

TOSVERT VF-S15 series

CC-Link[®] option unit Function Manual
CCL003Z

NOTICE

1. Read this manual before installing or operating. Keep this instruction manual on hand of the end user, and make use of this manual in maintenance and inspection.
2. All information contained in this manual will be changed without notice. Please contact your Toshiba distributor to confirm the latest information.

Introduction

Thank you for purchasing the “CC-Link[®] option (CCL003Z)” for TOSVERT VF-S15 drive. This option can connect with open field network CC-Link and data communications with the CC-Link master through installing this option in the VF-S15 and using it. Besides this instruction manual, the “CC-Link option Instruction Manual” is required to develop software communicating with VF-S15.

This option needs the option adaptor to connect VF-S15 which type form is SBP009Z. Please match here and buy it when SBP009Z is not at hand yet.




After reading this function manual, please keep it handy for future reference.

For details of its general handling, see an instruction manual attached with the option unit.






- TOSVERT VF-S15 Instruction Manual E6581611
- TOSVERT VF-MB1/S15 communication option Precautions Manual E6581739
- TOSVERT VF-S15 Communication Function Instruction Manual E6581913

CC-Link[®] is a registered trademark of Mitsubishi Electric Corporation.

■ **Handling in general**

 Warning	
 Prohibited	▼ Do not connect or disconnect a network cable while the drive power is on. It may lead to electric shocks or fire.
 Mandatory	▼ See the instruction manual attached with the option unit for cautions the handling. Otherwise, it may lead to electric shocks, fire, injuries or damage to product.

■ **Network control**

 Warning	
 Prohibited	▼ Do not send the value out of the valid range to objects and attributes. Otherwise, the motor may suddenly start/stop and that may result in injuries.
 Mandatory	▼ Use an additional safety device with your system to prevent a serious accident due to the network malfunctions. Usage without an additional safety device may cause an accident.
 Caution	
 Mandatory	<p>▼ Set up “Communication error trip function (see below)” to stop the drive when the option unit is deactivated by an unusual event such as tripping, an operating error, power outage, failure, etc.</p> <ul style="list-style-type: none"> - Network Time-Out, drive operation at disconnection, Preset speed operation selection (Refer to 5.2 for details) <p>Deactivated the option module may cause an accident, if the “Communication error trip function” is not properly set up.</p> <p>▼ Make sure that the operation signals are STOP before resetting drive’s fault. The motor may suddenly start and that may result in injuries.</p>

■ **Notes on operation**

Notes	
	<p>▼ When the control power is shut off by the instantaneous power failure, communication will be unavailable for a while.</p> <p>▼ The Life of EEPROM is approximately 100,000 times. Avoid writing a command more than 100,000 times to the same parameter of the drive and the option module.</p>

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1. Overview

The option allows the VF-S15 drive to be connected into a CC-Link network. CC-Link supports a maximum of 42 nodes, allowing for the Master and this option is based on CC-Link V1.1 and V2.0.

The CCL-003Z is able to operate RUN/STOP, monitor the status of the drive, set the drive's parameter and etc. by the CC-Link master through installing the VF-S15. And it can use various applications.

2. Basic specifications

<Environmental specification>

Item	Specification
Operating environment	Indoors, an altitude of 3,000m or less, where the product will not be exposed to direct sunlight, corrosive or explosive gasses, vapor, coarse particulates including dust and where there is no grinding fluid or grinding oil nearby.
Ambient temperature	0 to + 60 degreeC
Storage temperature	-25 to +65 degreeC
Related temperature	20 to 93% (no condensation and absence of vapor)
Vibration	5.9 m/s ² (0.6G) or less (10 – 55Hz)

<CC-Link communication and option specification>

Item	Specification
Number of units corrected	42 units max. (1 station occupied by 1 unit). May be used with other equipment.
Baud rate	156k, 625k, 2.5M, 5M, 10Mbps
Power supply	Supplied from SBP009Z
Station type	Remote device station
Number of stations occupied	Ver.1: occupies one station, V2: occupies one station (selectable from among double, quadruple and octuple)
Connect cable	CC-Link dedicated cable, CC-Link V1.10 compatible CC-Link dedicated cable

2.1. CC-Link Version

2.1.1. CC-Link Ver. 1.10

The conventional CC-Link products, whose inter-station cable lengths have equally been changed to 20cm (7.87 inch) or more to improve the inter-station cable length restriction, are defined as CC-Link Ver. 1.10. In comparison the conventional products are defined as CC-link Ver. 1.00.

Refer to the CC-link Master Module Manual for the maximum overall cable lengths and inter-station cable lengths of CC-Link Ver. 1.00 and Ver. 1.10

CC-Link Ver. 1.10 compatibility conditions

- 1) All modules that comprise a CC-Link system should be compatible with CC-Link Ver. 1.10.
- 2) All data link cables should be CC-Link Ver. 1.10 compatible, CC-Link dedicated cables. (CC-Link Ver.1.10 compatible cables have a logo or Ver. 1.10 indication.)

*In a system that uses the CC-Link Ver. 1.00 and Ver. 1.10 modules and cables together, the maximum overall cable length and inter-station cable length are as specified for CC-Link Ver. 1.00.

2.1.2. CC-Link Ver. 2

The CCL003Z is compatible with CC-Link Ver.2.

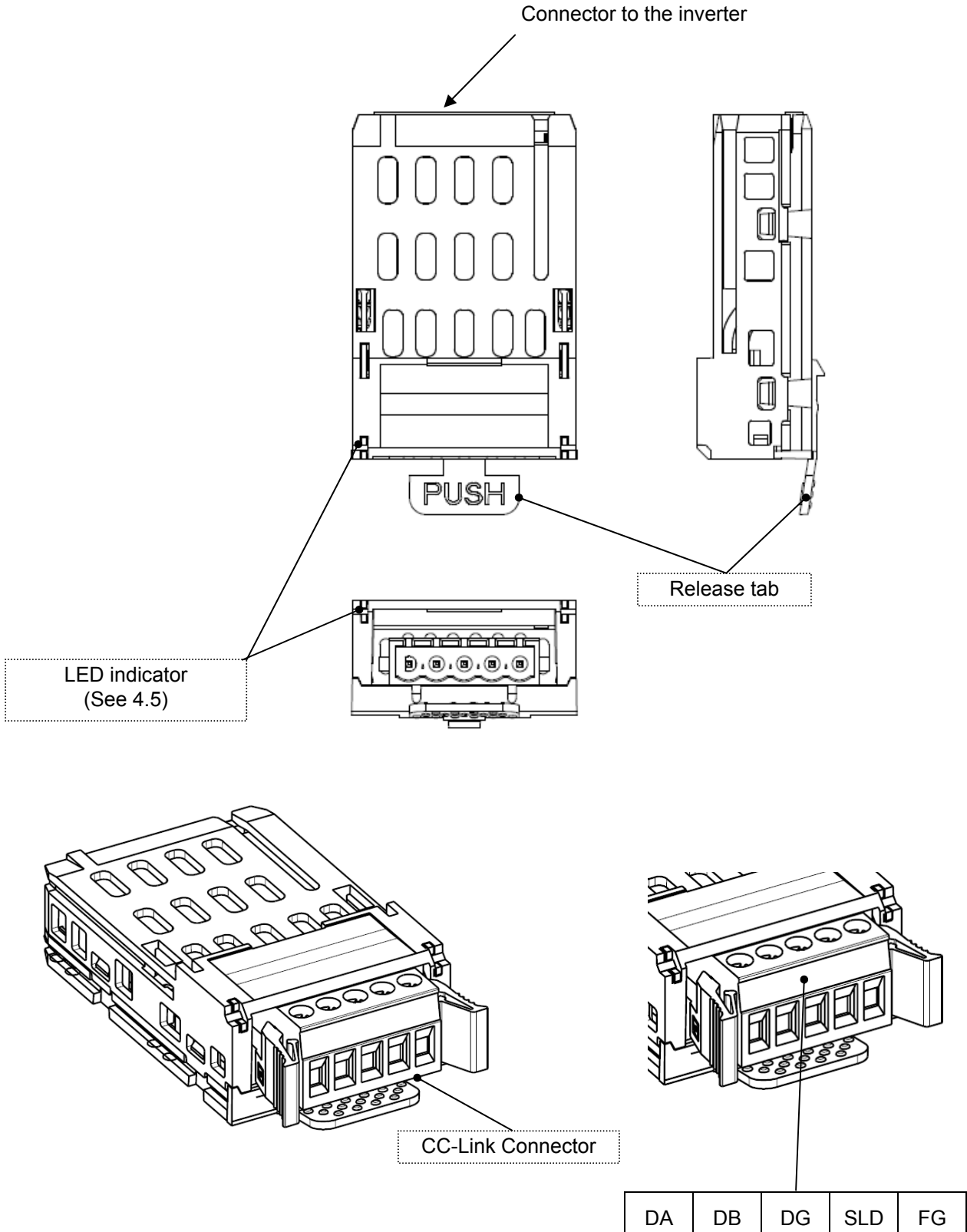
When using the CC-Link Ver.2 setting with the CCL003Z, the master station needs to be compatible with the CC-Link Ver.2.

For CC-Link Ver.2, double, quadruple and octuple settings can be used to increase remote register (RWw/r) point.

3. Names and functions

The drawing below shows names and functions of main parts.

3.1. Outline



4. Installation on inverter

Refer to VF-S15 option adapter instruction manual (E6581838) for the installation on the inverter.



Mandatory

▼ The following steps must be performed before installing.

1. Shut off all input power.
2. Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit.

4.1. Connection cable

In the CC-Link system, use CC-Link dedicated cables.

If the cable used is other than the CC-Link dedicated cable, the performance of the CC-Link system is not guaranteed.

For the specifications of the CC-Link dedicated cable, refer to the website of the CC-Link Partner Association.

Website: <http://www.cc-link.org/>

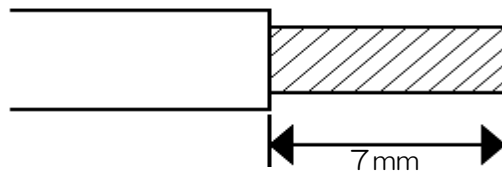
Strip off the sheath of the CC-Link dedicated cable and wind wires to use. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off.

· Recommended screwdriver : Small flat-blade screwdriver

(Tip thickness: 0.4mm /tip width: 2.5mm)

· Recommended tightening Torque : 0.22N·m to 0.25N·m

· Cable stripping size : About 7mm



*Fix a cable so that a communication connector may be not taken the weight of wire.

When the cable is not connected easily, the use of the following bar terminal is recommended.

Phoenix Contact Co. Ltd.

Bar terminal model: AI-TWIN2x0,5-8 WH

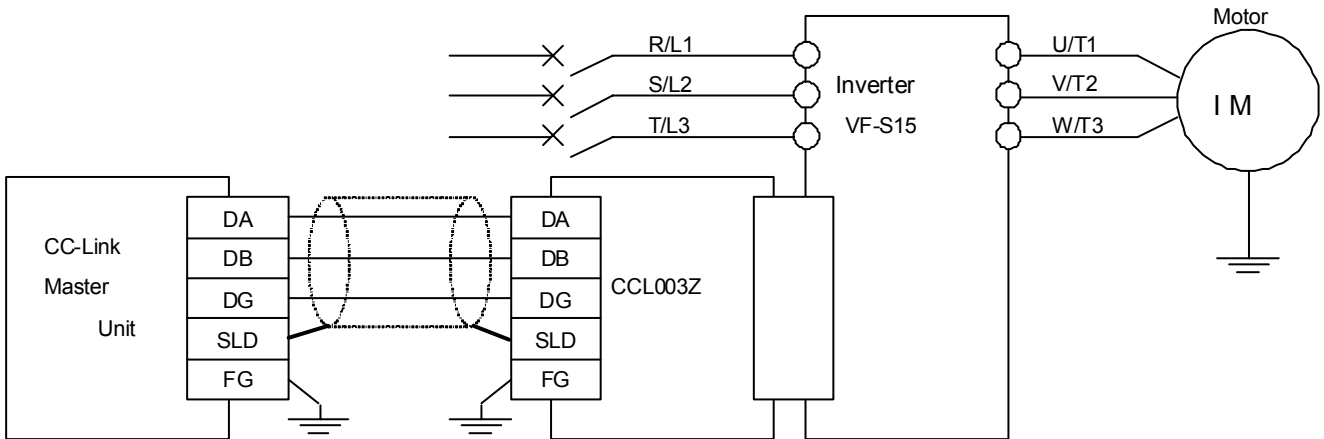
Length of bar terminal: 8mm

4.2. Terminating resistor

Connect the terminating resistor of 110Ω or 130Ω (CC-Link Ver.1.00 dedicated high performance cable.) between terminals at the end.

4.3. Connection of CC-Link master unit and inverter

The example of the connection of the CC-Link master unit and the inverter is shown..



***Connection of Several Inverters**

Factory Automation can be applied to several inverters which share a link system as CC-Link remote device stations and are controlled and monitored by PLC user programs.

◎ DA, DB

Shield twisted cable

◎ DG

◎ SLD / FG

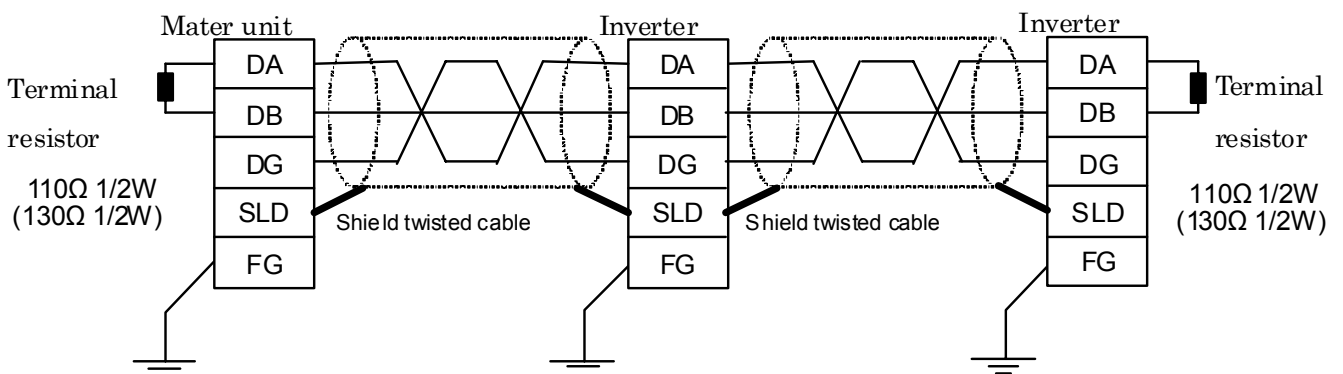
Connect the shielded wire of the dedicated CC-Link cable to the “SLD” of each module, and ground both ends of the shielded wire using type-D grounding (class 3 grounding) via “FG.”

(The ground resistance is 100Ω or less.)

◎ Terminal resistor

Connect the terminal resistor of 110Ω.

(130Ω is a resistance value for the CC-Link Ver.1.00 dedicated high performance cable.)



4.4. The maximum connection number of units

1. Maximum number of units connected to one master station (CC-Link Ver.1.10)

42 units (when only inverters are connected)

If any other units are included, the number of stations occupied depends on the unit and therefore the following conditions must be satisfied:

$$\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$$

a: Number of units occupying 1 station

b: Number of units occupying 2 stations

c: Number of units occupying 3 stations

d: Number of units occupying 4 stations

$$\{(16 \times A) + (54 \times B) + (88 \times C)\} \leq 2304$$

A: Number of remote I/O stations ≤ 64

B: Number of remote device stations ≤ 42

C: Number of local, standby master and intelligent device stations ≤ 26

2. Maximum number of units connected to one master station (CC-Link Ver.2.00)

42 units (when connections are inverter only)

If any other units are included, the number of stations occupied depends on the unit and therefore the following conditions must be satisfied:

$$\{(a + a2 + a4 + a8) + (b + b2 + b4 + b8) \times 2 + (c + c2 + c4 + c8) \times 3 + (d + d2 + d4 + d8) \times 4\} \leq 64$$

$$\{(a \times 32 + a2 \times 32 + a4 \times 64 + a8 \times 128) + (b \times 64 + b2 \times 96 + b4 \times 192 + b8 \times 384) + (c \times 96 + c2 \times 160 + c4 \times 320 + c8 \times 640) + (d \times 128 + d2 \times 224 + d4 \times 448 + d8 \times 896)\} \leq 8192$$

$$\{(a \times 4 + a2 \times 8 + a4 \times 16 + a8 \times 32) + (b \times 8 + b2 \times 16 + b4 \times 32 + b8 \times 64) + (c \times 12 + c2 \times 24 + c4 \times 48 + c8 \times 96) + (d \times 16 + d2 \times 32 + d4 \times 64 + d8 \times 128)\} \leq$$

2048

a: Number of single setting devices occupying one station

b: Number of single setting devices occupying two stations

c: Number of single setting devices occupying three stations

d: Number of single setting devices occupying four stations

a2: Number of double setting devices occupying one station

b2: Number of double setting devices occupying two stations

c2: Number of double setting devices occupying three stations

d2: Number of double setting devices occupying four stations

a4: Number of quadruple setting devices occupying one station

b4: Number of quadruple setting devices occupying two stations

c4: Number of quadruple setting devices occupying three stations

d4: Number of quadruple setting devices occupying four stations

a8: Number of octuple setting devices occupying one station

b8: Number of octuple setting devices occupying two stations

c8: Number of octuple setting devices occupying three stations

d8: Number of octuple setting devices occupying four stations

$$16 \times A + 54 \times B + 88 \times C \leq 2304$$

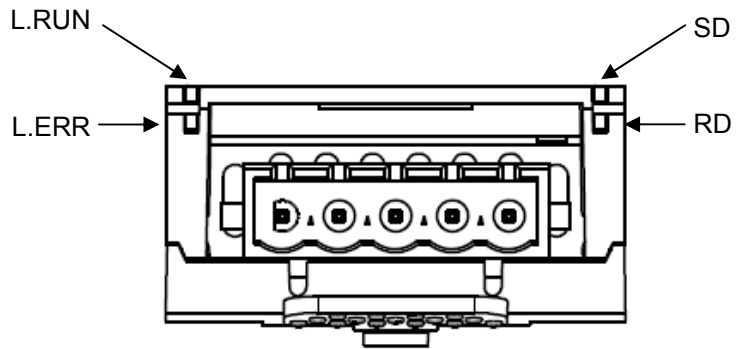
A: Numbers of remote I/O ≤ 64

B: Number of remote device stations ≤ 42

C: Number of local and intelligent device stations ≤ 26

4.5. LED indicator

The LEDs shows the present status of the network and module
 Refer to 7.3 for detail.



■ Layout of LED

L.RUN	Light on during communication.
SD	Light on during send the data of CC-Link.
RD	Light on during receive the data of CC-Link.
L.ERR	Light on during communication error.

5. Functions

This option is a communication interface unit that allows the PLC program to operate, monitor and set the parameter of the inverter as a remote station of CC-Link. It is able to communicate with a maximum speed of 10Mbps not only transmitting bit data but also by word data.

Moreover, more data transmissions are possible by the use of CC-Link V2.0.

5.1. Initial setting

Set the following parameters of the inverter.

Title	Function	Description	Factory setting	CC-Link setting
<i>F00d</i>	Command mode selection	0: Terminal board 1: Panel keypad (including remote keypad) 2: RS485 communication 3: CANopen communication 4: Communication option	1	4
<i>F00d</i>	Frequency setting mode selection 1	0: Setting dial 1 (save even if power is off) 1: Terminal board VIA 2: Terminal board VIB 3: Setting dial 2 (press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal board VIC 9, 10: - 11: Pulse train input 12, 13: - 14: <i>5r0</i>	0	7
<i>F856</i>	Number of motor pole for communication	1: 2 poles 2: 4 poles 3: 6 poles 4: 8 poles 5: 10 poles 6: 12 poles 7: 14 poles 8: 16 poles	2	*
<i>F899</i>	Communication function reset	0: - 1: Reset (after execution: 0)	0	-

*Set parameter according to number of motor pole used.

5.2. Communication parameters for CCL003Z

Title	Function	Description
<i>C 100</i>	Communication error detection delay time	0.0 - 100.0 sec.
<i>C 101</i>	Inverter operation at the communication loss action	0: Stop and controlled by <i>C 100d</i> , <i>F 100d</i> 1: Operation continue 2: Deceleration stop 3: Coast stop 4: Network error stop (<i>E r r B</i> trip) 5: Preset speed operation (by <i>C 102</i> setting)
<i>C 102</i>	Preset speed operation selection	0: None 1 to 15: Preset speed
<i>C 103</i>	Communication time-out condition selection	0: Disconnection detection 1: When communication mode enable (Both <i>C 100d</i> and <i>F 100d</i> are set CANopen or communication option) only 2: 1 + Driving operation
<i>C 120*</i>	CC-Link station number selection	1 to 64 Set the number of stations of inverters (Remote device station).
<i>C 121*</i>	CC-Link baud rate selection	0: 156kbps 1: 625kbps 2: 2.5Mbps 3: 5Mbps 4: 10Mbps Set the baud rate for CC-LINK network
<i>C 122*</i>	CC-Link extended selection	0: Occupies one station (V1.10) 1: Occupies one station double (V2.0) 2: Occupies one station quadruple (V2.0) 3: Occupies one station octuple (V2.0) The function of remote registers can be enhanced.
<i>C 142</i>	Input terminal function 3(S1)	The function depends on input terminal selection 3 (RYn2)
<i>C 143</i>	Input terminal function 4(S2)	The function depends on input terminal selection 4 (RYn3)
<i>C 144</i>	Input terminal function 5(S3)	The function depends on input terminal selection 5 (RYn4)
<i>C 145</i>	Input terminal function 6(S4)	The function depends on input terminal selection 6 (RYn5)
<i>C 146</i>	Input terminal function (PIOFF)	The function depends on input terminal selection 7 (RYn6)
<i>C 147</i>	Input terminal function 8(AD1)	The function depends on input terminal selection 8 (RYn7)
<i>C 148</i>	Input terminal function 9 (ESTP)	The function depends on input terminal selection 9 (RYn8)

* Set parameters according to the CC-Link network system.

5.3. CC-Link function setting

5.3.1. Station number setting

Use parameter $\text{C}120$ to set station number of the inverter.

Set this parameter within the range of 1 to 64.

Title	Function	Description
$\text{C}120$	CC-Link station number selection	1 to 64

*Use different station numbers for different devices. (If different devices have the same station number, the communication cannot be performed properly.)

- Set consecutive numbers for the station numbers. (Do not skip a number in sequence like "station number 1 - station number 2 - station number 4".)
- The station number does not have to match with the physical connection sequence. (There is no problem with having the physical connection sequence like "station number 1 - station number 3 - station number 4 - station number 2".)
- One inverter occupies one station. (One remote device station)
- "L.ERR" LED flickers if the setting is changed. When power is switched on again, reset by parameter ($\text{F}899 = 1$) or the RES signal is turned on, the setting value is reflected and the LED turns off.

5.3.2. Baud rate setting

Set the transmission speed. (Refer to the manual for the CC-Link master module for details of transmission speed.)

Title	Function	Description
$\text{C}121$	CC-Link baud rate selection*	0: 156kbps 1: 625kbps 2: 2.5Mbps 3: 5Mbps 4: 10Mbps

- If the setting is changed during communication, "L.ERR" LED becomes flicker state. Please reset the inverter by power supply, parameter ($\text{F}899 = 1$) or RES signal for reflecting the parameter setting. After that, "L.ERR" LED becomes OFF state.

*: Under the less than 625kbps baud rate setting and more than two slaves, when you do the reset by other than the CC-Link network or return to the CC-Link network by power on, the false detection of E-23 may occur.

If you do the reset by other than CC-Link network or return to the CC-Link network by power on, please select the more than 2.5Mbps baud rates for avoiding the false detection of E-23.

5.3.3. CC-Link extended setting

Remote register function can be extended.

Title	Function	Description
⌈ 122*	CC-Link extended selection	0: Occupies one station (V1.10) 1: Occupies one station double (V2.0) 2: Occupies one station quadruple (V2.0) 3: Occupies one station octuple (V2.0)

- When using double, quadruple and octuple settings of the CC-Link Ver.2, station data of the master station must be set to double, quadruple and octuple also.
(If the master station is CC-Link Ver.1 compatible station, the above setting can not be made.)

5.4. Basic functions

This clause shows the basic function of this CC-Link option using by CC-Link communication.

5.4.1. Run and frequency operation command

The PLC program can operate the inverter to run, stop, set the operation frequency and change the parameters.

If the PLC controls these operations, select the command mode and the frequency setting mode.

The parameter setting of the inverter

Command mode selection

CnCd : 4[Communication option] (Factory setting: 1)

Frequency setting mode selection

FnCd : 7[Communication option] (Factory setting: 0)

* The frequency setting and command can be made CC-Link priority by RYnA and RYnB.
("n" is depend on the station number.)

5.4.2. Monitor

It is able to monitor the status of the inverter.

Set a monitor code to RWw n and turn RYnC on.

The data is stored in the buffer memory of the PLC.

* "n" is depend on the station number.

The monitor value is updated while RynC has been turned on.

Refer to 5.5.11 for detail.

5.4.3. Writing and reading the parameter

The PLC can read, write the inverter parameters and reset the inverter.

Set the command code to RWw(n+2) (set the write data to RWw(n+3) if necessary) and turn RYnF (instruction code execution request) on.

The inverter performs processing corresponding to the command code, return the response data, read out data and RXnF (instruction code execution completion).

▪ Refer to 5.5.8 for detail.

5.5. I/O signal list

5.5.1. One station is occupied (CC-Link Ver.1) (C 122=0)

This option occupies one station area of the buffer memory of the PLC.

In the case of C 122 = 0, there are remote I/O (RX, RY both 32 bits) and the remote register (RWw, RWr both 4 word) in the communication data for one station area.

Remote I/O (Default value = 0)

Inverter (Slave) → PLC (Master)		PLC (Master) → Inverter (Slave)	
Device No.	Signal	Device No.	Signal
RXn0	Forward running	RYn0	Forward rotation command
RXn1	Reverse running	RYn1	Reverse rotation command
RXn2	Output terminal 1 (RY-RC)	RYn2	Input terminal 3 (S1)
RXn3	Output terminal 2 (OUT)	RYn3	Input terminal 4 (S2)
RXn4	Output terminal 3 (FL)	RYn4	Input terminal 5 (S3)
RXn5	Failure FL	RYn5	Input terminal 6 (S4)
RXn6	PI control OFF	RYn6	Input terminal 7 (PIOFF)
RXn7	Acceleration/deceleration pattern selection (1 or 2)	RYn7	Input terminal 8 (AD1)
RXn8	Emergency stop	RYn8	Input terminal 9 (ESTP)
RXn9	Coast stop (ST = OFF)	RYn9	Intercept output to inverter (Coast stop)
RXnA	Alarm	RYnA	Frequency priority CC-Link
RXnB	Reserved*	RYnB	Command priority CC-Link
RXnC	Monitoring	RYnC	Monitor command
RXnD	Frequency setting completion (RAM)	RYnD	Frequency setting command (RAM)
RXnE	Reserved*	RYnE	Reserved**
RXnF	Instruction code execution completion	RYnF	Instruction code execution request
RX(n+1)0 to RX(n+1)9	Reserved*	RY(n+1)0 to RY(n+1)9	Reserved**
RX(n+1)A	Error status flag	RY(n+1)A	Error reset request flag (A reset request is during switched ON)
RX(n+1)B	Remote station ready	RY(n+1)B	Reserved**
RX(n+1)C to RX(n+1)F	Reserved*	RY(n+1)C to RY(n+1)F	Reserved**

"n" is depend on the station number.

* The bit described " Reserved " is unstable. Don't use the "Reserved " bit for the judgment.

** Set OFF ("0") to reserved bit.

Remote register (Default value = 0)

RWr Inverter → PLC		RWw PLC → Inverter	
Address	Signal	Address	Signal
RWr n	Monitor value 1	RWw n	Monitor code (1 and 2)
RWr n+1	Monitor value 2 (output frequency)	RWw n+1	Set frequency
RWr n+2	Reply code	RWw n+2	Instruction code
RWr n+3	Read data	RWw n+3	Write data

"n" is depend on the station number.

5.5.2. Double setting is selected (CC-Link Ver.2) ($\zeta \ 122=1$)

This option occupies one station area of the buffer memory of the PLC.

In the case of $\zeta \ 122 = 1$, there are remote I/O (RX, RY both 32 bits(same as CC-LINK Ver.1)) and the remote register (RWw, RWr both 8 word) in the communication data for one station area.

* Default value of RY and RX is 0.

Remote register (Default value = 0)

RWr Inverter → PLC		RWw PLC → Inverter	
Address	Signal	Address	Signal
RWr n	Monitor value 1	RWw n	Monitor code (1 and 2)
RWr n+1	Monitor value 2 (output frequency)	RWw n+1	Set frequency
RWr n+2	Reply code	RWw n+2	Instruction code
RWr n+3	Read data	RWw n+3	Write data
RWr n+4	Monitor value 3	RWw n+4	Monitor code 3
RWr n+5	Monitor value 4	RWw n+5	Monitor code 4
RWr n+6	Monitor value 5	RWw n+6	Monitor code 5
RWr n+7	Monitor value 6	RWw n+7	Monitor code 6

"n" is depend on the station number.

5.5.3. Quadruple setting is selected (CC-Link Ver.2) ($\zeta \ 122=2$)

This option occupies one station area of the buffer memory of the PLC.

In the case of $\zeta \ 122 = 2$, there are remote I/O (RX, RY both 32 bits(same as CC-LINK Ver.1)) and the remote register (RWw, RWr both 16 word) in the communication data for one station area.

* Default value of RY and RX is 0.

Remote register (Default value = 0)

RWr Inverter → PLC			RWw PLC → Inverter		
Address	Signal		Address	Signal	
RWr n	Monitor value 1		RWw n	Monitor code (1 and 2)	
RWr n+1	Monitor value 2 (output frequency)		RWw n+1	Set frequency	
RWr n+2	Reply code		RWw n+2	Instruction code	
RWr n+3	Read data		RWw n+3	Write data	
RWr n+4	Monitor value 3		RWw n+4	Monitor code 3	
RWr n+5	Monitor value 4		RWw n+5	Monitor code 4	
RWr n+6	Monitor value 5		RWw n+6	Monitor code 5	
RWr n+7	Monitor value 6		RWw n+7	Monitor code 6	
RWr n+8	Upper 8 Bits	Trip history No.	RWw n+8	Upper 8 Bits	Trip history No.
	Lower 8 Bits	Trip code		Lower 8 Bits	Reserved**
RWr n+9	Trip information (output frequency)		RWw n+9	Reserved**	
RWr n+A	Trip information (output current)		RWw n+A	Reserved**	
RWr n+B	Trip information (output voltage)		RWw n+B	Reserved**	
RWr n+C	Trip information (energization time)		RWw n+C	Reserved**	
RWr n+D	Reserved*		RWw n+D	Reserved**	
RWr n+E	Reserved*		RWw n+E	Reserved**	
RWr n+F	Reserved*		RWw n+F	Reserved**	

"n" is depend on the station number.

* The bit described "Reserved" is unstable. Don't use the "Reserved" bit for the judgment.

** Do not use it.

5.5.4. Octuple setting is selected (CC-Link Ver.2) ($\zeta 122=3$)

This option occupies one station area of the buffer memory of the PLC.

In the case of $\zeta 122 = 3$, there are remote I/O (RX, RY both 32 bits(same as CC-LINK Ver.1)) and the remote register (RWw, RWr both 32 word) in the communication data for one station area.

* Default value of RY and RX is 0.

Remote register (Default value = 0)

RWr		Inverter → PLC		RWw		PLC → Inverter	
Address	Signal		Address	Signal			
RWr n	Monitor value 1		RWw n	Monitor code (1 and 2)			
RWr n+1	Monitor value 2 (output frequency)		RWw n+1	Set frequency			
RWr n+2	Reply code		RWw n+2	Instruction code			
RWr n+3	Read data		RWw n+3	Write data			
RWr n+4	Monitor value 3		RWw n+4	Monitor code 3			
RWr n+5	Monitor value 4		RWw n+5	Monitor code 4			
RWr n+6	Monitor value 5		RWw n+6	Monitor code 5			
RWr n+7	Monitor value 6		RWw n+7	Monitor code 6			
RWr n+8	Upper 8 Bits	Trip history No.	RWw n+8	Upper 8 Bits	Trip history No..		
	Lower 8 Bits	Trip code		Lower 8 Bits	Reserved**		
RWr n+9	Trip information (output frequency)		RWw n+9	Reserved**			
RWr n+A	Trip information (output current)		RWw n+A	Reserved**			
RWr n+B	Trip information (output voltage)		RWw n+B	Reserved**			
RWr n+C	Trip information (energization time)		RWw n+C	Reserved**			
RWr n+D	Reserved*		RWw n+D	Reserved**			
RWr n+E	Reserved*		RWw n+E	Reserved**			
RWr n+F	Reserved*		RWw n+F	Reserved**			
RWr n+10	Reply code 2		RWw n+10	Instruction code 2			
RWr n+11	Read data 2		RWw n+11	Write data 2			
RWr n+12	Reply code 3		RWw n+12	Instruction code 3			
RWr n+13	Read data 3		RWw n+13	Write data 3			
RWr n+14	Reply code 4		RWw n+14	Instruction code 4			
RWr n+15	Read data 4		RWw n+15	Write data 4			
RWr n+16	Reply code 5		RWw n+16	Instruction code 5			
RWr n+17	Read data 5		RWw n+17	Write data 5			
RWr n+18	Reply code 6		RWw n+18	Instruction code 6			
RWr n+19	Read data 6		RWw n+19	Write data 6			
RWr n+1A	Reserved*		RWw n+1A	Reserved**			
RWr n+1B	Reserved*		RWw n+1B	Reserved**			
RWr n+1C	Reserved*		RWw n+1C	Reserved**			
RWr n+1D	Reserved*		RWw n+1D	Reserved**			
RWr n+1E	Reserved*		RWw n+1E	Reserved**			
RWr n+1F	Reserved*		RWw n+1F	Reserved**			

"n" is depend on the station number.

* The bit described " Reserved " is unstable. Don't use the "Reserved " bit for the judgment.

** Do not use it.

5.5.5. Trip history

When “Quadruple setting” or “Octuple setting” of CC-LINK V.2 is selected, the past trip information can be referred to by the following methods.

RWr n+8	Upper 8 Bits	Trip history No.	RWw n+8	Upper 8 Bits	Trip history No..
	Lower 8 Bits	Trip code		Lower 8 Bits	Reserved
RWr n+9	Trip information (output frequency)		RWw n+9	Reserved	
RWr n+A	Trip information (output current)		RWw n+A	Reserved	
RWr n+B	Trip information (output voltage)		RWw n+B	Reserved	
RWr n+C	Trip information (energization time)		RWw n+C	Reserved	

1. Set the past trip history No. to upper 8 bits of "RWw n+8."
2. The following information is stored to registers.

Trip history No. : Upper 8 bits of "RWr n+8."

Trip code : Lower 8 bits of "RWr n+8."

Output frequency : "RWr n+9"

Output current : "RWr n+A"

Output voltage : "RWr n+B"

Energization time : "RWr n+C"

5.5.6. Detail of input and output signals

1. Output signals (Master -> Inverter)

The output signals from the master unit are indicated. (Input signals to inverter)

Device No.	Signal	Description
RYn0	Forward run command	OFF: Stop command ON: Forward run command***
RYn1	Reverse run command	OFF: Stop command ON: Reverse run command***
RYn2	Input terminal function 3(S1)	The function depends on input terminal selection 3 (☐ 142) *
RYn3	Input terminal function 4(S2)	The function depends on input terminal selection 4 (☐ 143) *
RYn4	Input terminal function 5(S3)	The function depends on input terminal selection 5 (☐ 144) *
RYn5	Input terminal function 6(S4)	The function depends on input terminal selection 6 (☐ 145) *
RYn6	Input terminal function (PIOFF)	The function depends on input terminal selection 7 (☐ 146) *
RYn7	Input terminal function 8(AD1)	The function depends on input terminal selection 8 (☐ 147) *
RYn8	Input terminal function 9(ESTP)	The function depends on input terminal selection 9 (☐ 148) *
RYn9	Intercept output to inverter (Coast stop)	Stop the output of the inverter when turned on this signal. (Stop the output in the secondary circuit)
RYnA	Frequency priority CC-Link	Speed commands are entered from the CC-Link.
RYnB	Command priority CC-Link	Signals from the CC-Link are used to start and stop operation
RYnC	Monitor command	When the monitor command (RYnC) is switched on, each monitored values are set to remote registers RWrn, RWrn+1, RWrn+4 to RWrn+7 and monitoring flag (RXnC) switches on. While the monitor command (RYnC) is on, the monitored value is always updated.
RYnD	Frequency setting command (RAM)	When the frequency setting command (RYnD) is switched on, the set frequency RWwn+1 is written to the inverter. After the writing completion, frequency setting completion flag (RXnD) switches on. When the frequency setting command (RYnD) is ON, the set frequency is always updated.
RYnE	Reserved**	Reserved**
RYnF	Instruction code execution request	When the instruction code execution request (RYnF) is switched on, processes corresponding to the instruction codes are set to RWwn+2, RWwn+10, RWwn+12, RWwn+14, RWwn+16 and RWwn+18 are executed. After completion of instruction code execution, instruction code execution completion flag (RXnF) switches on. When an instruction code execution error occurs, a value other than 0 is set to the reply code (RWrn+2, RWrn+10, RWrn+12, RWrn+14, RWrn+16 and RWrn+18). The instruction code execution request is effective only when this signal changes from OFF to ON. Special monitor (72H) is chosen by the instruction code, and this signal always updates a monitor value during ON.
RY(n+1)0 to Y(n+1)9	Reserved**	Reserved**
RY(n+1)A	Error reset request	If the error reset request (RY(n+1)A) is switched on only when an inverter fault occurs, the inverter is reset and the error status flag (RX(n+1)A) switches off.
RY(n+1)B to RY(n+1)F	Reserved**	Reserved**

"n" is depend on the station number.

* The input terminal function can be changed by the input terminal function selections(☐ 142 to ☐ 148).
(But there are functional restrictions. Refer to the following page.)

** Set OFF ("0") to reserved bit.

***When RYn0 and RYn1 are ON simultaneously, the rotation is followed a parameter *F 105* (default = stop).

■ Input function selection from the CC-Link.

The function numbers selection of the RYn2 to RYn8 function valid from the command of the CC-Link are following boldface numbers.

Positive logic	Negative logic	Function	Speed control	PM control	V/f
0	1	No function is assigned	●/●	●	●
2	3	Forward run command	●/●	●	●
4	5	Reverse run command	●/●	●	●
6	7	Standby	●/●	●	●
8	9	Reset command	●/●	●	●
10	11	Preset speed command 1	●/●	●	●
12	13	Preset speed command 2	●/●	●	●
14	15	Preset speed command 3	●/●	●	●
16	17	Preset speed command 4	●/●	●	●
18	19	Jog run mode	●/●	●	●
20	21	Emergency stop by external signal *	●/●	●	●
22	23	DC braking command	●/●	●	●
24	25	2nd acceleration/deceleration	●/●	●	●
26	27	3rd acceleration/deceleration	●/●	●	●
28	29	2nd V/F control mode switching	●/●	●	●
32	33	2nd stall prevention level	●/●	●	●
36	37	PID control prohibition	●/●	●	●
46	47	External thermal error input	●/●	●	●
48	49	Forced local from communication	●/●	●	●
50	51	Operation hold (hold of 3-wire operation)	●/●	●	●
52	53	PID integral/differential clear	●/●	●	●
54	55	PID characteristics switching	●/●	●	●
56	57	Forced run operation	●/●	●	●
58	59	Fire speed operation	●/●	●	●
60	61	Acceleration/deceleration suspend signal	●/●	●	●
62	63	Power failure synchronized signal	●/●	●	●
64	65	My function-S trigger signal	●/●	●	●
74	75	Integrating wattmeter(kWh) display clear	●/●	●	●
76	77	Trace back trigger signal	●/●	●	●
78	79	Light-load high-speed operation prohibitive signal	●/●	●	●
80	81	Holding of RY-RC terminal output	●/●	●	●
82	83	Holding of OUT terminal output	●/●	●	●
88	89	Frequency UP	●/●	●	●
90	91	Frequency DOWN	●/●	●	●
92	93	Clear frequency UP/DOWN	●/●	●	●
96	97	Coast stop command	●/●	●	●
98	99	Forward/reverse selection	●/●	●	●
100	101	Run/Stop command	●/●	●	●
104	105	Frequency setting mode forced switching	●/●	●	●
106	107	Frequency setting mode terminal block	●/●	●	●
108	109	Command mode terminal block	●/●	●	●
110	111	Parameter editing permission	●/●	●	●
120	121	Fast stop command 1	●/●	●	●
122	123	Fast stop command 2	●/●	●	●
134	135	Traverse permission signal	●/●	●	●
136	137	Low voltage operation signal	●/●	●	●
140	141	Forward deceleration	●/●	●	●
142	143	Forward stop	●/●	●	●
144	145	Reverse deceleration	●/●	●	●
146	147	Reverse stop	●/●	●	●
152	153	No.2 motor switching (AD2 + VF2 + OCS2)	●/●	●	●
200	201	Parameter editing prohibition	●/●	●	●
202	203	Parameter reading prohibition	●/●	●	●

* This function is not dependent on $\zeta \eta \theta d$.

2. Input signal (Inverter -> Master)

The following shows input signals to the master unit. (The output signals for the inverter.)

Device No..	Signal	Description
RXn0	Forward running	OFF: Other than forward running (during stop or reverse rotation) ON : Forward running
RXn1	Reverse running	OFF: Other than reverse running (during stop or forward rotation) ON : Reverse running
RXn2	Output terminal function 1 (RY-RC)	The function depends on output terminal function selection 1 (F 130).
RXn3	Output terminal function 2 (OUT)	The function depends on output terminal function selection 2 (F 131).
RXn4	Output terminal function 3 (FL)	The function depends on output terminal function selection 3 (F 132).
RXn5	Failure FL	OFF : No failure ON : Failure
RXn6	PI control OFF	OFF : PI control permitted ON : PI control prohibited
RXn7	Acceleration/ deceleration pattern selection (1 or 2)	OFF: Acceleration/deceleration pattern 1 (AD1) ON : Acceleration/deceleration pattern 2 (AD2)
RXn8	Emergency stop	ON : Emergency stop
RXn9	Coast stop (ST = OFF)	OFF : ST = ON ON : ST = OFF
RXnA	Alarm	OFF: No alarm ON : Alarm issued
RXnB	Reserved*	Reserved*
RXnC	Monitoring flag	Switched on when the monitored values are set to RWrn, RWrn+1, RWrn+4 to RWrn+7 by the monitor command (RYnC) switching on. Switched off when the monitor command (RYnC) is switched off.
RXnD	Frequency setting completion flag (RAM)	Switched on when the set frequency is written to the inverter by the frequency setting command (RYnD) switching on. Switched off when the frequency setting command (RYnD) is switched off.
RXnE	Reserved*	Reserved*
RXnF	Instruction code execution completion flag	Switched on completion of the processing corresponding to the instruction code (RWw+2) which is executed when the instruction code execution request (RYnF) switches on. Switched off when the instruction code execution completion flag (RXnF) is switched off.
RX(n+1)0 to RX(n+1)9	Reserved*	Reserved*
RX(n+1)A	Error status flag	Switched on when occurred an inverter error or option error (watchdog error, CPU error, ROM error or RAM error). It is not switched on besides that.
RX(n+1)B	Remote station ready	Switched on when the inverter goes into the ready status on completion of initial setting after power-on or hardware reset. (Used as an interlock for read/write from/to the master.) Switched off when an inverter error occurs (protective function is activated).
RX(n+1)C to RX(n+1)F	Reserved*	Reserved*

"n" is depend on the station number.

* The bit described " Reserved " is unstable. Don't use the "Reserved " bit for the judgment.

5.5.7. Remote Register Assignment

Divide the monitor code (RWw n) into half and select the monitor value 1 (RWr n) from the lower 8 bits and the monitor value 2 (RWr n) from the higher 8 bits.

For example: When output voltage is selected for the monitor value 1 and output torque is selected for the monitor value 2. -> The monitor code is 0703H.

* The hexadecimal value attaches and expresses "H" to the end of a number.

1. Remote register (Master -> inverter)

RWw

Address	Signal	Description
RWw n	Monitor code (1 and 2)	Set the monitor code to be referenced. By switching on the (RYnC) signal after setting, the specified monitored data is set to (RWr n). The monitor value 1 (RWr n): RWw n Setting of the lower 8 bits of monitor code. The monitor value 2 (RWr n+1): RWw n Setting of the upper 8 bits of monitor code.
RWwn+1	Set frequency	Set the set frequency. After setting the register, a frequency is written after turning on (RynD). When the writing of the frequency is completed, (RXnD) turns on, depending on the input command. Unit: 0.01Hz
RWwn+2	Command code 1	Set the command code for actions such as operation mode switching, parameter read, write, error reference, error clear, etc. The command will be executed by turning (RynF) on after the register setting is completed. When the command execution is completed, (RXnF) turns on.
RWwn+3	Write data 1	Set data specified by the above-mentioned command code (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+4	Monitor code 3	Set the monitor code to be monitored. By setting "ON" in (RYC) after setting, the specified monitored data is stored in RWr n+4.
RWwn+5	Monitor code 4	Set the monitor code to be monitored. By setting "ON" in (RYC) after setting, the specified monitored data is stored in RWr n+5.
RWwn+6	Monitor code 5	Set the monitor code to be monitored. By setting "ON" in (RYC) after setting, the specified monitored data is stored in RWr n+6.
RWwn+7	Monitor code 6	Set the monitor code to be monitored. By setting "ON" in (RYC) after setting, the specified monitored data is stored in RWr n+7.
RWwn+8	Trip history No.	Set how many fault records in past to be read. Upper 8 bits: H00 (latest fault) to H07 (eight faults in past) Lower 8 bits: H00
RWwn+9 to RWwn+F	Reserved	Reserved

Address	Signal	Description
RWwn+10	Instruction code 2	Set the command code for actions such as operation mode switching, parameter read, write, error reference, error clear, etc. The command will be executed by turning (RynF) on after the register setting is completed. When the command execution is completed, (RXnF) turns on.
RWwn+11	Write data 2	Set data specified by the above-mentioned command code 2 (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+12	Instruction code 3	It is the same as instruction code 1 and 2.
RWwn+13	Write data 3	Set data specified by the above-mentioned command code 3 (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+14	Instruction code 4	It is the same as instruction code 1 and 2.
RWwn+15	Write data 4	Set data specified by the above-mentioned command code 4 (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+16	Instruction code 5	It is the same as instruction code 1 and 2.
RWwn+17	Write data 5	Set data specified by the above-mentioned command code 5 (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+18	Instruction code 6	It is the same as instruction code 1 and 2.
RWwn+19	Write data 6	Set data specified by the above-mentioned command code 6 (if necessary). If no data needs to be written, the value shall be zero. (RynF) is turned on after setting the above-mentioned command code and this register.
RWwn+1A to RWwn+1F	Reserved	Reserved

"n" is depend on the station number.

2. Remote register (Inverter -> Master)

RWr

Address	Signal	Description
RWr n	Monitor value 1	When (RYnC) is on, the monitored value specified to the lower 8 bits of the monitor code (RWwn) is set.
RWrn+1	Monitor value 2 (output frequency)	When "0" is set to the higher 8 bits of the monitor code (RWwn), the current output frequency is always set. When other than "0" is set to the upper 8 bits of the monitor code (RWwn) and (RYnC) is on, the monitored value specified to the higher 8 bits of the monitor code (RWwn) is set.
RWrn+2	Response code 1	When (RYnF) is on, the response code correspond to the instruction code of (RWwn+2) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.
RWrn+3	Read data 1	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RWrn+4	Monitor value 3	When (RYnC) is on, the monitored value specified to the monitor code (RWw n+4) is set.
RWrn+5	Monitor value 4	When (RYnC) is on, the monitored value specified to the monitor code (RWw n+5) is set.
RWrn+6	Monitor value 5	When (RYnC) is on, the monitored value specified to the monitor code (RWw n+6) is set.
RWrn+7	Monitor value 6	When (RYnC) is on, the monitored value specified to the monitor code (RWw n+7) is set.
RWrn+8	Trip information (Trip code)	The fault data of the trip history No. specified by (RWw n+8) is stored in the lower 8bits. The trip history No. specified is echo backed to the upper 8bits.
RWrn+9	Trip information (output frequency)	Output frequency of the trip history No. specified in (RWw n+8) is stored.
RWrn+A	Trip information (output current)	Output current of the trip history No. specified in (RWw n+8) is stored.
RWrn+B	Trip information (output voltage)	Output voltage of the trip history No. specified in (RWw n+8) is stored.
RWrn+C	Trip information (energization time)	Energization time of the trip history No. specified in (RWw n+8) is stored.
RWrn+D to RWrn+F	Reserved	Do not use it.
RWrn+10	Reply code 2	When (RYnF) is on, the response code correspond to the instruction code of (RWw n+10) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.
RWrn+11	Read data 2	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RWrn+12	Reply code 3	When (RYnF) is on, the response code correspond to the instruction code of (RWw n+12) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.

Address	Signal	Description
RW _{rn} +13	Read data 3	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RW _{rn} +14	Reply code 4	When (RY _n F) is on, the response code correspond to the instruction code of (RW _w n+14) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.
RW _{rn} +15	Read data 4	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RW _{rn} +16	Reply code 5	When (RY _n F) is on, the response code correspond to the instruction code of (RW _w n+16) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.
RW _{rn} +17	Read data 5	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RW _{rn} +18	Reply code 6	When (RY _n F) is on, the response code correspond to the instruction code of (RW _w n+18) is set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc.
RW _{rn} +19	Read data 6	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RW _{rn} +1A to RW _{rn} +1F	Reserved	Do not use it.

"n" is depend on the station number.

5.5.8. Instruction Codes

Code No.	Item	Description	
1003H	Command mode selection read	0: Terminal block 1: Panel keypad (including extension panel) 2: RS485 communication	
2003H	Command mode selection write	3: No function 4: Communication option	
1004H	Frequency setting mode selection read	0: Setting dial 1(save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2(press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input	
2004H	Frequency setting mode selection write	6: No function 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: <i>Sr 0</i>	
0072H	Special monitor	0000H to FFFFH: Monitor value selected after choosing instruction code 00F3H.	
read	0073H	Special monitor code read	Read the content that was monitored by special monitor.
write	00F3H	Special monitor selection	Select the monitor code of special monitor.
0074H	Trip history No.1, No.2 read	Read the No.1 and No.2 of trip information.	
0075H	Trip history No.3, No.4 read	Read the No.3 and No.4 of trip information.	
0076H	Trip history No.5, No.6 read	Read the No.5 and No.6 of trip information.	
0077H	Trip history No.7, No.8 read	Read the No.7 and No.8 of trip information.	
006DH	Frequency command value (RAM) read	Read the frequency command value (RAM).	
00EDH	Option frequency command value (EEPROM&RAM) write*	Write the option frequency command value (EEPROM &RAM).	
00F4H	Trip history clear	9696H: Clear all trip histories.	
00FCH	Parameter all clear	9696H: Clear all parameters. (Parameters other than proofreading values are made into factory default settings.)	
00FDH	Inverter reset	9696H: Reset the inverter.	
1000H to 1999H (1000H to 1F99H)	Read parameters (RAM)	To read parameters <i>F000</i> to <i>F984</i> , add the triple figures that follow Fxxx to 1000H. (Ex: <i>F984</i> -> 984 + 1000 = 1984) No error occurs when you select 1A00 to 1F99. Because these parameters are for maintenance.	
2000H to 2999H	Write parameters (EEPROM&RAM) *	To write parameters <i>F000</i> to <i>F984</i> , add the triple figures that follow Fxxx to 2000H.	

Code No.	Item	Description
4900H to 6999H	Read parameters (RAM)	To read parameters $A900$ to $C999$, 6000H is subtracted from the parameter number. (Ex: A900 → A900H – 6000H = 4900H, C123 → C123H – 6000H = 6123H)
A900H to C999H	Write parameters (EEPROM&RAM) *	To write parameters $A900$ to $C999$, the parameter number doesn't change. (Ex: A900 → A900H, C123 → C123H)

* The Life of EEPROM is approximately 100,000 times. Avoid writing a command more than 100,000 times to the same parameter of the drive and the option module.

5.5.9. The details of an error code

The following data are stored as fault history data when the inverter trip occurred.

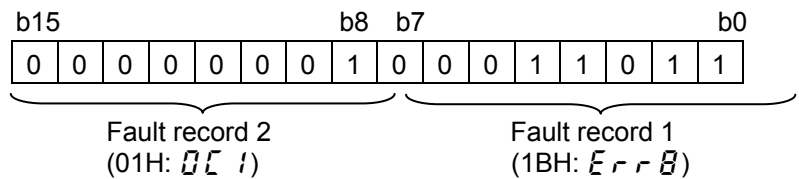
Error code		Description	Trip display
Decimal No.	Hexadecimal No.		
0	00H	No error	<i>nErr</i>
1	01H	Overcurrent during acceleration	<i>OC1</i>
2	02H	Overcurrent during deceleration	<i>OC2</i>
3	03H	Overcurrent during constant speed operation	<i>OC3</i>
4	04H	Overcurrent (An overcurrent on the load side at start-up)	<i>OCL</i>
5	05H	Overcurrent at start-up	<i>OCA</i>
8	08H	Input phase failure	<i>EPH1</i>
9	09H	Output phase failure	<i>EPH0</i>
10	0AH	Overvoltage during acceleration	<i>OP1</i>
11	0BH	Overvoltage during deceleration	<i>OP2</i>
12	0CH	Overvoltage during constant-speed operation	<i>OP3</i>
13	0DH	Inverter overload	<i>OL1</i>
14	0EH	Motor overload	<i>OL2</i>
15	0FH	Dynamic braking resistor overload trip	<i>OLr</i>
16	10H	Overheat	<i>OH</i>
17	11H	Emergency stop	<i>E</i>
18	12H	EEPROM fault 1	<i>EEP1</i>
19	13H	EEPROM fault 2	<i>EEP2</i>
20	14H	EEPROM fault 3	<i>EEP3</i>
21	15H	Main unit RAM fault	<i>Err2</i>
22	16H	Main unit ROM fault	<i>Err3</i>
23	17H	CPU fault 1	<i>Err4</i>
24	18H	Communication error	<i>Err5</i>
26	1AH	Current detector fault	<i>Err7</i>
27	1BH	Optional unit fault 1	<i>Err8</i>
28	1CH	Remote keypad disconnection fault	<i>Err9</i>
29	1DH	Low-current operation fault	<i>UC</i>
30	1EH	Undervoltage fault (main circuit)	<i>UP1</i>
32	20H	Over-torque trip 1	<i>Ot</i>
34	22H	Ground fault	<i>EF2</i>
40	28H	Auto-tuning error	<i>Et n</i>
41	29H	Inverter type error	<i>EtYP</i>
45	2DH	Over speed fault	<i>E-13</i>
46	2EH	Thermal fault stop command from external device	<i>OH2</i>
47	2FH	Step-out (for PM motor drive only)	<i>SOUt</i>

Error code		Description	Trip display
Decimal No.	Hexadecimal No.		
50	32H	Analog input break detection fault	<i>E-18</i>
51	33H	CPU communications error	<i>E-19</i>
52	34H	Over torque boost fault	<i>E-20</i>
53	35H	CPU fault 2	<i>E-21</i>
55	37H	Optional unit fault 2	<i>E-23</i>
58	3AH	CPU fault 3	<i>E-26</i>
62	3EH	Main module overload	<i>OL3</i>
64	40H	PTC fault	<i>E-32</i>
65	41H	Over-torque trip 2	<i>OL2</i>
69	45H	Servo lock fault	<i>E-37</i>
71	47H	Auto-tuning error (PM motor)	<i>E-39</i>
72	48H	Over-torque / Overcurrent fault	<i>OLC3</i>
73	49H	Small-torque / Small-current fault	<i>ULC3</i>
84	54H	Auto-tuning error	<i>Err1</i>
85	55H	Auto-tuning error	<i>Err2</i>
86	56H	Auto-tuning error	<i>Err3</i>

Fault record display example

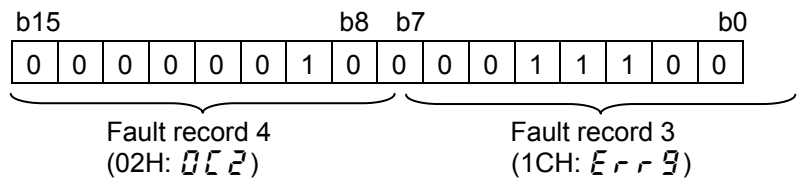
(instruction code H74)

For read data: 011BH



(instruction code H74)

For read data : 021CH



5.5.10. Description of reply code

When executing the frequency setting (RYnD) or instruction code execution (RYnF), check the reply code (RWr (n+2), (n+10), (n+14), (n+16), (n+18)) in the remote register after execution.

Reply code

Data (Hexadecimal No.)	Item	Description
0000H	Normal (No error)	Normal completion of instruction code execution.
0001H	Write mode error	Parameter write was attempted during operation other than a stop.
0002H	Parameter selection error	Unregistered code number was set.
0003H	Setting range error	Set data is outside the setting data range.

5.5.11. Description of monitor code

Divide the monitor code (RWw n) into half and select the monitor value 1 (RWr n) from the lower 8 bits and the monitor value 2 (RWr n) from the upper 8 bits.

For Example: When output voltage is selected for the monitor value 1 and output torque is selected for the monitor value 2. -> The monitor code is 0703H.

Address	Upper 8 bits	Lower 8 bits
RWw n	Monitor value 2	Monitor value 1
RWw n+4	-	Monitor value 3
RWw n+5	-	Monitor value 4
RWw n+6	-	Monitor value 5
RWw n+7	-	Monitor value 6

Monitor code (When an invalid monitor code is set up, monitor value fixes to 0.)

Code Number	Second Monitor Description (upper 8 bits)	First Monitor Description (lower 8 bits)	Unit
00H	Output frequency (Only the second monitor)	None monitor (Monitor value is 0)	0.01Hz
01H	Output frequency	Output frequency	0.01Hz
02H	Output current	Output current	0.01A
03H	Output voltage	Output voltage	0.1V
04H	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
05H	Frequency command value	Frequency command value	0.01Hz
06H	Output speed	Output speed	1min ⁻¹
07H	Output torque (With sign)	Output torque (With sign)	0.1%
08H	DC voltage	DC voltage	0.1V
09H	PBR load factor	PBR load factor	0.1%
0AH	Motor overload factor	Motor overload factor	0.1%
0BH · 0CH	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
0DH	Input power	Input power	0.01kW
0EH	Output power	Output power	0.01kW
0FH	Input terminal information	Input terminal information	—
10H	Output terminal information	Output terminal information	—
11H	Output current	Output current	0.1%
12H	Exciting current	Exciting current	0.01A
13H	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
14H	Cumulative operation time	Cumulative operation time	1h
15H · 16H	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
17H	Accumulation power supply ON time	Accumulation power supply ON time	1h
18H	Motor overload factor	Motor overload factor	0.1%
19H	Integral input power	Integral input power	1kWh
1AH	Integral output power	Integral output power	1kWh
1BH	Analog input(VIA)	Analog input(VIA)	0.01%
1CH	Analog input(VIB) (With sign)	Analog input(VIB) (With sign)	0.01%
1DH	Analog input(VIC)	Analog input(VIC)	0.01%
1EH · 1FH	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
21H	Torque current (With sign)	Torque current (With sign)	0.1%
22H	None monitor (Monitor value is 0)	None monitor (Monitor value is 0)	—
23H	Factory specific monitor	Factory specific monitor	—
24H	PID feedback value	PID feedback value	0.01Hz

5.5.12. Description of input terminal information

Data composition of input terminal information (Code No. = 0FH).

Bit	Terminal name	Function (parameter name)	0	1
0	F	Input terminal function selection 1A(F 111) / 1B(F 151) / 1C(F 155)	OFF	ON
1	R	Input terminal function selection 2A(F 112) / 2B(F 152) / 2C(F 156)		
2	RES	Input terminal function selection 3A(F 113) / 3B(F 153)		
3	S1	Input terminal function selection 4A(F 114) / 4B(F 154)		
4	S2	Input terminal function selection 5(F 115)		
5	S3	Input terminal function selection 6(F 116)		
6	VIB	Input terminal function selection 7(F 117)		
7	VIA	Input terminal function selection 8(F 118)		
8 to 15	—	—	—	—

5.5.13. Description of output terminal information

Data composition of input terminal information (Code No. = 10H).

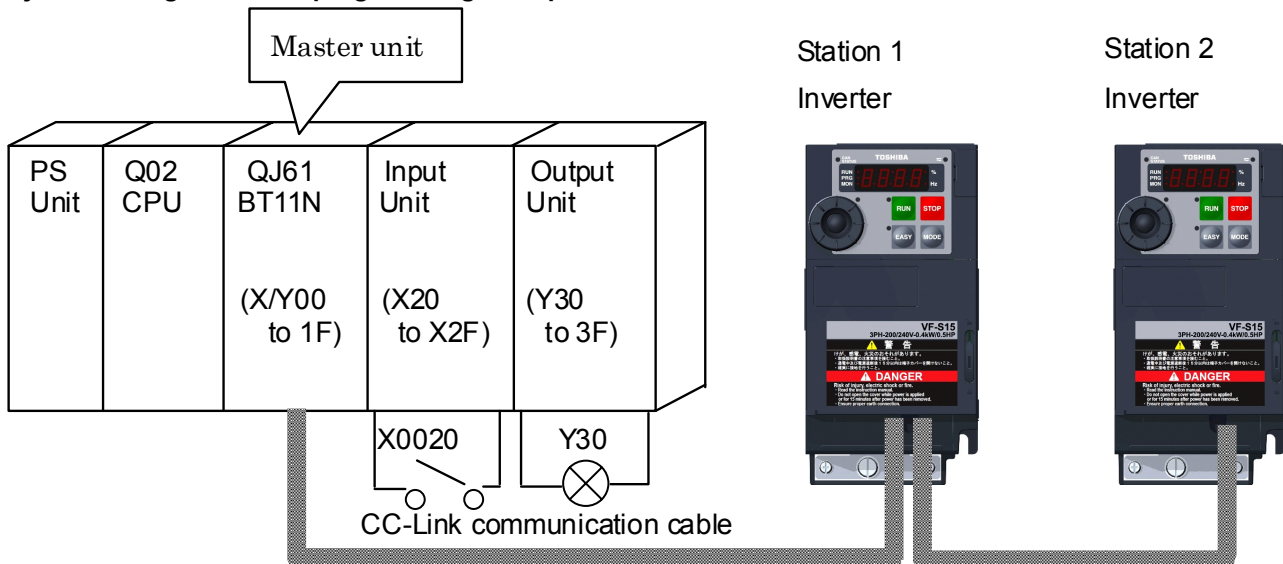
Bit	Terminal name	Function (parameter name)	0	1
0	RY-RC	Output terminal function selection 1A(F 130) / 1B(F 137)	OFF	ON
1	OUT	Output terminal function selection 2A(F 131) / 2B(F 138)		
2	FL	Output terminal function selection 3(F 132)		
3 to 15	—	—	—	—

6. Programming examples

This chapter provides programming examples which control the inverter with the PLC.

	Item	Programming Example	Refer to Page
6.1	Reading the inverter status	Reading the inverter status from the buffer memory of the master station.	- 38 -
6.2	Setting the command mode	Command mode from CC-Link is confirmed.	- 39 -
6.3	Setting the operation commands	Commanding the forward rotation.	- 40 -
6.4	Setting the reference frequency	Setting to 50.00Hz.	- 40 -
6.5	Setting the monitoring function	Monitoring the output frequency.	- 41 -
6.6	Writing a parameter value	Setting the $F311$ [Reverse-run prohibition selection] to [1 : Prohibit reverse run].	- 42 -
6.7	Reading a parameter value	Reading the parameter $F311$.	- 42 -
6.8	Reading the the fault record	Reading the fault record	- 44 -
6.9	Inverter reset	Resetting the inverter.	- 45 -

System configuration for programming example



The example of CC-Link communication network composition

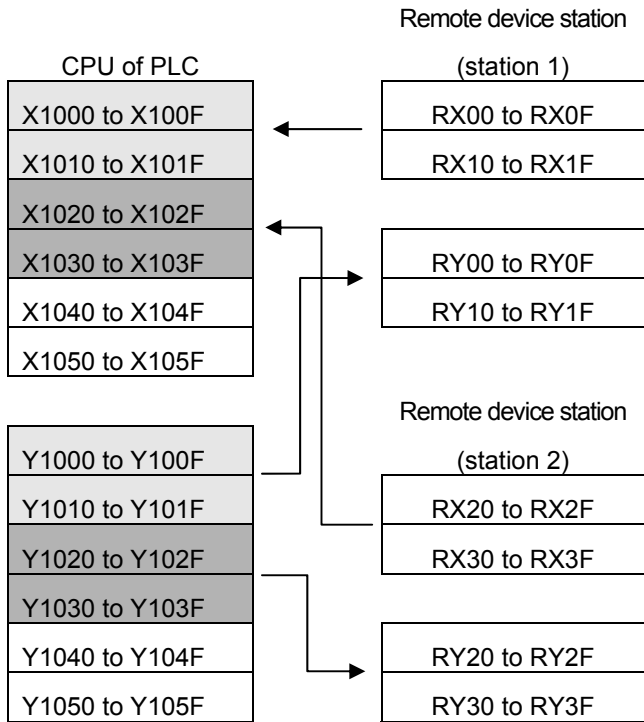
· CPU	Mitsubishi Electric Corp.	Q02CPU
· Master unit	Mitsubishi Electric Corp.	QJ61BT11N
· Input module	Mitsubishi Electric Corp.	QX40
· Output module	Mitsubishi Electric Corp.	QY40P
· CC-Link dedicated cable	Kuramo Electric Corp.	FANC-110SBH
· Inverter	Toshiba	TOSVERT VF-S15(2 units)
		One station is occupied
· CC-Link option	Toshiba	CCL003Z(2 units)

2. Network parameter setting of the master station

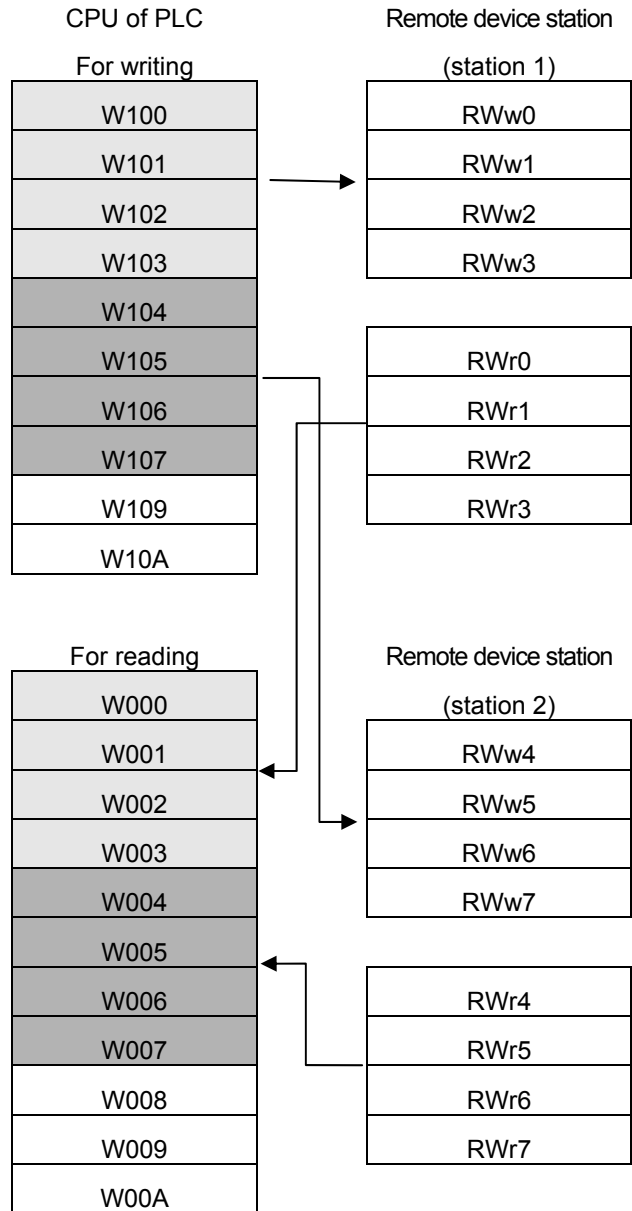
Network parameters are set as below.

Item		Setting Conditions	Item		Setting Conditions
Start I/O No.		0000	Remote register (RWw)		W100
Operation settings	Data link alarm station setting	Input clear	Special relay (SB)		SB0
	Setting at CPU stop	Refresh	Special resister (SW)		SW0
Type		Master	Retry count		3
Mode		Remote net Ver.1 mode	Automatic reconnection station count		1
All connect count		2	CPU down select		Stop
Remote input (RX)		X1000	Scan mode settings		Asynchronous
Remote output (RY)		Y1000	Station information	Station type	Remote device station
Remote register (RWr)		W0			

3. The relation between the device of the programmable controller CPU and remote I/O (RX,RY) of the remote device station is as follows:
The devices used actually are indicated in shaded regions.



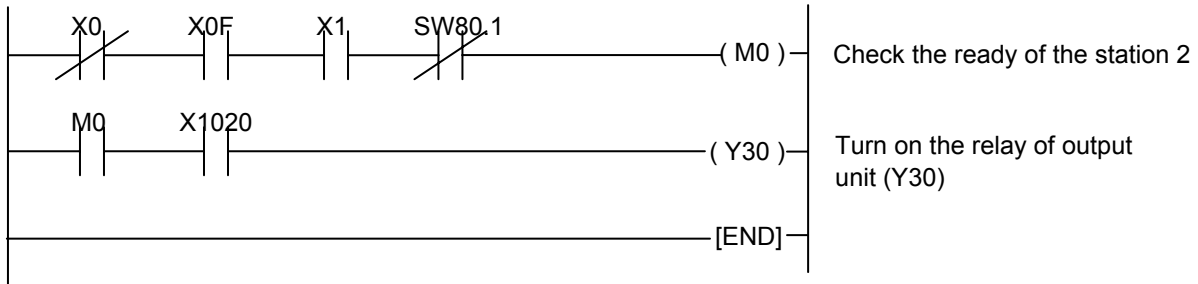
4. The relation between the device of the programmable controller CPU and remote register (RWw, RWr) of the remote device station is as follows:
The devices used actually are indicated in shaded regions.



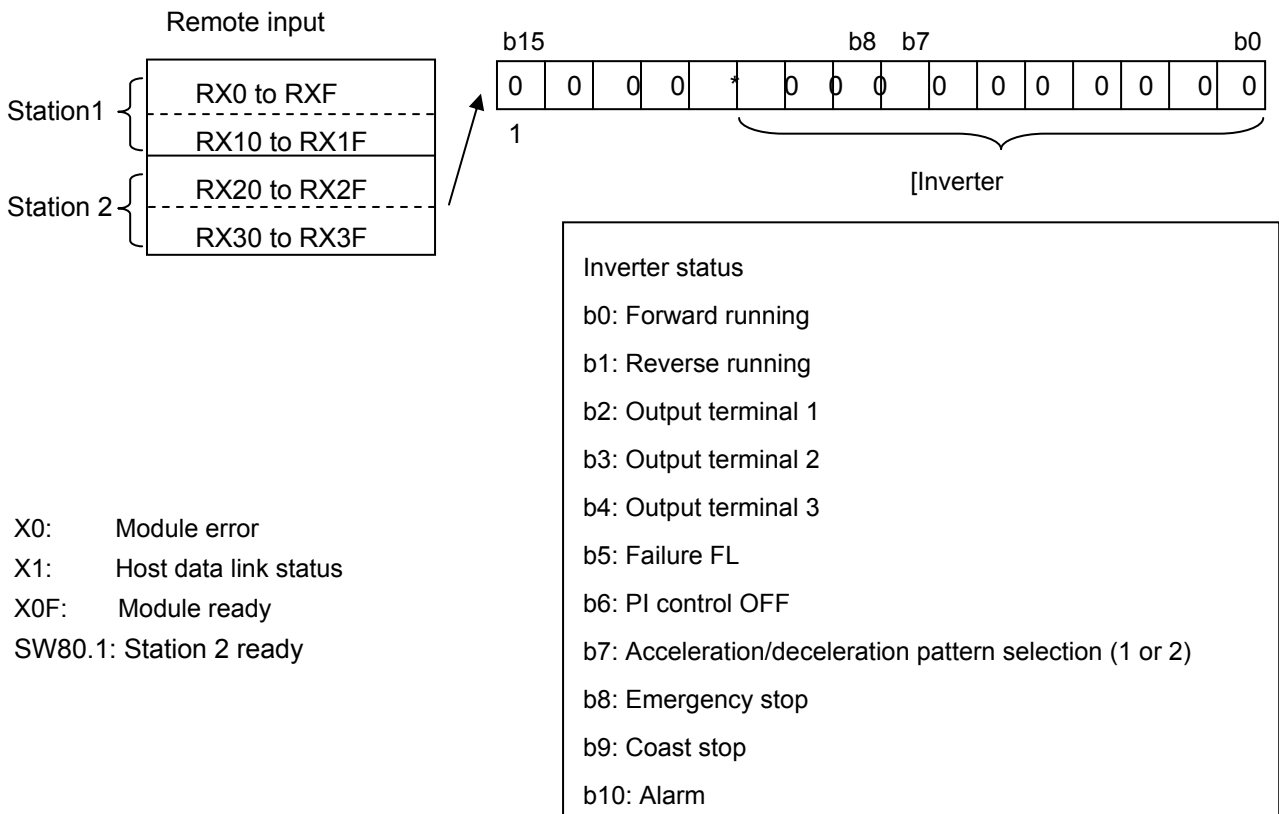
6.1. Program example for reading the inverter status

Example 1 shows a ladder logic to read the inverter status.

Y30 of the output unit is turned on when inverter of station 2 is forward running



Example



- X0: Module error
- X1: Host data link status
- X0F: Module ready
- SW80.1: Station 2 ready

6.2. Program example for setting the operation mode

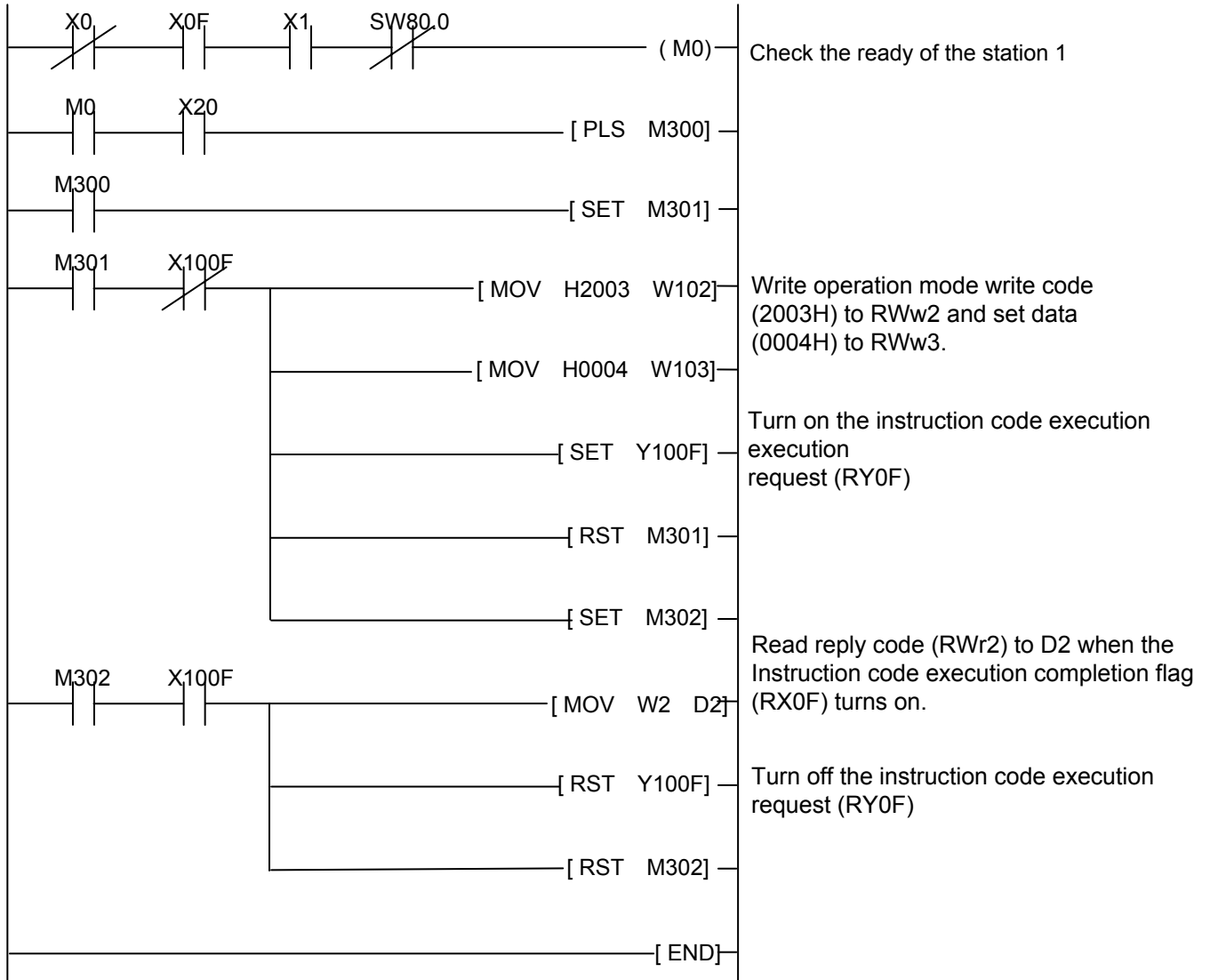
Example 2 shows a ladder logic to write data in the inverter.

The operation mode of station 1 inverter can be changed to network operation.

Operation mode writing code number: 2003H (hexadecimal)

Network operation set data: 0004H (hexadecimal)

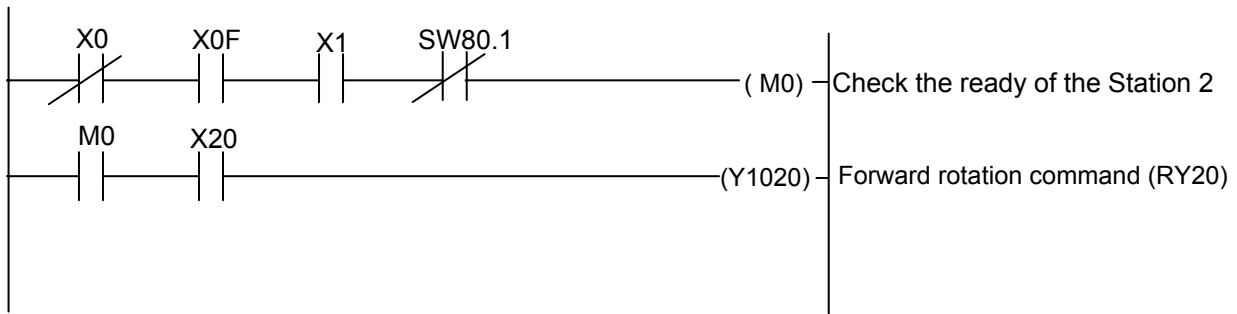
The reply code at the time of instruction code execution is set to D2.



Example

6.3. Program example for setting the operation commands

Example 3 shows a ladder logic to give a forward command to station 2 inverter.

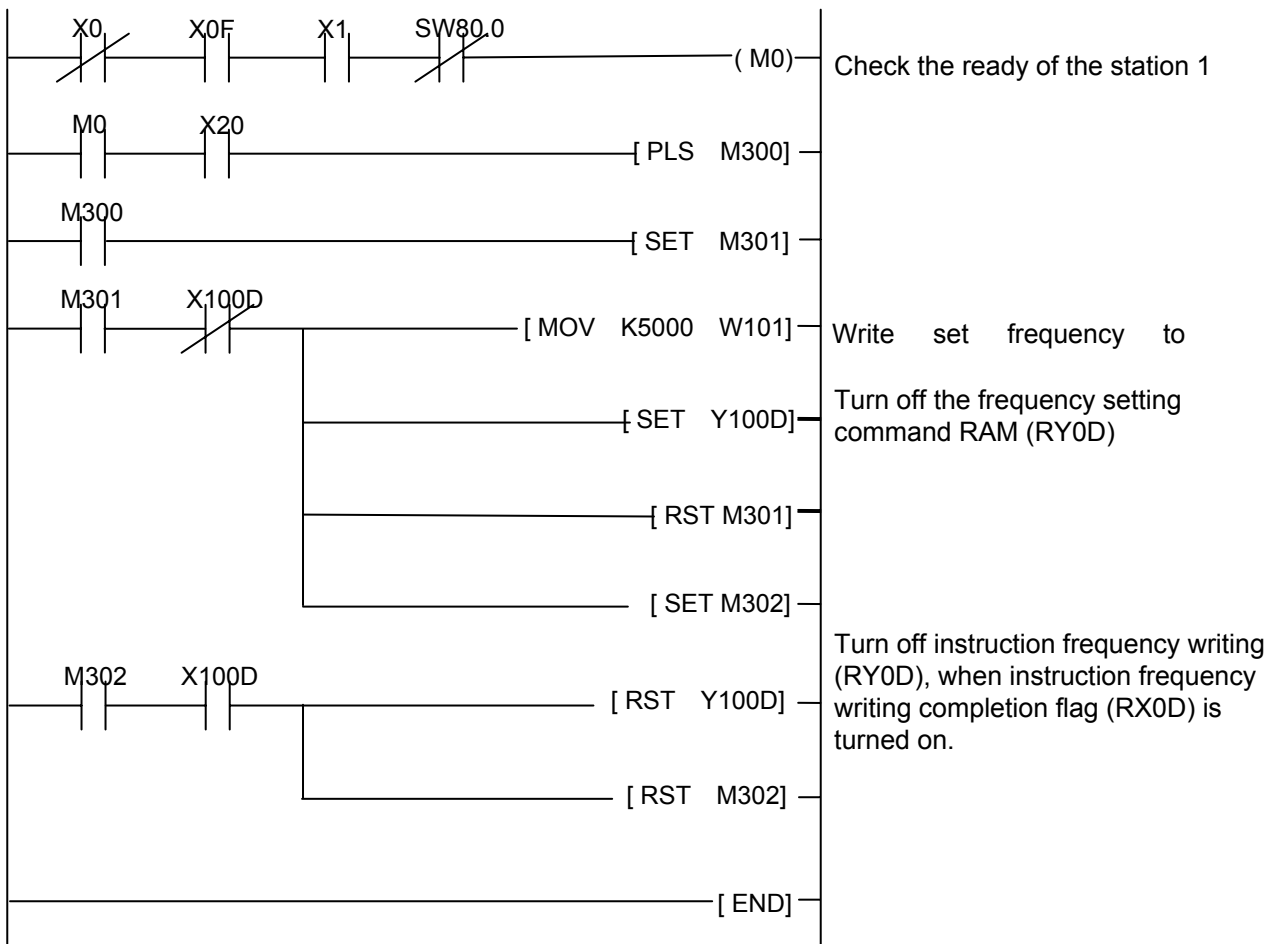


Example 3

6.4. Program example for setting the running frequency

Example 4 shows a ladder logic to change the running frequency of station 1 inverter to 50.00Hz

Set frequency: 5000 (decimal)



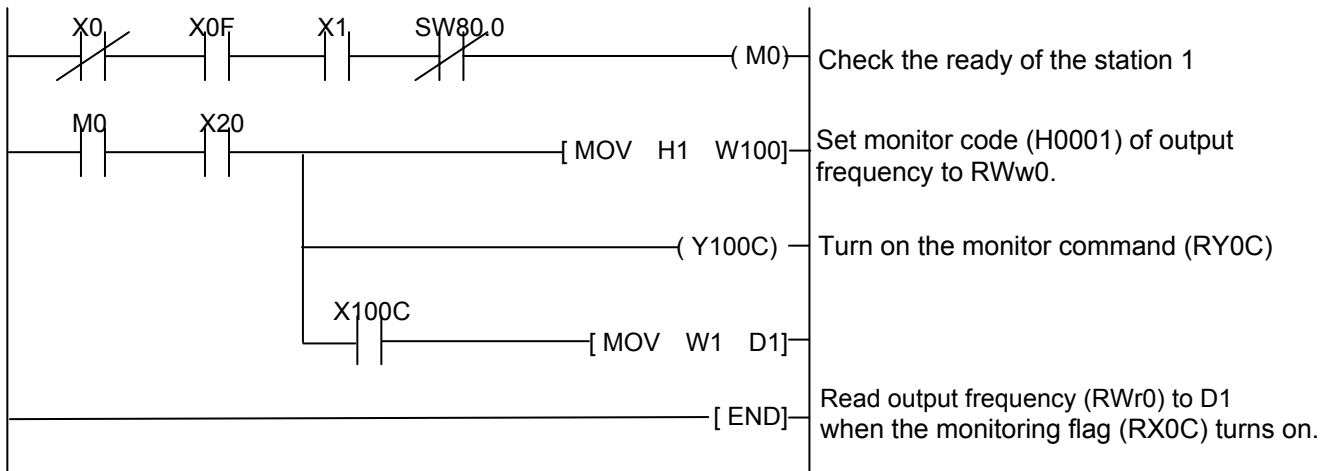
Example

6.5. Program example for monitoring the output frequency

Example 5 shows a ladder logic to read the output frequency of station 1 inveter to D1.

Output frequency reading code number: 0001H (hexadecimal)

When the output frequency is 50Hz, D1 is 1388H (5000) (unit: 0.01Hz).

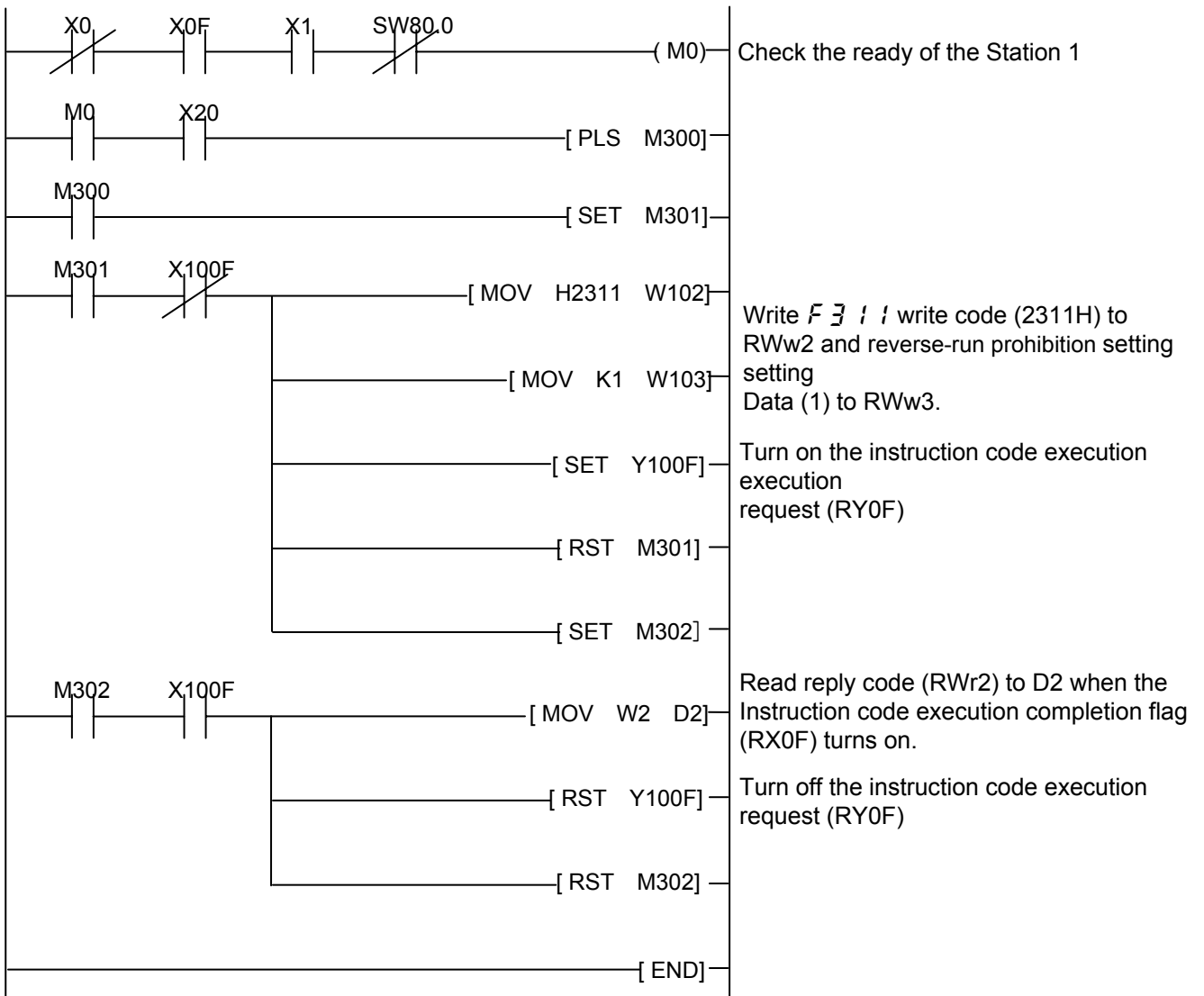


Example 5

Refer to 5.5.11 for detail of monitor code.

6.6. Program example for parameter writing

Example 6 shows a ladder logic to change the setting of $F311$ of station 1 inverter to 1
 $F311$: Reverse-run prohibition reading code number: 2311H (hexadecimal)
 Reverse-run prohibition set data: 1 (decimal)



Example

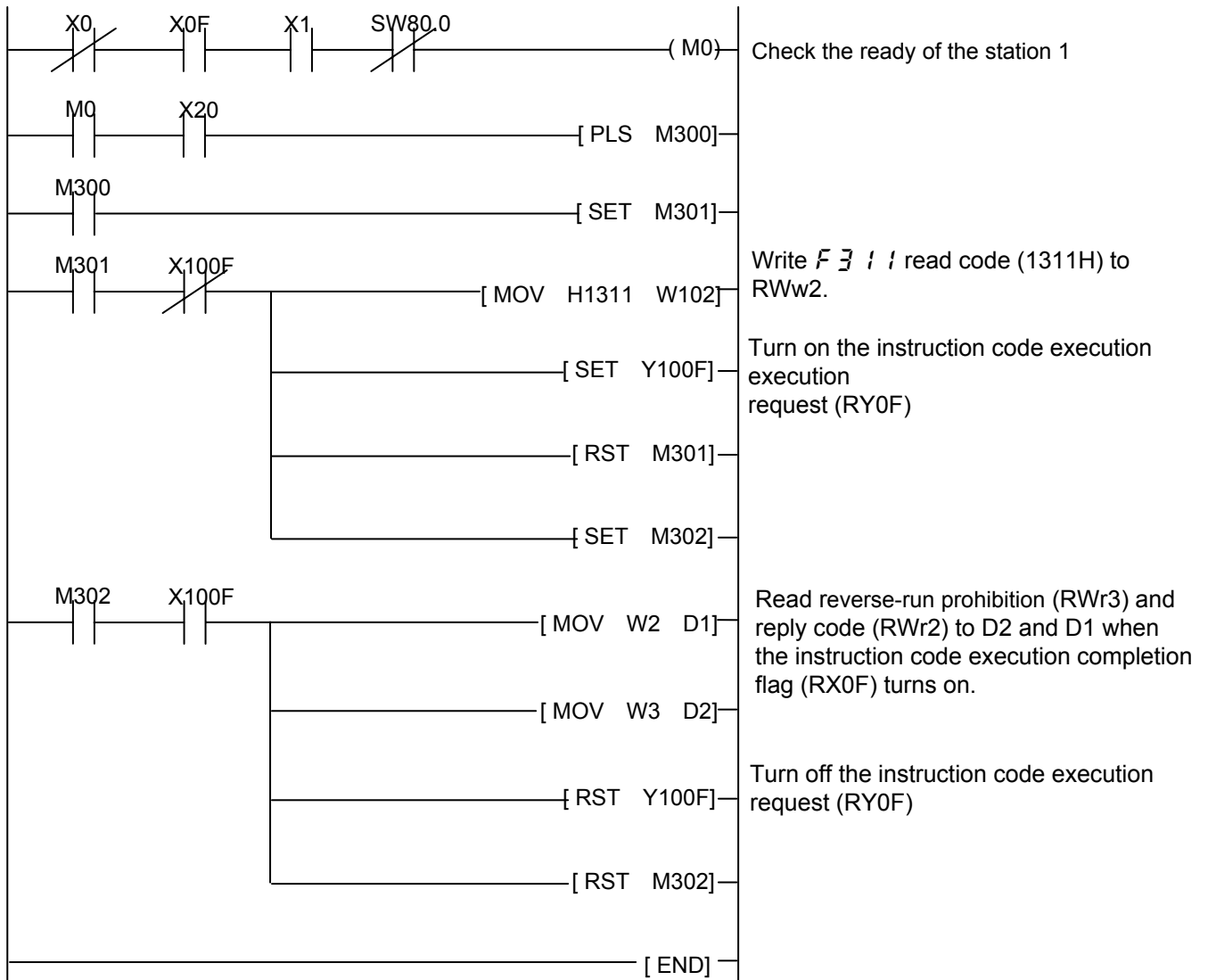
Refer to 5.5.8 for detail of instruction code.

6.7. Program example for parameter reading

Example 7 shows a ladder logic to read parameter $F311$ of station 1 inverter to D2.

$F311$: Reverse-run prohibition reading code number: 1311H (hexadecimal)

The reply code at the time of instruction code execution is set to D1.



Example

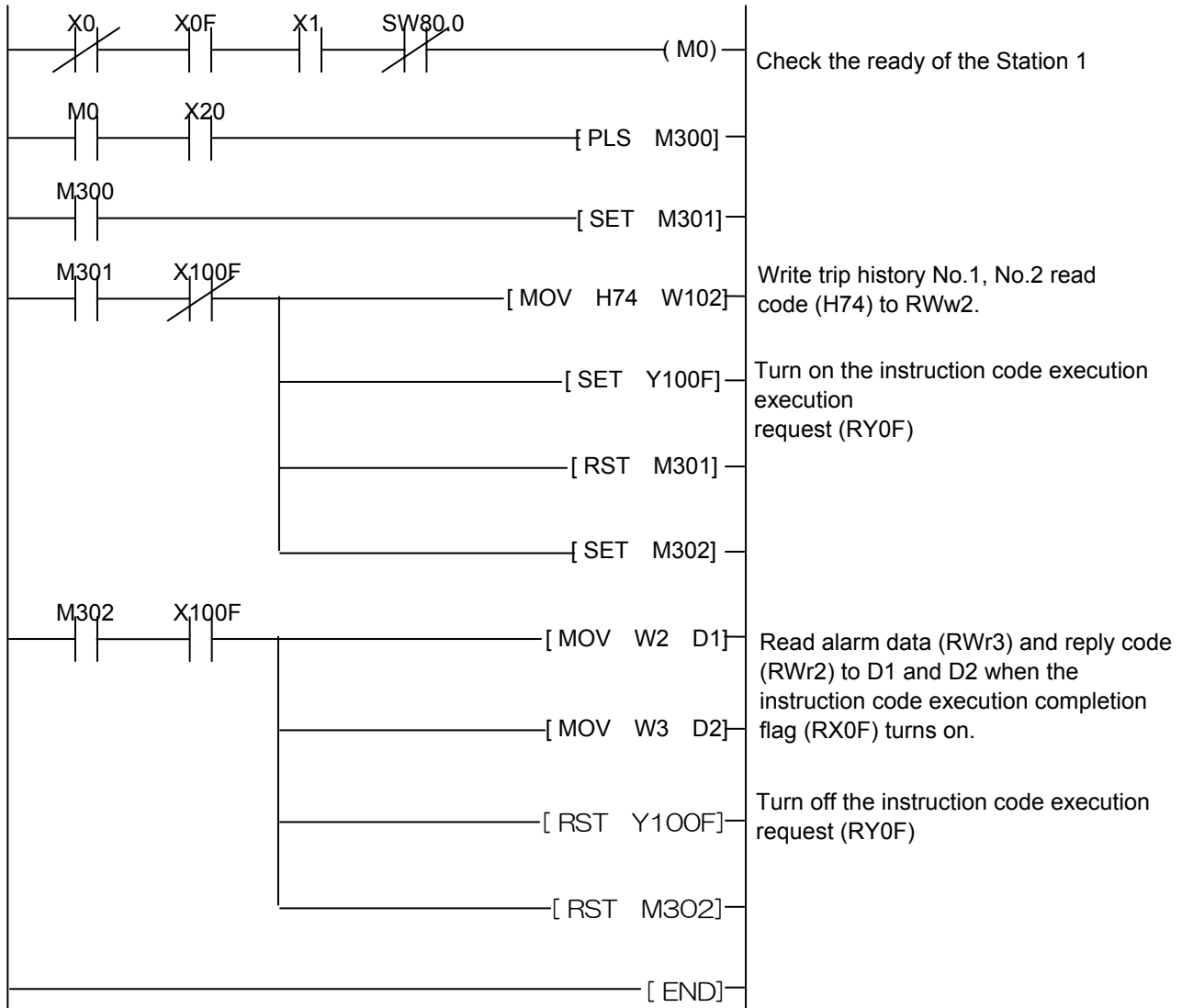
Refer to 5.5.8 for detail of instruction code.

6.8. Program example for trip information reading

Example 8 shows a ladder logic to read the trip information of station 1 inverter to D1.

Trip history No. 1, No. 2 reading code number: 74H (hexadecimal)

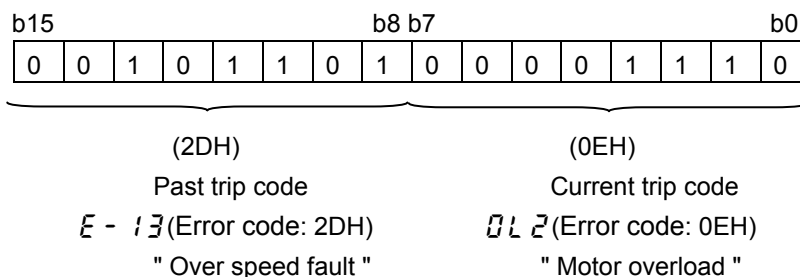
The reply code at the time of instruction code execution is set to D2.



Example

For example of trip information

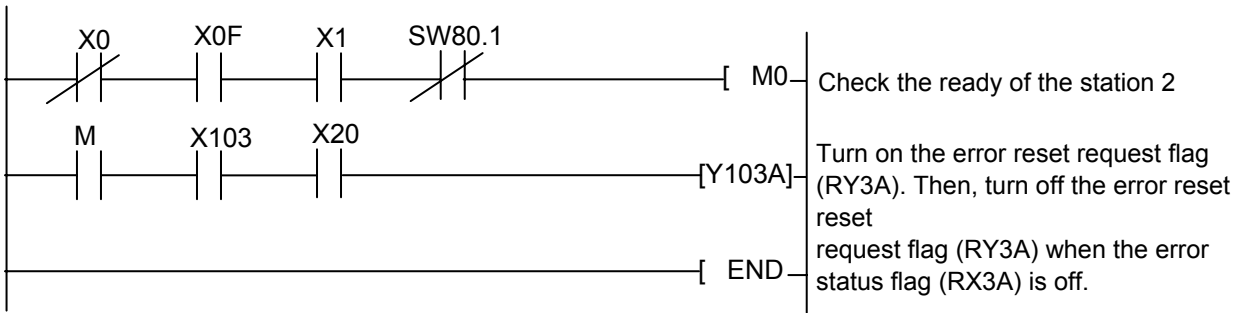
Read data: 2D0EH



Refer to 5.5.9 for detail of error code.

6.9. Program example for resetting the inverter at inverter error

Example 9 shows ladder logic to reset the station 2 inverter.



Example

The above inverter reset using RY3A may be made only when an inverter error occurs. Also, inverter reset can be made independently of the operation mode.

6.10. Instructions

1. Programming instructions

1.1 Since the buffer memory data of the master station is kept transferred (refreshed) to/from the inverters, the TO instruction need not be executed every scan in response

to data write or read requests.

The execution of the TO instruction every scan does not pose any problem.

1.2 If the FROM/TO instruction is executed frequently, data may not be written reliably.

When transferring data between the inverter and sequence program via the buffer memory, perform the handshake to confirm that data has been written without error.

2. Operating and handling instructions

2.1 Command only from the programmable controller can be accepted during operation from CC-Link communication.

The run command from external and parameter unit is ignored.

2.2 If the station number of two or more inverters is the same, wrong data will be transferred and normal communication cannot be made.

2.3 If a network error (controller fault, an open CC-LINK dedicated cable, etc) continues past the time set in $\zeta 100$ during CC-Link operation, it is recognized as a communication error and the operation of the inverter follows the setting of $\zeta 101$.

2.4 When the programmable controller (master) is reset or the power supply of the programmable controller (master) is turned off during CC-Link operation, data communication stops and an inverter follows the setting of $\zeta 101$.

7. Unusual diagnosis

7.1. Option error

The error message is displayed when there is hardware error, software error or lose of connection of wire.

▼Display of trip information

$E-23$ (Optional unit fault 2 : 0037H) : Option error

7.2. Disconnection error of network cable

▼Display of trip information

$E-18$ (Optional unit fault 1 : 001BH): Network error stop

*If a network error occurs when $C101$ is set to "4", it is displayed.

▼Related parameter

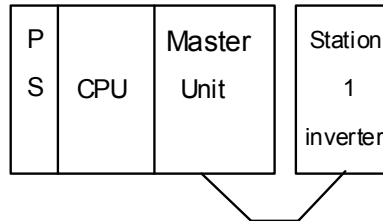
Title	Function	Setting range	Description
$C100$	Communication error detection delay time	0.0 to 100.0 sec	The waiting time from when a network error occurs can be adjusted. If a network error continues past the time set in $C100$, it is recognized as a communication error and the operation of the inverter follows the setting of $C101$. When normal communication returns during the setting time, a communication error is not displayed and operation is continued. * Time-out time = CC-Link network time out + $C100$ (communication error detection delay time) [0.1s]
$C101$	Inverter operation at the communications loss action	0 to 5	The operation of the drive when the communication fault occurs can be specified.
$C102$	Preset speed operation selection	0 to 15	The operation frequency of the drive when the communication fault occurs can be specified. (Only when $C101$ is set to 5)
$C103$	Communication time-out condition selection	0 to 2	Select the communication time-out condition.

7.3. How to check the error using the LEDs

The following example explains the causes of fault which may be judged from the LED status of the CC-Link unit (CCL003Z) of the inverter.

1. When One Inverter Is Connected

The following example indicates the causes of faults which may be judged from the LED status of the CC-Link unit (CCL003Z) of the inverter under the condition that the SW, M/S and PRM LEDs of the master unit are off (the master unit setting is correct) in the system configuration where one inverter is connected.



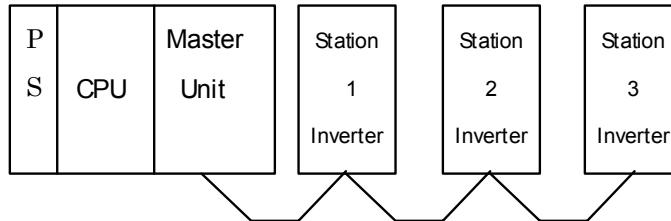
PS:
Power supply

LED Status				Cause	Corrective Action
L.RUN	SD	RD	L.ERR		
●	●	●	◎	Normal communication is made but CRC error has occurred due to noise.	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)
●	●	●	○	Baud rate or station number was changed during operation.	After correcting the baud rate and/or station number setting, switch power on again.
●	●	●	○	Normal communication	-
●	○	●	◎	Cannot answer due to CRC error of receive data.	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)
●	○	●	○	Data sent to the host station does not reach destination.	Check the network transmission setting and the sequence program on the PLC side.
●	○	○	○	Hardware fault (There is a possibility of the instability of the communication by the disconnection.)	Check for contact fault, break in the cable, etc.
○	●	●	◎	Polling response is made but refresh receive is in CRC error.	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)
○	○	●	◎	Data sent to the host station is in CRC error.	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)
○	○	●	○	There is no data sent to the host station, or data sent to the host station cannot be received due to noise.	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)
○	○	○	○	Cannot receive data due to break in the cable, etc.	Check for contact fault, break in the cable, etc.
○	○	○	○	WDT error occurrence (hardware fault), power off, power supply failure	Check that CCL003Z is fitted properly.

●:On, ○:OFF, ◎:Flicker, *: Any of on, flicker or off.

2. When two or more inverters are connected

The following example explains the causes and corrective actions for fault which may be judged from the LED status of the CC-Link units (CCL003Z) of the inverters under the condition that the SW, M/S and PRM LEDs of the master unit are off (the master unit setting is proper) in the system configuration shown below:



PS:
Power supply

LED Status				Cause	Corrective Action
Master	CCL003Z				
	Station 1	Station 2	Station 3		
TIME○ LINE○ or TIME● LINE○	L.RUN ●	L.RUN ●	L.RUN ●	Normal	-
	SD ●	SD ●	SD ●		
	RD ●	RD ●	RD ●		
	L.ERR ○	L.ERR ○	L.ERR ○		
TIME● LINE○ or TIME○ LINE○	L.RUN ○	L.RUN ●	L.RUN ●	Poor contact of the CCL003Z with the Inverter or the power supply is not supplied.	Plug the CCL003Z securely. Check the connector.
	SD ○	SD ●	SD ●		
	RD ○	RD ●	RD ●		
	L.ERR ○	L.ERR ○	L.ERR ○		
TIME● LINE● or TIME○ LINE●	L.RUN ●	L.RUN ○	L.RUN ○	Since the L.RUN LEDs of station 2 and later are off, the communication cable between the unit 1 and 2 is open or disconnected from the terminal block.	Referring to the LED "on" condition, search for an open point and repair.
	SD ●	SD *	SD *		
	RD ●	RD *	RD *		
	L.ERR ○	L.ERR ○	L.ERR ○		
	L.RUN ○	L.RUN ○	L.RUN ○	The communication cable is shorted.	Among the three wires of the communication cable, search for shorted wire and repair.
	SD *	SD *	SD *		
	RD *	RD *	RD *		
	L.ERR ○	L.ERR ○	L.ERR ○		
	L.RUN ○	L.RUN ○	L.RUN ○	The communication cable is wired improperly.	Check the wiring on CCL003Z terminal block and correct the improper wiring point.
	SD *	SD *	SD *		
	RD *	RD *	RD *		
	L.ERR *	L.ERR *	L.ERR *		

●:On, ○:OFF, ◎:Flicker, *: Any of on, flicker or off.

3. Communication stops during operation

- Check that the CC-Link units and the CC-Link dedicated cable are connected properly.
(Check for contact fault, break in the cable, etc.)
- Check that the PLC program is executed properly.
- Check that data communication has not stopped due to an instantaneous power failure, etc.

		LED Status						Cause	Corrective Action
Master	CCL003Z								
	Station 1		Station 2		Station 3				
TIME○ LINE○ or TIME● LINE○	L.RUN	○	L.RUN	●	L.RUN	○	The station numbers of station 1 and 3 are duplicated.	After correcting the repeated station numbers of the inverters, switch power on again.	
	SD	*	SD	●	SD	*			
	RD	●	RD	●	RD	●			
	L.ERR	○	L.ERR	○	L.ERR	○	The baud rate setting of station 2 is different from master unit.	After correcting the Baud rate setting, switch power on again.	
	L.RUN	●	L.RUN	○	L.RUN	●			
	SD	●	SD	○	SD	●			
	RD	●	RD	●	RD	●	The setting data of station 3 was changed during normal operation.	After returning the setting switch to the correct position, power on the inverter again.	
	L.ERR	○	L.ERR	○	L.ERR	○			
	L.RUN	●	L.RUN	●	L.RUN	●			
	SD	●	SD	●	SD	●	Station 2 is affected by noise. (L.RUN may put out the light.)	Securely connection FG of each inverter and master to ground.	
	RD	●	RD	●	RD	●			
	L.ERR	○	L.ERR	●	L.ERR	○			
TIME● LINE● or TIME○ LINE●	L.RUN	●	L.RUN	●	L.RUN	●	the communication cable between the inverters of stations 2 and 3 are affected by noise. (L.RUN may put out the light.)	Check that the communication cable is connected to SLD. Also wire it as far away as possible from the power lines.(200mm or more)	
	SD	●	SD	●	SD	●			
	RD	●	RD	●	RD	●			
	L.ERR	○	L.ERR	●	L.ERR	●	Terminal resistors are left un-connected. (L.RUN may put out the light.)	Check that the terminal resistors are connected.	
	L.RUN	●	L.RUN	●	L.RUN	●			
	SD	●	SD	●	SD	●			
	RD	●	RD	●	RD	●			
	L.ERR	○	L.ERR	○	L.ERR	●			
	L.RUN	●	L.RUN	●	L.RUN	●			
	SD	●	SD	●	SD	●			
	RD	●	RD	●	RD	●			
	L.ERR	○	L.ERR	○	L.ERR	●			

●:On, ○:OFF, ◎:Flicker, *: Any of on, flicker or off.