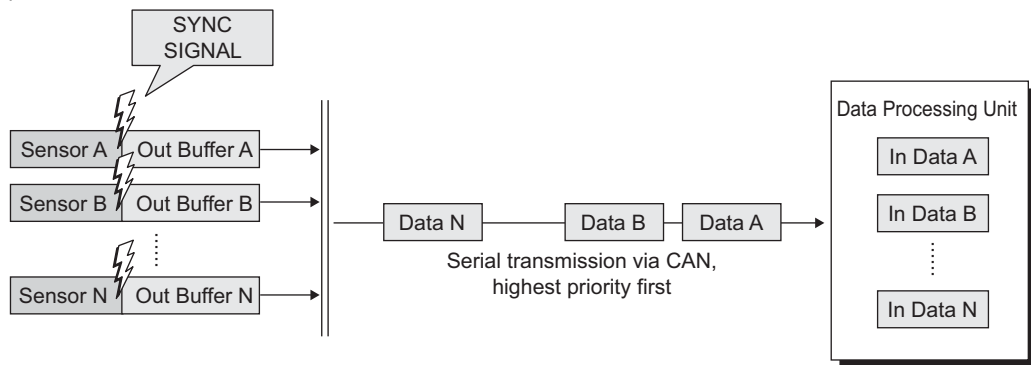
Index	Sub-Index	Name	Unit	Detail	Reference page
H1005	H00	COB-ID SYNC message	—	COB-ID of SYNC message	76

7.3.1 Bus Synchronization and Sampling

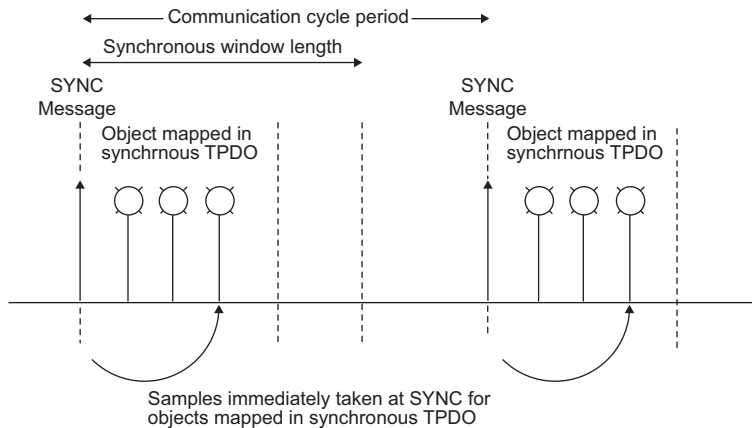
◆ Model

Output synchronous TPDO triggered by SYNC message periodically broadcasted.

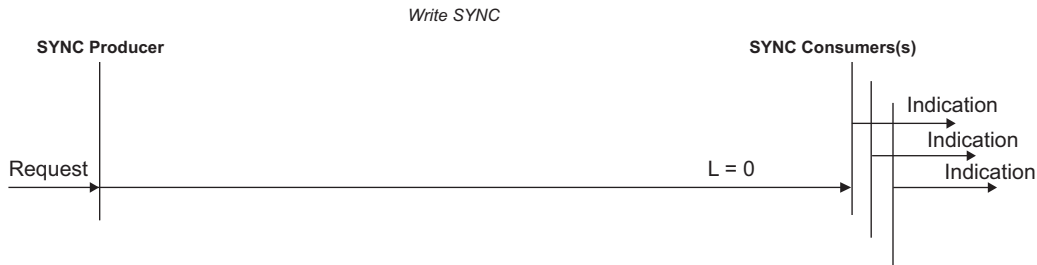
• Concept



- Time-line



- ◆ Request format
Without. Send COB-ID only.

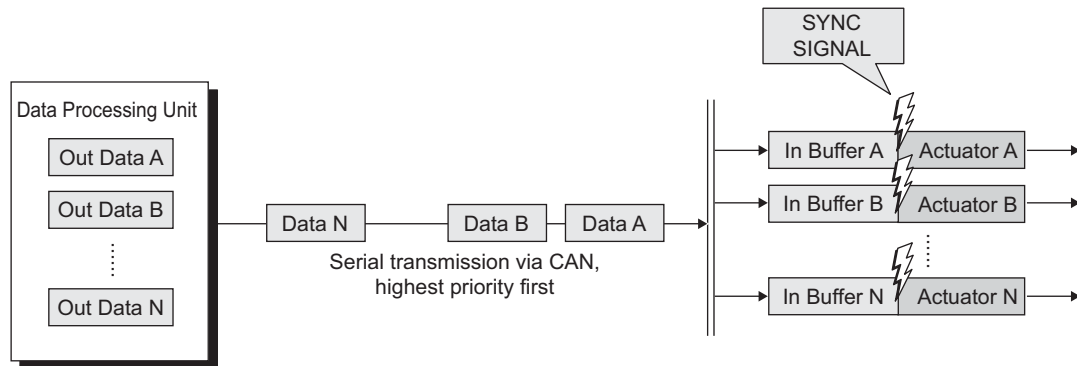


7.3.2 Bus Synchronization and Actual

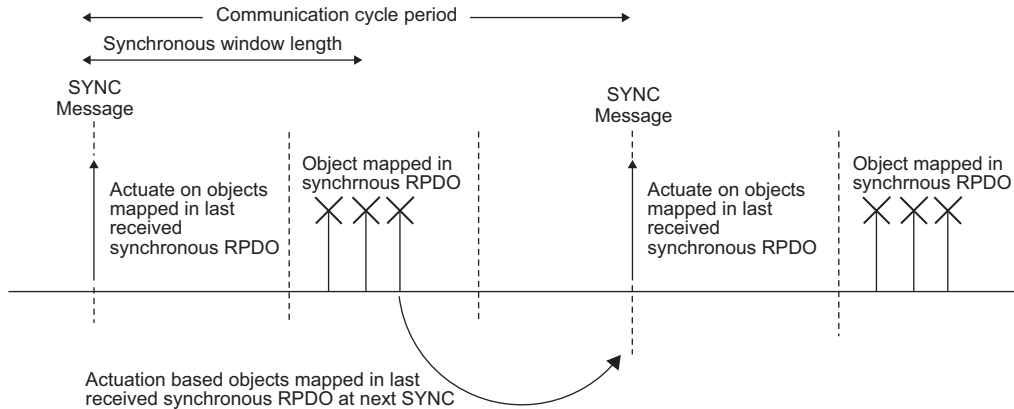
◆ Model

Process synchronous RPDO received triggered by SYNC message (SYNC SIGNAL) periodically broadcasted.

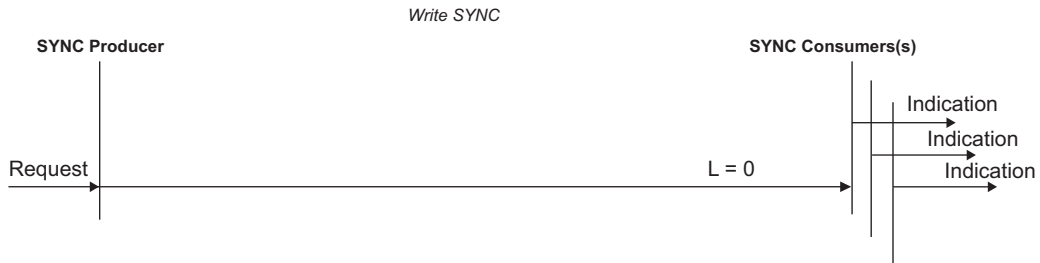
- Concept



- Time-line



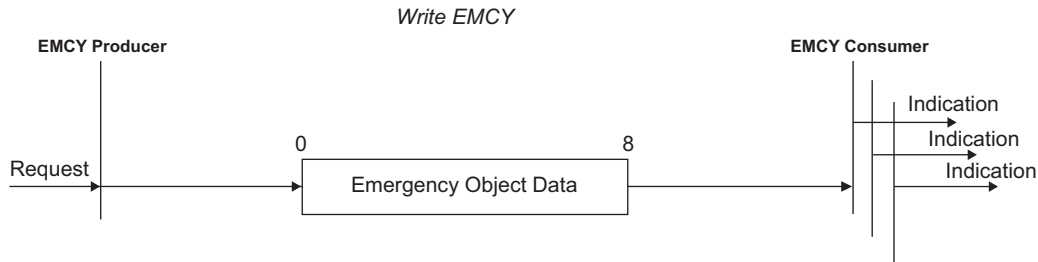
- ◆ Request format
Without. Send COB-ID only.



7.4 Emergency object

When an inverter error occurs or the heartbeat / node guarding reception interval equals or exceeds the setting, the object is used for reporting the error from the inverter.

- Model



- Request format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Emergency Error Code (L)							
Byte 1	Emergency Error Code (H)							
Byte 2	Error Register (same description as Index H1001)							
Byte 3	Blank(0)							
Byte 4	Blank(0)							
Byte 5	Blank(0)							
Byte 6	Blank(0)							
Byte 7	Blank(0)							

◆ Emergency error code

Emergency error code		Corresponding inverter alarm
H0000	No error	
H2213	Over-current in ramp function	E.OC1 E.OC3
H2214	Over-current in the sequence	E.OC2
H2220	Continuous over current	E.SOT
H2300	Current on device output side	E.THT E.OLT E.THM
H2310	Continuous over current	E.CDO
H2330	Earth leakage	E.GF
H3130	Phase failure	E.LF E.ILF
H3200	DC link voltage	E.OV1 to E.OV3
H3220	DC link under-voltage	E.UVT
H3331	Field circuit interrupted	E.IPF
H4200	temperature device	E.IAH
H4210	excess temperature device	E.FIN
H4310	excess temperature drive	E.PTC E.OHT
H5000	Device Hardware	E.OPT E.OP1

Emergency error code		Corresponding inverter alarm
H5112	U2 = supply +24V	E.P24
H5114	U4 = manufacturer specific	E.AIE
H5120	supply intermediate circuit	E.SAF
H5400	power section	E.PBT E.13
H5420	chopper	E.BE
H5430	input stages	E.IOH
H5530	Non-volatile data memory	E.PE E.PE2
H6010	software reset (watchdog)	E.6 E.7 E.CPU
H6100	internal software	E.RET
H630B	data record No.11	E.11
H6310	data record other	E.16 to E.20
H7305	incremental sensor 1 fault	E.ECT
H7306	incremental sensor 2 fault	E.ECA
H7307	incremental sensor 3 fault	E.EP
H7380	Device specific	E.MP

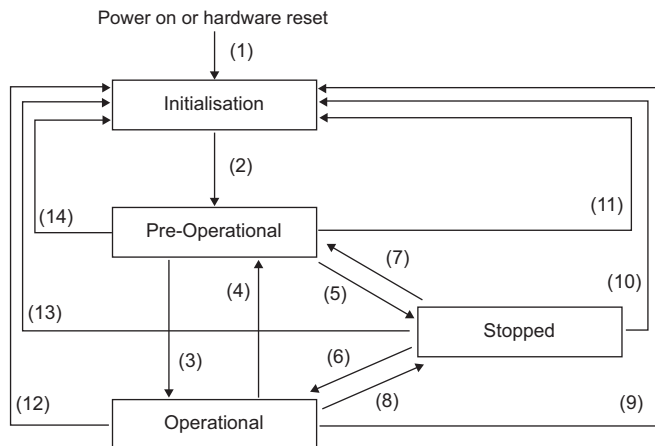
Emergency error code		Corresponding inverter alarm
H7400	computation circuit	E.1 to E.3
H7510	serial interface No.1	E.PUE E.CTE E.SER
H7580	USB interface (Device specific)	E.USB
H7590	Ethernet interface (Device specific)	E.EHR
HFF00	Device specific	E.OS
HFF01		E.OSD

Emergency error code		Corresponding inverter alarm
HFF02	Device specific	E.OD
HFF03		E.MB1 to E.MB7
HFF04		E.LCI
HFF05		E.PCH
HFF06		E.PID
HFFFF	Undefined error (device specific)	

7.5 Network Management object (NMT)

7.5.1 Status transition of NMT state

The status transition as option unit CANopen slave is indicated below.
(determined in CANopen standard)



Transition No	Operation
(1)	Power on or inverter reset
(2)	Initialization complete. Send Boot-Up protocol and transit to "Pre-Operational".
(3), (6)	Receive Start-Remote-Node protocol and transit to "Operational".
(4), (7)	Receive Enter-Pre-Operational protocol and transit to "Pre-Operational".
(5), (8)	Receive Stop-Remote-Node protocol and transit to "Stopped".
(9), (10), (11)	Receive Reset-Node protocol and transit to "Initialization".
(12), (13), (14)	Receive Reset-Communication protocol and transit to "Initialization".

7.5.2 Status transition matrix of NMT state

The table below shows available services in each status.

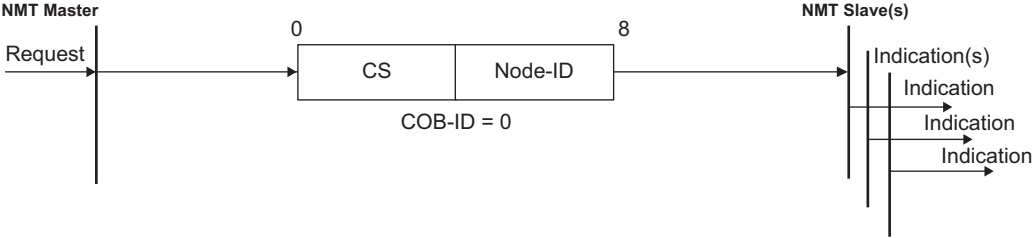
Service name	NMT State			
	Initializing	Pre-Operational	Operational	Stopped
Boot-Up	○			
SDO		○	○	
Emergency		○	○	
SYNC		○	○	
Heartbeat / Nodeguard		○	○	○
PDO			○	

○ : Service usable

7.5.3 Module Control Service

Changes to NMT state (node status).

- Model



- Request format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	CS							
Byte 1	Node-ID (0 to 127)							

CS	Module Control Service	Description
1	Start Remote Node	Changes to NMT state (node status) to "Operational status"
2	Stop Remote Node	Changes to NMT state (node status) to "Stop"
128	Enter Pre-Operational	Changes to NMT state (node status) to "Pre-Operation state".
129	Reset Node	Changes to NMT state (node status) to "Initialization state". Inverter reset.
130	Reset Communication	Switches NMT state to "Pre-Operation state". Resets the option unit only.

Node-ID	Description
0	All nodes execute Module Control Service.
1 to 127	Specified nodes execute Module Control Service.

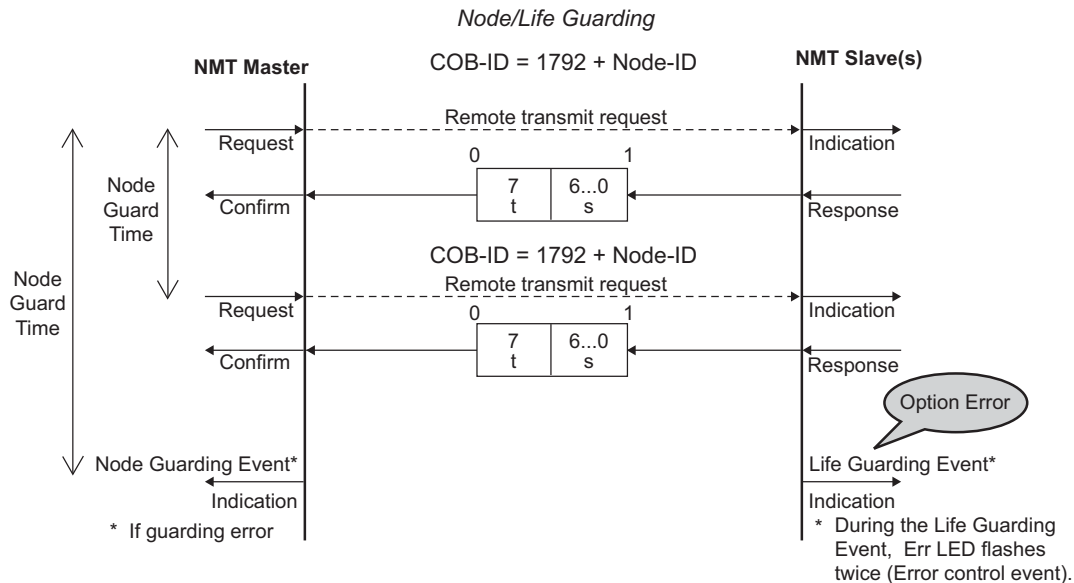
7.5.4 Error Control Service

◆ Guarding

Used when the master sends a request to the slave for obtaining the device state of the slave.

When the slave can not receive the request in [Node Life time], option error (E. OP1) occurs.

- Model



[Node Guard Time] : (Index H100C)Setting time of Guard Time (0 to 65535 ms)

[Node Life Time] : [Node Guard Time](ms) × [Life Time Factor(Index H100D)]

- Response format

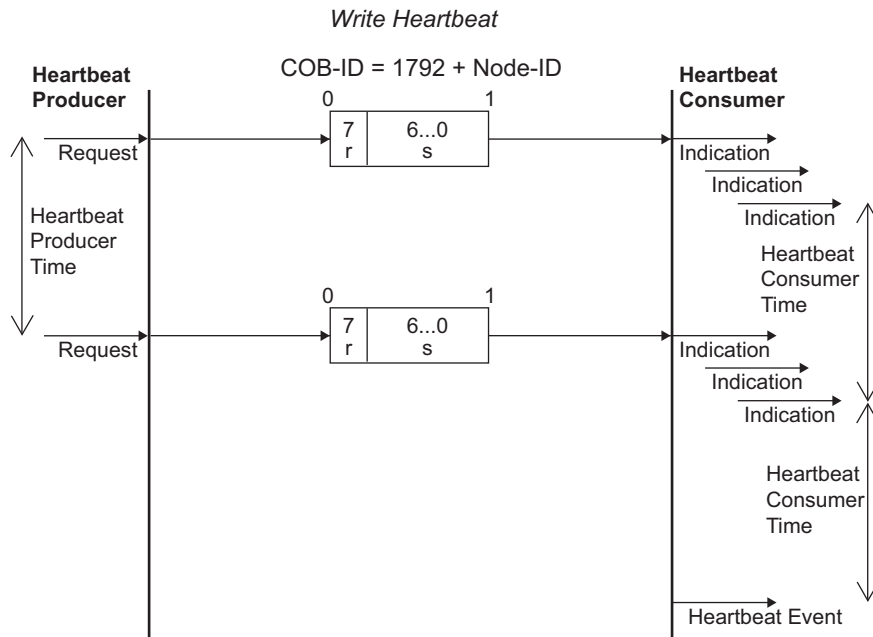
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	t (0)	s (0 to 127)						

s	Description (NMT status)
4	Stopped
5	Operational
127	Pre-Operational

◆ Heartbeat

Used for notifying the device state of itself without request.

- Model



- Transmission format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	r (0)		s (0 to 127)					

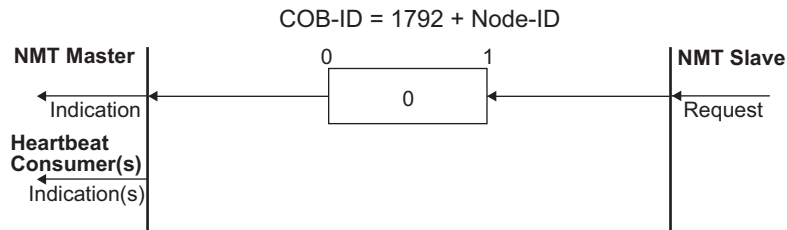
s	Description (NMT status)
0	Bootup
4	Stopped
5	Operational
127	Pre-Operational

◆ Bootup

Transmits the own node address at startup.

- Model

Bootup Event



- Transmission format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	H700 + Node ID							

8.1 Object list

	Index	Sub index	Name	Data type	Attribute *1	Reference page
Communication profile area	H1000	H00	device type	UNSIGNED32 (32 bit unsigned)	ro	73
	H1001	H00	error register	UNSIGNED8 (8 bit unsigned)	ro	74
	H1002	H00	manufacturer status register	UNSIGNED32 (32 bit unsigned)	ro	75
	H1005	H00	COB-ID SYNC	UNSIGNED32 (32 bit unsigned)	rw	76
	H1008	H00	manufacturer device name	Vis-String	const	77
	H100A	H00	Manufacturer Software Version	Object for manufacturer setting. Do not set.	const	—
	H100C	H00	guard time	UNSIGNED16 (16 bit unsigned)	rw	78
	H100D	H00	life time factor	UNSIGNED8 (8 bit unsigned)	rw	79
	H1010	H00	store parameters	UNSIGNED32 (32 bit unsigned)	rw	80
	H1011	H00	restore default parameters	UNSIGNED32 (32 bit unsigned)	rw	82
	H1014	H00	COB-ID EMCY	UNSIGNED32 (32 bit unsigned)	ro	83
	H1015	H00	Inhibit Time EMCY	UNSIGNED16 (16 bit unsigned)	rw	84
	H1016	H00	Consumer Heartbeat Time	UNSIGNED32 (32 bit unsigned)	rw	85
	H1017	H00	Producer heartbeat time	UNSIGNED16 (16 bit unsigned)	rw	86
	H1018	H00	Identity Object	Identity (H23)	ro	87
	H1400	H00	Receive PDO parameter 1	PDO_COMMUNICATION_PARAMETER (H0020)	rw	89

	Index	Sub index	Name	Data type	Attribute *1	Reference page
Communication profile area	H1405	H00	Receive PDO parameter 6	PDO_COMMUNICATION_PARAMETER (H0020)	rw	89
	H1414	H00	Receive PDO parameter 21	PDO_COMMUNICATION_PARAMETER (H0020)	rw	89
	H1600	H00	Receive PDO Mapping 1	PDO_MAPPING (H0021)	ro	91
	H1605	H00	Receive PDO Mapping 6	PDO_MAPPING (H0021)	ro	91
	H1614	H00	Receive PDO Mapping 21	PDO_MAPPING (H0021)	ro	91
	H1800	H00	Transmit PDO parameter 1	PDO_COMMUNICATION_PARAMETER (H0020)	rw	92
	H1805	H00	Transmit PDO parameter 6	PDO_COMMUNICATION_PARAMETER (H0020)	rw	92
	H1814	H00	Transmit PDO parameter 21	PDO_COMMUNICATION_PARAMETER (H0020)	rw	92
	H1A00	H00	Transmit PDO Mapping 1	PDO_MAPPING (H0021)	ro	95
	H1A05	H00	Transmit PDO Mapping 6	PDO_MAPPING (H0021)	ro	95
	H1A14	H00	Transmit PDO Mapping 21	PDO_MAPPING (H0021)	ro	95

	Index	Sub index	Name	Data type	Attribute *1	Reference page
Manufacturer specific area	H2000 to H2063	H00	Inverter monitor	UNSIGNED16 (16 bit unsigned)	ro	96
	H2106	H00	Alarm clear	UNSIGNED16 (16 bit unsigned)	wo	98
	H2107	H00	Inverter reset	UNSIGNED16 (16 bit unsigned)	wo	98
	H2108	H00	Parameter Clear	UNSIGNED16 (16 bit unsigned)	wo	99
	H2109	H00	Operation Mode	UNSIGNED16 (16 bit unsigned)	rw	100
	H3000 to H3385	H00	Parameter area (Pr.0 to Pr.901)	UNSIGNED16 (16 bit unsigned)	rw	101
	H3386 to H33AB	H00	Parameter area (Pr.902 to Pr.939) Number of entry record	UNSIGNED8 (8 bit unsigned)	ro	102
		H01	Offset / Gain value	UNSIGNED16 (16 bit unsigned)	rw	102
		H02	Analog value	UNSIGNED16 (16 bit unsigned)	rw	102
	H33AC to H33E7	H00	Parameter area (Pr.940 to Pr.999)	UNSIGNED16 (16 bit unsigned)	rw	101
	H3400	H00	Alarm history 1, 2	UNSIGNED16 (16 bit unsigned)	rw	103
	H3401	H00	Alarm history 3, 4	UNSIGNED16 (16 bit unsigned)	ro	103
	H3402	H00	Alarm history 5, 6	UNSIGNED16 (16 bit unsigned)	ro	103
	H3403	H00	Alarm history 7, 8	UNSIGNED16 (16 bit unsigned)	ro	103
	H3500 to H36F3	H00	Parameter area (Pr.1000 to Pr.1499)	UNSIGNED16 (16 bit unsigned)	rw	104

	Index	Sub index	Name	Data type	Attribute *1	Reference page
Manufacturer specific area	H4000	H00	Control input command (w) / Inverter status (r)	UNSIGNED16 (16 bit unsigned)	rw	105
	H4001	H00	Number of Entries	UNSIGNED8 (8 bit unsigned)	ro	108
		H01	Set frequency (RAM) (w) / Output frequency (r)	UNSIGNED16 (16 bit unsigned)	rw	108
		H02	Set frequency (RAM) (w) / Running Speed (r)	UNSIGNED16 (16 bit unsigned)	rw	108
	H4002	H00	Number of Entries	UNSIGNED8 (8 bit unsigned)	ro	110
		H01	Set frequency (RAM)	UNSIGNED16 (16 bit unsigned)	rw	110
		H02	Set frequency (EEPROM)	UNSIGNED16 (16 bit unsigned)	wo	110
	H4003	H00	Number of Entries	UNSIGNED8 (8 bit unsigned)	ro	111
		H01	Set speed (RAM)	UNSIGNED16 (16 bit unsigned)	rw	111
		H02	Set speed (EEPROM)	UNSIGNED16 (16 bit unsigned)	wo	111
	H4010	H00	Control input command (w)	UNSIGNED16 (16 bit unsigned)	wo	112
	H4011	H00	Inverter status (r)	UNSIGNED16 (16 bit unsigned)	ro	113
	H4012	H00	Number of Entries	UNSIGNED8 (8 bit unsigned)	ro	114
		H01	Set frequency (RAM) (w)	UNSIGNED16 (16 bit unsigned)	wo	114
		H02	Set speed (RAM) (w)	UNSIGNED16 (16 bit unsigned)	wo	114
	H4013	H00	Number of Entries	UNSIGNED8 (8 bit unsigned)	ro	115
		H01	Output frequency (r)	UNSIGNED16 (16 bit unsigned)	ro	115
		H02	Running Speed (r)	UNSIGNED16 (16 bit unsigned)	ro	115

	Index	Sub index	Name	Data type	Attribute *1	Reference page
Device profile area	H6040	H00	controlword	UNSIGNED16 (16 bit unsigned)	rw	116
	H6041	H00	statusword	UNSIGNED16 (16 bit unsigned)	ro	119
	H6042	H00	vl_target_velocity	INTEGER16 (16 bit signed)	rw	122
	H6043	H00	vl_velocity_demand	INTEGER16 (16 bit signed)	ro	122
	H6044	H00	vl_control_effort	INTEGER16 (16 bit signed)	ro	123
	H6046	H00	vl_velocity_min_max_amount	UNSIGNED32 (32 bit unsigned)		124
	H6048		vl_velocity_acceleration deceleration_record		rw	126
		H01	Delta_speed	UNSIGNED32 (32 bit unsigned)	rw	126
		H02	Delta_time	UNSIGNED16 (16 bit unsigned)	rw	126
	H6049		vl_velocity_deceleration	vl_velocity_acceleration deceleration_record	rw	128
		H01	Delta_speed	UNSIGNED32 (32 bit unsigned)	rw	128
		H02	Delta_time	UNSIGNED16 (16 bit unsigned)	rw	128
	H604A		vl_velocity_quick_stop	vl_velocity_acceleration deceleration_record	rw	130
		H01	Delta_speed	UNSIGNED32 (32 bit unsigned)	rw	130
		H02	Delta_time	UNSIGNED16 (16 bit unsigned)	rw	130
	H605A	H00	quick_stop_option_code	INTEGER16 (16 bit signed)	rw	132
	H67FF	H00	Single Device Type	UNSIGNED32 (32 bit unsigned)	ro	133

*1 rw: read / write, ro: read only, wo: write only

8.2 Object Detail of Communication Profile Area

8.2.1 (Index H1000) Device Type

Sub index	Item	Description
H00	Name	Device Type
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	H00010192
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

Bit	Description	Remarks
0 to 15	Device Profile Number	H0192 (Drive Profile is 402)
16 to 23	Additional Information (Type)	H01 (Frequency Converter)
24 to 31	Additional Information (mode bits)	H00

8.2.2 (Index H1001) Error Register

Sub index	Item	Description
H00	Name	Error Register
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	0 (Inverter alarm is not occurred.)
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

Bits corresponding to emergency error code of emergency object turn to 1.

Bit	Description	Remarks
0	Generic Error	1 when an error related to any of the followings occurs: H1000 generic error, H5000 device hardware, H6000 device software, H7000 additional modules, H9000 external error, HF000 additional functions of emergency error code and 0 when no error occurs.
1	Current	1 when an error related to H2000 current of emergency error code occurs and 0 when no error occurs.
2	Voltage	1 when an error related to H3000 voltage of emergency error code occurs and 0 when no error occurs.
3	Temperature	1 when an error related to H4000 temperature of emergency error code occurs and 0 when no error occurs.
4	Communication Error	1 when an error related to H8000 monitoring of emergency error code occurs and 0 when no error occurs.
5	Device Profile Defined Error	(Not supported) Always 0
6	Reserved(0)	Always 0
7	Manufacturer Specific Error	(Not supported) Always 0

8.2.3 (Index H1002) Manufacturer Status Register

Sub index	Item	Description
H00	Name	Manufacturer Status Register
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	0 (Inverter alarm is not occurred.)
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

Bit	Description	Remarks	
0	Running (RUN signal)	0: Not running, 1: Running	Signals are not affected by settings of Pr.190 to Pr.196 (output terminal function selection).
1	During forward rotation	0: Not forward rotation, 1: Forward rotation	
2	During reverse rotation	0: Not reverse rotation, 1: Reverse rotation	
3	Up-to-running frequency (SU signal)	0: Not reached the running frequency, 1: Reached the running frequency	
4	Overload (OL signal)	0: Not overloaded, 1: Overloaded	
5	Instantaneous power failure (IPF signal)	0: Instantaneous power failure not occurred, 1: Instantaneous power failure occurred	
6	Frequency detection (FU signal)	0: Frequency detection not exercised, 1: Frequency detection exercised	
7	Error	0: Inverter alarm not occurred, 1: Inverter alarm occurred	
8 to 14	(Inhibited)	(Always 0)	
15	Operation ready completion	0: Operation ready not completed, 1: Operation ready completed	
16 to 31	(Inhibited)	(Always 0)	

8.2.4 (Index H1005) COB-ID SYNC

Sub index	Item	Description
H00	Name	COB-ID for SYNC Object
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	H00000080
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Bit	Description	Remarks
0 to 10	COB-ID of SYNC Object	
11 to 28	(Not used)	Always 0
29	Selection of COB-ID length (0: 11 bit length, 1: 29 bit length)	Always 0 (When 1 is set on this bit, SDO abort code returns.) ([Value range of parameter exceeded(write access only)] = H06090030)
30	Selection of SYNC Object generation (0: Not generate, 1: Generate)	Always 0 (When 1 is set on this bit, SDO abort code returns.) ([Value range of parameter exceeded(write access only)] = H06090030)
31	(Not used)	Always 0

8.2.5 (Index H1008) Manufacturer Device Name

Sub index	Item	Description
H00	Name	Manufacturer Device Name
	Data type	VISIBLE_STRING (ASCII data)
	Default value	Refer to the table below.
	Access attribute	Const
	Availability of mapping to PDO	Disable

Model	Description
A800	"A800" = (LSB) H41 H38 H30 H30

8.2.6 (Index H100C) Guard Time

Sub index	Item	Description
H00	Name	Guard Time
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	0
	Unit	ms
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

A factor to determine the Time out value ([Node Life Time]) in Node Guarding Protocol.

[Node Life Time], a factor to determine the check time of polling receive interval in Guarding protocol, is determined by [Guard Time] × [Life Time Factor].



- When 0 is set in [Guard Time], Guarding operation is made invalid.
- Guarding protocol : Refer to [page 64](#).
- [Life Time Factor] : Refer to [page 79](#).

8.2.7 (Index H100D) Life Time Factor

Sub index	Item	Description
H00	Name	Life Time Factor
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	0
	Unit	ms
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

A factor to determine the Time out value ([Node Life Time]) in Node Guarding Protocol.

[Node Life Time], a factor to determine the check time of polling receive interval in Guarding protocol, is determined by [Guard Time] \times [Life Time Factor].



NOTE

- When 0 is set in [Guard Time], Guarding operation is made invalid.
- Guarding protocol : Refer to [page 64](#).

8.2.8 (Index H1010) store parameters

Sub index	Item	Description
H00	Name	Largest Subindex Supported
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	3
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Save All Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H02	Name	Save Communication Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H03	Name	Save Application Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

When "save" is written to Sub Index, "Store process" is performed and the value of object dictionary is saved to EEPROM. (Write "save" starting from "s". (LSB): H73 H61 H76 H65)

Sub index	Store process
H01	Save the all entry.
H02	Save Index H1000 to H1FFF (Communication Profile Area).
H03	Save Index H6000 to H9FFF (Device Profile Area).

When "save" is written, the corresponding store process is performed, and SDO response is returned.

When save is failed, SDO abort is returned (Abort code: H0606 0000).

When an incorrect character string is written, store process is not performed, and SDO Abort is returned (Abort code: H0800 002[]).

When Sub Index is read, availability of automatic parameter save is returned.

Bit	Description
0	1: Save the parameter by writing "save" to Sub Index. 0: Not save the parameter even if "save" is written to Sub Index.
1	1: The parameter is automatically saved. 0: The parameter is not automatically saved. (Save manually)
2 to 31	Reserved. Read value is 0.

8.2.9 (Index H1011) restore default parameters

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	3
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Restore All Default Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H02	Name	Restore Communication Default Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H03	Name	Restore Application Default Parameters
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

When "load" is written to Sub Index, "Restore process" is performed.
(Write "load" starting from "1". (LSB): H6C H6F H61 H64)

Sub index	Restore process
H01	All entries return to the default values. (All clear + Option EEPROM clear)
H02	Index H1000 to H1FFF (Communication Profile Area) return to the default values.
H03	Index H6000 to H9FFF (Device Profile Area) return to the default values.

8.2.10 (Index H1014) COB-ID EMCY

Sub index	Item	Description
H00	Name	Emergency COB-ID
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	H00000080 + Node-ID
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

Valid / Invalid switchover of Emergency protocol and COB-ID used in Emergency protocol is available.
(Refer to [page 58](#).)

Bit	Description
0 to 10	COB-ID used in Emergency protocol
11 to 28	Always 0
29	Always 0
30	(reservation) Always 0
31	0: Emergency protocol is valid. 1: Emergency protocol is invalid.

8.2.11 (Index H1015) Inhibit Time EMCY

Sub index	Item	Description
H00	Name	Inhibit Time EMCY
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	0
	Unit	100 μ s
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

For Emergency protocol. Transmission disabled time can be set.

Setting range is "0 to 65535 μ s".

Necessary to implement Emergency protocol in Vector slave source.

8.2.12 (Index H1016) Consumer Heartbeat Time

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	1
	Unit	ms
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Consumer Heartbeat Time
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	0
	Unit	ms
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Set the heartbeat reception interval (timeout time). (1 ms increments)

The time count starts after the first heartbeat is received. This function is disabled when "0" is set.

Bit	Remarks
0 to 15	Heartbeat reception interval
16 to 23	Node-ID of the heartbeat monitoring target (Heartbeat Producer)
24 or more	Set "0".

8.2.13 (Index H1017) Producer Heartbeat Time

Sub index	Item	Description
H00	Name	Producer Heartbeat Time
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	0
	Unit	ms
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Set the Heartbeat transmission interval when Heartbeat protocol is used. (Refer to [page 66](#).)

8.2.14 (Index H1018) Identity

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	4
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Vendor ID
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	H000001D0
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H02	Name	Product Code
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	H00000047 (71)
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H03	Name	Revision Number
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

Sub index	Item	Description
H04	Name	Serial Number
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	Use within the range of H00000000 to H0000FFFF.
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

- Return some basic information of node. (Vender ID, Product code, Revision number, Serial number)
- Vender ID is allocated to each manufacturers.
- Product code is allocated to each products.
- Revision number is the version of the product.

Bit	Description	Remarks
0 to 15	Minor Revision Number	Incremented when the setting which does not change the operation or the action of CANopen has been made. For example, minor bug fix, etc.
16 to 31	Major Revision Number	Incremented when the setting which changes the operation or the action of CANopen has been made. For example, addition / deletion of object, etc.

- Serial Number is the unique number of the product.

8.2.15 (Index H1400 to H15FF) Recive PDO Parameters

Sub index	Item	Description
H00	Name	Lagrgest Subindex Supported
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	COB-ID used by PDO
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	Index H1400: H200 + Node-ID Index H1405: H80000300 + Node-ID * ₁ Index H1414: H80000400 + Node-ID * ₁ Index H1401 to H1404, H1406 to H1413, H1415 to H15FF: disabled
	Unit	—
	Access attribute	Read Only (other than Index H1400, H1405, H1414) Read / Write (Index H1400, H1405, H1414)
	Availability of mapping to PDO	Disable
H02	Name	Transmission Type
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	255
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

Perform a communication setting of Receive PDO.

Sub index	Bit	Description																																									
H00	0 to 7	The number of valid entries within the communication record is stored. Its value is at least 2.																																									
H01	0 to 10	COB-ID																																									
	11 to 28	Always 0																																									
	29	Always 0 11-bit ID (CAN 2.0A)																																									
	30	0: RTR allowed on this PDO 1: no RTR allowed on this PDO																																									
	31	0: PDO exists (valid) 1: PDO does not exist (invalid)																																									
H02	0 to 7	Description of transmission type																																									
		<table><tr><th rowspan="2">Value</th><th colspan="5">PDO transmission</th></tr><tr><th>cyclic</th><th>acyclic</th><th>synchronous</th><th>asynchronous</th><th>RTR only</th></tr><tr><td>0</td><td></td><td>valid</td><td>valid</td><td></td><td></td></tr><tr><td>1 to 240</td><td>valid</td><td></td><td>valid</td><td></td><td></td></tr><tr><td>241 to 253</td><td colspan="5">reserved</td></tr><tr><td>254</td><td></td><td></td><td></td><td>valid</td><td></td></tr><tr><td>255</td><td></td><td></td><td></td><td>valid</td><td></td></tr></table>	Value	PDO transmission					cyclic	acyclic	synchronous	asynchronous	RTR only	0		valid	valid			1 to 240	valid		valid			241 to 253	reserved					254				valid		255				valid	
		Value		PDO transmission																																							
			cyclic	acyclic	synchronous	asynchronous	RTR only																																				
		0		valid	valid																																						
		1 to 240	valid		valid																																						
		241 to 253	reserved																																								
		254				valid																																					
255				valid																																							



- Refer to [page 92](#) for details of (Index H1800 to H19FF) Transmit PDO Parameters.

8.2.16 (Index H1600 to H17FF) Recive PDO Mapping

Sub index	Item	Description
H00	Name	Number of mapped application objects in PDO
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01 to H40	Name	PDO mapping for the nth application object to be mapped
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	Refer to page 42
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

Perform a mapping of Receive PDO.

8.2.17 (Index H1800 to H19FF) Transmit PDO Parameters

Sub index	Item	Description
H00	Name	Lagrgest Subindex Supported
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	4
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	COB-ID used by PDO
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	Index H1800: H180 + Node-ID Index H1805: H80000280 + Node-ID * ¹ Index H1814: H80000380 + Node-ID * ¹ Index H1801 to H1804, H1806 to H1813, H1815 to H19FF: disabled
	Unit	—
	Access attribute	Read Only (other than Index H1800, H1805, H1814) Read / Write (Index H1800, H1805, H1814)
	Availability of mapping to PDO	Disable

*1 This is not available in the initial status. To enable it, set "0" in Bit 31 (MSB) of the PDO using SDO.

Sub index	Item	Description
H02	Name	Transmission Type
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	255
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H03	Name	Inhibit Time
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	100 μ s
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable
H05	Name	Event Timer
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	—
	Unit	ms
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Perform a communication setting of Transmit PDO.

Sub index	Bit	Description																																																					
H00	0 to 7	The number of valid entries within the communication record is stored. Its value is 4.																																																					
H01	0 to 10	COB-ID																																																					
	11 to 28	Always 0																																																					
	29	Always 0 11-bit ID (CAN 2.0A)																																																					
	30	0: RTR allowed on this PDO 1: no RTR allowed on this PDO																																																					
	31	0: PDO exists (valid) 1: PDO does not exist (invalid)																																																					
H02	0 to 7	Description of transmission type																																																					
		<table><tr><th rowspan="2">Value</th><th colspan="5">PDO transmission</th></tr><tr><th>cyclic</th><th>acyclic</th><th>synchronous</th><th>asynchronous</th><th>RTR only</th></tr><tr><td>0</td><td></td><td>valid</td><td>valid</td><td></td><td></td></tr><tr><td>1 to 240</td><td>valid</td><td></td><td>valid</td><td></td><td></td></tr><tr><td>241 to 251</td><td colspan="5">reserved</td></tr><tr><td>252</td><td></td><td></td><td>valid</td><td></td><td>valid</td></tr><tr><td>253</td><td></td><td></td><td></td><td>valid</td><td>valid</td></tr><tr><td>254</td><td></td><td></td><td></td><td>valid</td><td></td></tr><tr><td>255</td><td></td><td></td><td></td><td>valid</td><td></td></tr></table>	Value	PDO transmission					cyclic	acyclic	synchronous	asynchronous	RTR only	0		valid	valid			1 to 240	valid		valid			241 to 251	reserved					252			valid		valid	253				valid	valid	254				valid		255				valid	
		Value		PDO transmission																																																			
			cyclic	acyclic	synchronous	asynchronous	RTR only																																																
		0		valid	valid																																																		
		1 to 240	valid		valid																																																		
		241 to 251	reserved																																																				
		252			valid		valid																																																
		253				valid	valid																																																
		254				valid																																																	
255				valid																																																			
H03	0 to 15	The inhibit time is set. This time is a minimum interval for PDO transmission. The value is defined as multiple of 100 μ s.																																																					
H05	0 to 7	By setting the Sub Index H05, PDO is sent with Sub Index H05 setting value. (The setting increments is 1 ms.)																																																					



- Refer to [page 89](#) for details of (Index H1400 to H15FF) Recive PDO Parameters.

8.2.18 (Index H1A00 to H1BFF) Transmit PDO Parameters

Sub index	Item	Description
H00	Name	number of mapped application objects in PDO
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01 to H40	Name	PDO mapping for the nth application object to be mapped
	Data type	UNSIGNED32 (32 bit unsigned)
	Default value	Refer to page 46
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

Perform a mapping of Transmit PDO.

8.3 Object Detail of Manufacturer Specific Area

8.3.1 (Index H2000 to H2063) Monitor of the inverter

Sub index	Item	Description
H00	Name	Inverter Monitor
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	Refer to the following table
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

The monitor code read via the CANopen communication corresponds to the RS-485 communication dedicated monitor of the inverter. Use the following formula to calculate the monitor code.

Index number of the monitor item to be read = RS-485 communication dedicated monitor + H1FFF

Index	RS-485 communication dedicated monitor (hexadecimal)	Item	Increment
H2000	H01	Output frequency	0.01 Hz
H2001	H02	Output current	0.01 A/0.1 A
H2002	H03	Output voltage	0.1 V
H2004	H05	Frequency setting value	0.01 Hz
H2005	H06	Running speed	1
.	.	.	.
.	.	.	.
.	.	.	.

For example, when the output voltage is monitored, the RS-485 communication dedicated monitor for the output voltage is H03. Therefore, the CANopen index number is H2002.

$H03 + H1FFF = H2002$



- For the details of the RS-485 communication dedicated monitor codes or monitor items, refer to the description of the monitor display (**Pr.52**) in the Instruction Manual (Detailed) of the inverter.

8.3.2 (Index H2106) Alarm clear

Sub index	Item	Description
H00	Name	Alarm clear
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Write Only
	Availability of mapping to PDO	Enable

Perform an alarm clear by writing "any data".

8.3.3 (Index H2107) Inverter reset

Sub index	Item	Description
H00	Name	Inverter reset
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Write Only
	Availability of mapping to PDO	Disable

Reset the inverter by writing H9696.

8.3.4 (Index H2108) Parameter Clear

Sub index	Item	Description
H00	Name	Parameter Clear
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Write Only
	Availability of mapping to PDO	Disable

Perform parameter clear / all parameter clear.

Clear type can be selected with the written value.

Written value	Description
H965A	Parameter Clear
H99AA	All Parameter Clear
H5A96	Parameter Clear (except for communication parameter)
HAA99	All Parameter Clear (except for communication parameter)
Other than the above	Nothing is done.



NOTE

- Respond error when the inverter is not receptive.

8.3.5 (Index H2109) Operation Mode

Sub index	Item	Description
H00	Name	Operation Mode
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Change or read the operation mode of the inverter.

Value	Description
H0000	External operation mode
H0001	PU operation mode (Writing is enabled only when "6" is set in Pr.79 .)
H0002	External JOG operation mode
H0003	PU JOG operation mode
H0004	NET operation mode
H0005	External / PU combined operation mode (Read only)
Other than the above	Nothing is done.



NOTE

- Respond error if the inverter is not receptive when requesting the change.

8.3.6 (Index H3000 to H3385, H33AC to H33E7) Parameter Area

Sub index	Item	Description
H00	Name	Parameter area (Pr.0 to Pr.901, Pr.940 to Pr.999)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

Perform read / write of parameter area (**Pr.0 to Pr.901, Pr.940 to Pr.999**).

Index number - H3000 = Inverter parameter number



- Respond error if the inverter is not receptive when requesting.

8.3.7 (Index H3386 to H33AB) Calibration Parameter Area

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Parameter Area (Pr.902 to Pr.939) (Offset value)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Parameter Area (Pr.902 to Pr.939) (Analog value)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

Perform read / write of calibration parameter area (**Pr.902 to Pr.939**).

Index number - H3000 = Inverter parameter number



- Respond error if the inverter is not receptive when requesting.

8.3.8 (Index H3400 to H3403) Alarm history 1 to 8

Sub index	Item	Description
H00	Name	Alarm history 1 to 8
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write (Index H3400), Read Only (Index H3401 to H3403)
	Availability of mapping to PDO	Enable

Read alarm history.

Index No.	Sub index	High byte	Low byte
H3400 ^{*1}	H00	Alarm history 2	Alarm history 1
H3401	H00	Alarm history 4	Alarm history 3
H3402	H00	Alarm history 6	Alarm history 5
H3403	H00	Alarm history 8	Alarm history 7

*1 Writing any value will clear the faults history.



NOTE

- For the details of the alarms, refer to the Instruction Manual (Detailed) of the inverter.

8.3.9 (Index H3500 to H36F3) Parameter Area

Sub index	Item	Description
H00	Name	Parameter area (Pr.1000 to Pr.1499)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Perform read / write of parameter area (**Pr.1000 to Pr.1499**).

(Index number - H3500) + 1000 = Inverter parameter number



- Respond error if the inverter is not receptive when requesting.

8.3.10 (Index H4000) Control input command (w) / Inverter status (r)

Sub index	Item	Description
H00	Name	Control input command (w) / Inverter status (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

Perform control command to the inverter. And read the inverter status.

When written at the same time as Index H4010 Control input command (w) (written at the same time with SDO and PDO), the latter writing has priority.

◆ Control input command (Writing)

The following items can be sent to the inverter as control input command.

Bit	Definition	Bit	Definition
0	(Blank)	7	Second function selection (terminal RT function) *1
1	Forward rotation command *3	8	Current input selection (terminal AU function) *1
2	Reverse rotation command *3	9	Selection of automatic restart after instantaneous power failure (terminal CS function) *1, *2
3	High-speed operation command (terminal RH function) *1	10	Output shutoff (terminal MRS function)*1
4	Middle-speed operation command (terminal RM function) *1	11	Start self-holding selection (terminal STOP function) *1, *2
5	Low-speed operation command (terminal RL function) *1	12	Reset (RES terminal function) *1, *2
6	Jog operation command (terminal JOG function) *1, *2	13 to 15	(Blank)

*1 Signal names are initial values. Definitions change according to the **Pr.180 to Pr.189 (input terminal function selection)**.

*2 The signal within parentheses is the default setting. Since jog operation/automatic restart after instantaneous power failure/start self-holding/reset cannot be controlled by the network, they are invalid in the initial status.

*3 STF and STR are valid only when the internal status of the FR-A8NCA (Refer to [page 117](#)) is Operation Enable.
The motor runs at the speed of target_velocity at transition to Operation Enable.
(To change the rotation direction at transition to Operation Enable, set target_velocity to negative speed.)

◆ Inverter status (Reading)

Bit definitions are as follows.

Bit	Definition	Bit	Definition
0	RUN (inverter running) *1	8	Running (terminal RUN function) *2
1	FWD (during forward rotation) *1	9	Up to frequency (terminal SU function) *2
2	REV (during reverse rotation) *1	10	Overload alarm (terminal OL function) *2
3	SU (up-to-frequency) *1	11	Instantaneous power failure (terminal IPF function) *2
4	OL (overload) *1	12	Frequency detection (terminal FU function) *2
5	IPF (instantaneous power failure) *1	13	Fault (terminal ABC1 function) *2
6	FU (frequency detection) *1	14	— (terminal ABC2 function) *2
7	ALM (alarm) *1	15	Operation ready completion (READY)

*1 Signals are not affected by settings of **Pr.190 to Pr.196 (output terminal function selection)**.

*2 Signal names are initial values. Definitions change according to the **Pr.190 to Pr.196 (output terminal function selection)**.

8.3.11 (Index H4001) Set frequency (Set Speed) (w) / Output frequency (Running speed) (r)

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Set frequency (w) / Output frequency (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	0.01 Hz (frequency)
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Set speed (w) / Running Speed (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	1 r/min (speed)
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

Perform frequency setting to the inverter. And read the output frequency.

When written at the same time as Index H4012 Set frequency (w), Set speed (w) (written at the same time with SDO and PDO), the latter writing has priority.

- Writing

Perform the set frequency (speed) writing in 0.01 Hz (1 r/min) increments.

- Reading

Perform the output frequency (running speed) reading in 0.01 Hz (1 r/min) increments.



- Refer to [page 35](#) for the conversion between frequency and speed.

8.3.12 (Index H4002) Set Frequency

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Set Frequency (RAM)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	0.01 Hz
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Set Frequency (EEPROM)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	0.01 Hz
	Access attribute	Write Only
	Availability of mapping to PDO	Enable

Perform reading / writing of the set frequency (RAM / EEPROM) to the inverter.

When written at the same time as Index H4012 Set frequency (w), Set speed (w) (written at the same time with SDO and PDO), the latter writing has priority.

8.3.13 (Index H4003) Set Speed

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Set Speed (RAM)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Set Speed (EEPROM)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	1 r/min
	Access attribute	Write Only
	Availability of mapping to PDO	Enable

Perform reading / writing of the set speed (RAM / EEPROM) to the inverter.

When written at the same time as Index H4012 Set frequency (w), Set speed (w) (written at the same time with SDO and PDO), the latter writing has priority.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.3.14 (Index H4010) Control Input Command (w)

Sub index	Item	Description
H00	Name	Control Input Command (w)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Write Only
	Availability of mapping to PDO	Enable

Perform control command to the inverter. The written content is the same as that of Index H4000. (Refer to [page 105](#).)
When written at the same time as Index H4000 Control input command (w) (written at the same time with SDO and PDO), the latter writing has priority.

8.3.15 (Index H4011) Inverter Status (r)

Sub index	Item	Description
H00	Name	Inverter Status (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

Read the inverter status. The read content is the same as that of Index H4000. (Refer to [page 105](#).)

8.3.16 (Index H4012) Set Frequency (w) / Set Speed (w)

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Set Frequency (w)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	0.01 Hz
	Access attribute	Write Only
	Availability of mapping to PDO	Enable
H02	Name	Set Speed (w)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	1 r/min
	Access attribute	Write Only
	Availability of mapping to PDO	Enable

Perform frequency (speed) setting to the inverter in 0.01 Hz (1 r/min) increments.

When index H4001 Set frequency (Set speed) (w)/Output frequency (Running speed) (r) are set at the same time (when written by SDO and PDO simultaneously), the value written later has precedence.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.3.17 (Index H4013) Output Frequency (r) / Running Speed (r)

Sub index	Item	Description
H00	Name	Number of Entries
	Data type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Output Frequency (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	0.01 Hz
	Access attribute	Read Only
	Availability of mapping to PDO	Enable
H02	Name	Running Speed (r)
	Data type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	1 r/min
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

Read output frequency (running speed) in 0.01 Hz (1 r/min) increments.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.4 Object detail of Device Profile Area

8.4.1 (Index H6040) controlword

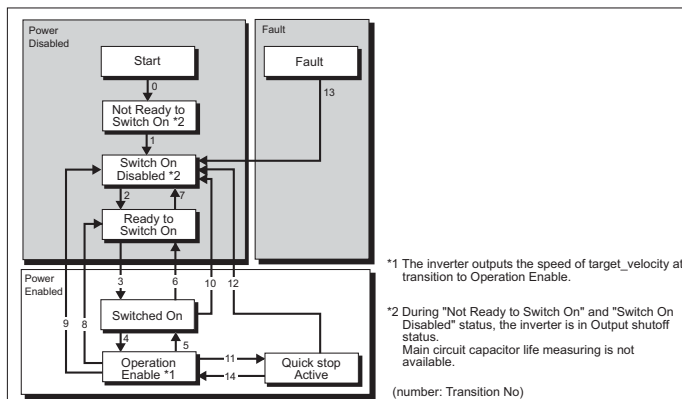
Sub index	Item	Description
H00	Name	controlword
	Data Type	UNSIGNED16 (16 bit unsigned)
	Default value	—
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

Control command to the inverter.

Bit	Description	Remarks
0	Switch On	
1	Disable voltage	Output shutoff
2	Quick Stop	Stop command
3	Enable Operation	Run command
4 to 6	(Not used)	(Bit operation invalid)
7	Reset Fault	Alarm reset
8 to 15	(Not used)	(Bit operation invalid)

- Status transition

Refer to the table below to send a command for status transition.



- Relationship between command and bit combination

Command \ Bit combination	Bit 7 Fault reset	Bit 3 Enable operation	Bit 2 Quick stop	Bit 1 Disable voltage	Bit 0 Switch on	Transition No
Shutdown	0	—	1	1	0	2, 6, 8
Switch On	0	0	1	1	1	3
Disable Voltage	0	—	—	0	—	7, 9, 10, 12 *1
Quick Stop	0	—	0	1	—	7, 10, 11
Disable Operation	0	0	1	1	1	5
Enable Operation	0	1	1	1	1	4, 14 *2
Fault Reset *3	0→1	—	—	—	—	13

0 : OFF 1 : ON — : whichever is ok

*1 The transition No. 12 is valid only when a value other than 5 or 6 is set in Index H605A.

*2 The transition No. 16 is valid only when 5 or 6 is set in Index H605A.

*3 During an inverter error, inverter reset can be executed regardless of the operation mode or operation command source.

Each inverter status indicated in status transition on [page 117](#) is as follows:

Inverter status	Description
Start	Power-on
Not Ready to Switch On	During reset
Switch On Disabled	<ul style="list-style-type: none">• Reset is completed• Inverter is at a stop• The status changes by a command
Ready to Switch On	<ul style="list-style-type: none">• Inverter is at a stop• The status changes by a command
Switched On	<ul style="list-style-type: none">• Inverter is at a stop• The status changes by a command
Operation Enable	During operation
Quick Stop Active	At deceleration to stop by QuickStop execution
Fault	Fault occurrence status

8.4.2 (Index H6041) statusword

Sub index	Item	Description
H00	Name	statusword
	Data Type	UNSIGNED16 (16 bit signed)
	Default value	—
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

Indicate the current status of the inverter.

Bit	Description	Remarks
0	Ready to Switch On	
1	Switch On	
2	Operation enabled	
3	Fault	
4	Voltage enabled	1 is set when high voltage is being supplied to the inverter. (Always 1)
5	Quick stop	1 is set when the inverter is responding to the Quick stop request at reset.
6	Switch on disabled	
7	Warning	1 is set when the inverter is in fault status.
8	Manufacturer specific	
9	Remote	1 is set during parameter change from the network and command message execution. Set 0 in local mode.
10	Target reached	

Bit	Description	Remarks
11	Internal limit active	1 when (Index H6046 Subindex H01) vl_velocity_min_amount is bigger than (Index H6042 Subindex H00) vl_target velocity and (Index H6042 Subindex H00) vl_target velocity is bigger than (Index H6046 Subindex H02) vl_velocity_max_amount.
12	Reserved	
13	Reserved	
14	Manufacturer specific	
15	Manufacturer specific	

- Relationship between status and bit combination

The table below shows each status of [page 117](#) of the status transition diagram.

Bit combination Command	Bit 6 Switch on disabled	Bit 5 Quick stop	Bit 4 Voltage enabled	Bit 3 Fault	Bit 2 Operation enabled	Bit 1 Switch on	Bit 0 Ready to switch on
Not ready to switch on	0	0	1	0	0	0	0
Switch on disabled	1	—	1	0	0	0	0
Ready to switch on	0	1	1	0	0	0	1
Switched on	0	1	1	0	0	1	1
Operation enabled	0	1	1	0	1	1	1
Quick stop active	0	0	1	0	1	1	1
Fault	0	—	1	1	0	0	0

0 : OFF 1 : ON — : whichever is ok

8.4.3 (Index H6042) vl_target_velocity

Sub index	Item	Description
H00	Name	vl target velocity
	Data Type	INTEGER16 (16 bit signed)
	Default value	0
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

The value (in 1 r/min increments) converted from the set frequency is read. A negative value is displayed during reverse rotation.

The set speed (in 1 r/min increments) and the start command are written. A positive value is written for the forward rotation command, and a negative value is written for the reverse rotation command.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.4.4 (Index H6043) vl_velocity_demand

Sub index	Item	Description
H00	Name	vl velocity demand
	Data Type	INTEGER16 (16 bit signed)
	Default value	—
	Unit	1 r/min
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

The running speed is read in 1 r/min increments. A negative value is displayed during reverse rotation.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.4.5 (Index H6044) vl_control_effort

Sub index	Item	Description
H00	Name	vl control effort
	Data Type	INTEGER16 (16 bit signed)
	Default value	—
	Unit	1 r/min
	Access attribute	Read Only
	Availability of mapping to PDO	Enable

The running speed is read in 1 r/min increments. A negative value is displayed during reverse rotation.



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.

8.4.6 (Index H6046) vl_velocity_min_max_amount

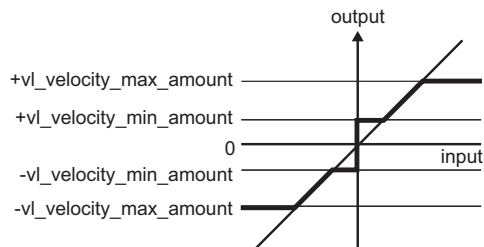
Sub index	Item	Description
H00	Name	Number of Entries
	Data Type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	vl velocity min amount (Pr.2)
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	— *1
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	vl velocity max amount (Pr.18)
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	— *1
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

*1 Depends on the **Pr.2** and **Pr.18** setting values.

The maximum and minimum speed can be set.

The setting range of Sub Index H01, H02 are same as the **Pr.2** and **Pr.18**.

When the setting in SubIndex H01 or H02 (vl_velocity_min/max_amount) is changed, the setting in **Pr.2 Minimum frequency** or **Pr.18 High speed maximum frequency** is also changed.



8.4.7 (Index H6048) vl_velocity_acceleration

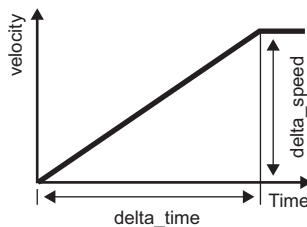
Sub index	Item	Description
H00	Name	Number of Entries
	Data Type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Delta speed (Pr.20)
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	— *1
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Delta time (Pr.7)
	Data Type	UNSIGNED16 (16 bit unsigned)
	Default value	— *1
	Unit	s
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

*1 Depends on the **Pr.7** and **Pr.20** setting values.

The motor acceleration time and the speed that will be the basis of acceleration time can be set.

SubIndex H01 corresponds to **Pr.20 Acceleration/deceleration reference frequency** and SubIndex H02 corresponds to **Pr.7 Acceleration time**.

$$v_l \text{ velocity acceleration} = \frac{\text{delta speed}}{\text{delta time}} = a_B$$



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.
- The increment for **Pr.7** is fixed at 1 s.

8.4.8 (Index H6049) vl_velocity_deceleration

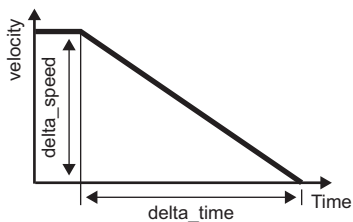
Sub index	Item	Description
H00	Name	Number of Entries
	Data Type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Delta speed (Pr.20)
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	— *1
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Delta time (Pr.8)
	Data Type	UNSIGNED16 (16 bit unsigned)
	Default value	— *1
	Unit	s
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

*1 Depends on the **Pr.8** and **Pr.20** setting values.

The motor deceleration time and the speed that will be the basis of deceleration time can be set.

SubIndex H01 corresponds to **Pr.20 Acceleration/deceleration reference frequency** and SubIndex H02 corresponds to **Pr.8 Deceleration time**.

$$v_l \text{ velocity deceleration} = \frac{\text{delta speed}}{\text{delta time}} = a_v$$



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.
- The increment for **Pr.8** is fixed at 1 s.

8.4.9 (Index H604A) vl_velocity_quick_stop

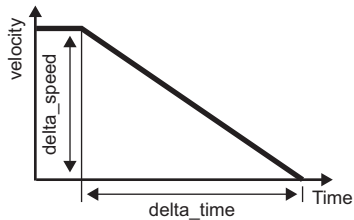
Sub index	Item	Description
H00	Name	Number of Entries
	Data Type	UNSIGNED8 (8 bit unsigned)
	Default value	2
	Unit	—
	Access attribute	Read Only
	Availability of mapping to PDO	Disable
H01	Name	Delta speed (Pr.20)
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	— *1
	Unit	1 r/min
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable
H02	Name	Delta time (Pr.8)
	Data Type	UNSIGNED16 (16 bit unsigned)
	Default value	— *1
	Unit	s
	Access attribute	Read / Write
	Availability of mapping to PDO	Enable

*1 Depends on the **Pr.8** and **Pr.20** setting values.

The motor deceleration time and the speed that will be the basis of deceleration time can be set.

SubIndex H01 corresponds to **Pr.20 Acceleration/deceleration reference frequency** and SubIndex H02 corresponds to **Pr.8 Deceleration time**.

$$\text{velocity quick stop} = \frac{\text{delta speed}}{\text{delta time}} = a_s$$



NOTE

- Refer to [page 35](#) for the conversion between frequency and speed.
- The increment for **Pr.8** is fixed at 1 s.

8.4.10 (Index H605A) Quick_stop_option_code

Sub index	Item	Description
H00	Name	Quick_stop_option_code
	Data Type	INTEGER16 (16 bit signed)
	Default value	2
	Unit	—
	Access attribute	Read / Write
	Availability of mapping to PDO	Disable

Select the operation for when Quick stop function is executed.

When an unsupported value is written, the Abort code: H0609 0030 is returned.

Value	Description	Remarks
Negative value	Manufacturer specific	
0	Disable drive function	The start signal sent via CANopen communication is turned OFF and the inverter output is shut off. Transit to "Switch On Disabled".
1	Slow down on slow down ramp	The start signal sent via CANopen communication is turned OFF. Transit to "Switch On Disabled".
2	Slow down on quick stop ramp	The start signal sent via CANopen communication is turned OFF. Transit to "Switch On Disabled".
3	—	
4	—	
5	Slow down on slow down ramp and stay in QUICK STOP	The start signal sent via CANopen communication is turned OFF. Transit to "Quick Stop Active".
6	Slow down on quick stop ramp and stay in QUICK STOP	The start signal sent via CANopen communication is turned OFF. Transit to "Quick Stop Active".
7 or more	Manufacturer specific	

8.4.11 (Index H67FF) Single_Device_Type

Sub index	Item	Description
H00	Name	Device Type
	Data Type	UNSIGNED32 (32 bit unsigned)
	Default value	H00010192
	Access attribute	Read Only
	Availability of mapping to PDO	Disable

The content is the same as that in Index H1000. (Refer to [page 73](#).)

9 TROUBLESHOOTING

If a fault occurs and the inverter fails to operate properly, locate the cause of the fault and take proper corrective action by referring to the troubleshooting below. If the corresponding information is not found in the table, the inverter has problem, or the component parts are damaged, contact your sales representative.

Display		Possible causes	Check point	Corrective action
Operation panel of inverter	ERR LED of FR-A8NCA			
Normal display	Single flash	Network error such as communication frame error occurred.	<ul style="list-style-type: none"> • Check that all cables are connected properly. • Check that baud rate setting is correct. • Check that the network cable is properly terminated. 	<ul style="list-style-type: none"> • Check for a cable and connector. • Check for baud rate setting. • Check for cable termination.
Normal display	On	Bus off occurrence	<ul style="list-style-type: none"> • Check that all cables are connected properly. • Check that baud rate setting is correct. • Check that Network power is on. 	<ul style="list-style-type: none"> • Check for a cable and connector. • Check for baud rate setting. • Check for the Network power.
E.OP1	Double flash	Life Garding Event occurrence (Remote request from the master was not received within Node Life Time.)	Check for Guard: Node Life Time (Index H100C Guard Time × Index H100D Life Time Factor).	Send remote request within Node Life Time (Guard Time × Life Time Factor).

Appendix 1 EDS file

Contact your sales representative for details.

REVISIONS

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

Print Date	*Manual Number	Revision
Apr. 2016	IB(NA)-0600666ENG-A	First edition

INVERTER

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN