VF66

TOYODENKI

Foreword

Thank you for choosing Optional Circuit Board for Toyo inverter product.
This protocol instruction manual contains information regarding the CC66-Z Optional Circuit Board for the VF66B Inverter. For correct use, please carefully read this instruction manual prior to using the CC66-Z.

This manual covers CC-Link communication functions of CC66-Z. Please refer to a "CC66-Z Operations manual" for the terminal block function of a CC66-Z PC board, the wiring method, a setup of a switch, and a setup of VF66B inverter.

In order to accommodate the many special functions to a wide variety of applications in addition to the basic inverter functions, please thoroughly read the VF66B inverter manual as well as any other applicable specialized instruction manuals.

The communication specification of CC66-Z corresponds to CC-Link Ver1.1 and CC-Link Ver2.0.

Please read before use

<u>**For Safety**</u>

Before installing, operating, maintaining and inspecting CC66-Z option, please read this manual and all other appendices thoroughly in order to get familiarize with the feature of this option, safety information and correct handling. For safe operation, be sure to also thoroughly read the VF66B inverter operating manual.

In this instruction manual, the safety instructions are classified in to two levels: DANGER and CAUTION.

⚠**DANGER** Indicates a hazardous situation which may result in death or serious injury if it is handled improperly.

⚠**CAUTION** Indicates a hazardous situation which may result in moderate or minor injury or only in property damage if it is handled improperly. However, such a situation may lead to serious consequences depending on circumstances.

⚠CAUTION [Installation]

- Do not use optional circuit board if you discover damage or deformation during unpacking.
  Doing so may cause optional circuit board failure or malfunction.
- Do not place any flammable materials near the optional circuit board.
  Doing so may cause a fire.
- Do not allow the optional circuit board to drop, fall over or sustain severe impacts.
  Doing so may cause optional circuit board failure or damage.
- Do not install or operate the optional circuit board if it is damaged or has any of its parts missing.
  Doing so may lead to personal injury.

⚠DANGER [Wiring]

- Before wiring, make sure the power is OFF.
  Failure to do so may cause an electric shock or fire.
- Wait more than 10 minutes after turning the power OFF before opening the unit case lid.
  Failure to do so may cause an electric shock or fire.
- Make sure that the unit is correctly earthed.
  Failure to do so may cause an electric shock or fire.
- Wiring must be done by skilled technicians.
  Failure to do so may cause an electric shock or fire.
- Wire the unit after it is installed.
  Failure to do so may cause an electric shock or fire.

⚠CAUTION [Wiring]

- Make sure that communication cables and connectors are properly installed and locked in place.
  Failure to do so may cause optional circuit board failure or malfunction.

⚠DANGER [Operation]

- Turn the power ON after fitting the inverter front cover.
  Do not remove the cover while the power is ON.
  Failure to do so may cause an electric shock.
- Do not operate any switch with wet hands.
  Failure to do so may cause an electric shock.
- Do not touch the inverter terminals while the power is ON, even if the inverter is in the idle state.
  Failure to do so may cause an electric shock.
- If the alarm is reset while the operation signal kept input, the inverter will suddenly restart. Reset the alarm after making sure that the operation signal is OFF.
  Failure to do so may lead to personal injury.
- The inverter can be set to operate in a wide range of speed. Operate the inverter after sufficiently checking the allowable range of the motor and equipment.
  Failure to do so may cause personal injury, equipment failure or damage.

⚠CAUTION [Operation]

- The inverter radiating fin and the radiating resistance are hot. Do not touch them.
  Failure to follow this warning may cause burns.

⚠DANGER [Maintenance, inspection and parts replacement]

- Always turn the power OFF before inspecting the inverter.
  Failure to do so may cause an electric shock, personal injury or fire.
- Unauthorized persons shall not perform maintenance, inspection or parts replacement.
  Use insulated tools for maintenance and inspection.
  Failure to do so may cause electric shock or personal injury.

⚠DANGER [Other]

- Never modify the unit.
  Doing so may cause electric shock or personal injury.

⚠CAUTION [General precautions]

Some illustrations given in this manual show the inverter from which the covers or safety shields have been removed to illustrate the details. Before operating the inverter, reinstall the covers and shields to their original positions and the inverter according to this manual.

These safety precautions and specifications stated in this manual are subject to change without notice.

Table of contents

Chapter 1　Functional outline

CC66-Z is remote device station apparatus corresponding to CC-Link Ver.2.0. CC66-Z is used connecting with the PC board (VFC66-Z) in a VF66B inverter. CC66-Z is equipped with an analog input/output function, multifunction input/output function, and PG input/output function other than extended cyclic transmission and the cable length relief between stations as CC-LinkVer.2.0 function.

CC-Link is the communication specification of the high-speed FA network developed in Japan, and realizes the data communication network corresponding to a multi vendor.

By CC-Link communication function of CC66-Z, operation commads, speed commads, torque commads, etc. are inputted into a VF66B inverter, or a monitor can do the operational status and the protection state of an inverter, current, voltage, etc. Moreover, the setting data of an inverter read-out/rewrites and read-out of trace back data, read-out of a protection history, and read-out of monitor data can be performed. Refer to a "CC66-Z communications protocol description" for CC-Link communication function. Moreover, it can be used as an input/output signal of the built-in PLC function of VF66B inverter. Refer to the description of VF66 PCTool for a built-in PLC function.

In order to reduce an environmental impact, CC66-Z is designed so that the content of a lead, mercury, cadmium, hexavalent chrome, PBB, and PBDE may be based on the RoHS instructions which EU defined.

⚠CAUTION [Safety precautions]

Carefully read the instruction manual before use, and use the inverter correctly.

Our inverter and optional circuit board are not designed or manufactured for the purpose of use in life-support machines or systems.

If you intend to use the product stated in this document for special purposes, such as passenger cars, medical devices, aerospace devices, nuclear energy controls and submarine relaying machines or systems, consult our sales department.

This product is manufactured under strict quality control. However, if it is used in critical equipment in which inverter and optional circuit board failure may result in death or serious damage, provide safeguard to avoid serious accidents.

If you wish to use this inverter with loads other than three-phase AC traction, please contact us.

To use this product, electrical work is necessary. The electrical work must be done by qualified expert.

Chapter 2　Basic Specification

2.1 CC-Link Communication Terminal Specifications

Table 2.1　CC-Link communication function

	Terminal No.	Use	Description
CC66-Z Terminal TB1	DA (2 terminals)	Communication Signal Terminal	CC-Link communication terminal Signal polarity of RS-485 (ISO/IEC8482)
	DB (2 terminals)		
	DG	Communication Earth Terminal	RS-485(ISO/IEC8482)Signal line data earth terminal
	SLD	Shield terminal of communication cable	Connect the shield cable of a CC-Link communication cable
	FG	Protective Earth Terminal	FG terminal is used when grounding all the station

2.1 CC-Link Communication Specification

Table 2.2　CC-Link communication specification of CC66-Z

Item		Specification
Communication protocol		CC-Link Ver1.1 CC-Link Ver2.0 Conformity
Station classification		Remote device station
Electrical characteristics of physical layer		In conformity to RS-485(ISO/IEC8482) +5V which insulated the power supply from the printed circuit board for inverter control through the built-in DC/DC converter is supplied.
Maker code		0993H
The number of occupancy sations, and a multiple setup		Sets up by the console of the main part of a VF66B inverter. (CC-Link Ver1.1 and CC-Link Ver2.0 change is possible) At the time of CC-Link Ver1.1 selection Number of occupancy stations 1-4 station Multiple setup is twice, 4 times, and 8 times by the number one station fixation of occupancy stations at the time of CC-LinkVer2.0 selection.
The number of statons of a link	Ver1.1	
	One station occupancy	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:4 word
	Two station occupancy	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:8 word
	Three staion occupancy	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:12 word
	Four station occupancy	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:16 word
	Ver2.0	
	One-station occupancy Twice	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:8 word
	One-station occupancy 4 times	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:16 word
	One-station occupancy 8 times	Remote input and output RX, RY: 32 points (fixation) Remote register RWr, RWw:32 word
Transmission procedure		Half duplex transmission
Synchronization system		Frame synchronization
Modulation system		Base band system
Encoding system		NRZI（Non Return to Zero Inverted）method
Connection, wiring system		Terminal block 3 wires type
Connection cable		3 core twisted-pair cable with a shield with the cable only for CC-Link

Item	Specification
Number of connection station	Number of connection is forming the following formula. ・$(a+a2+a4+a8)+(b+b2+b4+b8)*2+(c+c2+c4+c8)*3+(d+d2+d4+d8)*4 \leqq 64$ ・$(a*32+a2*32+a4*64+a8*128)+(b*64+b2*96+b4*192+b8*384)+$ $(c*96+c2*160+c4*320+c8*640)+(d*128+d2*224+d4*448+d8*896) \leqq 8192$ ・$(a*4+a2*8+a4*16+a8*32)+(b*8+b2*16+b4*32+b8*64)+$ $(c*12+c2*24+c4*48+c8*96)+(d*16+d2*32+d4*64+d8*128) \leqq 2048$ a : Number of a 1 time setup by one-station occupancy b : Number of a 1 time setup by two-station occupancy c : Number of a 1 time setup by three-station occupancy d : Number of a 1 time setup by four-station occupancy a2: Number of a 2 time setup by one-station occupancy b2: Number of a 2 time setup by two-station occupancy c2: Number of a 2 time setup by three-station occupancy d2: Number of a 2 time setup by four-station occupancy a4: Number of a 4 time setup by one-station occupancy b4: Number of a 4 time setup by two-station occupancy c4: Number of a 4 time setup by three-station occupancy d4: Number of a 4 time setup by four-station occupancy a8: Number of a 8 time setup by one-station occupancy b8: Number of a 8 time setup by two-station occupancy c8: Number of a 8 time setup by three-station occupancy d8: Number of a 8 time setup by four-station occupancy ・$16 \times A+54 \times B+88 \times C \leqq 2304$ A: Number of a remote I/O station……………………………… Maximum of 64 sets B: Number of a remote device station ………………………… Maximum of 42 sets C: Local station and the number of an intelligent device station…… Maximum of 26 sets
Setting of station number	1-64 : The number of offices is set up with the rotary switch on C66-Z.
Communication control system	Broadcasting polling
Error check system	$CRC(X^{16}+X^{12}+X^5+1)$
Correspondence service	Cyclic transmission Extended cyclic transmission Cable length relief between stations

2.3 Other

Please refer to a "**CC66-Z Operation manual**" for specifications, such as other terminal stands.

⚠ DANGER [Wiring]

● Before wiring, make sure the power is OFF.
 Failure to do so may cause an electric shock or a fire.

⚠ CAUTION [Wiring]

● G terminal, G terminal, and G2 terminal are not connected to a grounding by any means.
 Doing so may cause equipment failure or damage.
● Never connect or allow contact between the PS and G terminals.
 Doing so may cause equipment failure or damage.

⚠ CAUTION [Change of sw3]

● Change of sw3 is performed by certainly turning off the inverter.
 Failure to do so may cause an electric shock, personal injury, equipment failure or malfunction.

Chapter 3 Communication function explanation

By CC-Link communication function of CC66-Z, operation commads, speed commads, torque commads, etc. are inputted into a VF66B inverter, or a monitor can do the operational status and the protection state of an inverter, current, voltage, etc. Moreover, the setting data of an inverter read-out/rewrites and read-out of trace back data, read-out of a protection history, and read-out of monitor data can be performed. Refer to a "CC66-Z communications protocol description" for CC-Link communication function. Moreover, it can be used as an input/output signal of the built-in PLC function of VF66B inverter. Refer to the description of VF66 PCTool for a built-in PLC function.

Refer to a "CC66-Z instructions manual" for the connection method of the CC-Link transmission line to the terminal stand on a CC66-Z board.

In order to communicate with a CC-Link master station, it is necessary to set the setting parameter of the main part of VF66B inverter shown in the following table. "CC66-Z instructions manual", the instructions manual of the main part of VF66B inverter, and the instructions manual of the master office to be used are also referred to collectively.

As expression which shows the direction of the CC-Link communication in this chapter, an "input" shows the direction inputted into a master station from CC66-Z, and shows that an "output" is a direction outputted to CC66-Z from a master station. However, it does not correspond in the explanation about a built-in PLC function and a multifunction input/output function.

Table 3.1 CC-Link communication-related setup

Console Display	Items	Item Selection	Default Data	Rewrites during Operation
J-00	Digital communication option selection	0: OFF 7: CC66-Z 1 to 6: Other options are set up at the time of use.	0	×
J-01	CC66-Z option baud rate	0: 156kbps　　1: 625kbps　　2: 2.5kbps 3: 5Mbps　　4: 10Mbps　　5:10Mbps	4	×
J-07	CC66-Z communication version selection	0: CC-Link Ver1.1　One-station occupancy 1: CC-Link Ver1.1　Two-station occupancy 2: CC-Link Ver1.1　Three-station occupancy 3: CC-Link Ver1.1　Four-station occupancy 4: CC-Link Ver2.0　2 time setup by one-station occupancy 5: CC-Link Ver2.0　4 time setup by one-station occupancy 6: CC-Link Ver2.0　8 time setup by one-station occupancy	0	×
J-08	Speed commnad / monitor unit change	1: The input unit of speed/frequency commads (RWw1) is set as 20000 digit/the highest rotation speed (frequency) (A-00). The unit of a monitor (RWr1) of motor rotation speed / output frequency is set as 20000digit / the highest rotetion speed (frequency) (A-00). Except 1 : The unit of a monitor (RWr1) of speed/frequency commads (RWw1), and motor rotation speed/output frequency is indicated in 3.4 and 3.5 clause.	0	×
i-00	PLCL function usage selection(*1)	OFF (not use) ON (use)	OFF	×
i-01	PLCH function usage selection(*1)	0: OFF (not use) 1: PLCH ON 2: PLCH ON (speed command input = PLCH output)	0	×

*When these setup is changed, please once turn OFF the power supply of an inverter and switch on a power supply again.

(*1) When using speed commads, frequency commads, or torque commads by communication of CC66-Z, i00010 and i00011 are not used as an input register of a built-in PLC function.

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⚠ CAUTION

- In the option error in the state where ⸤▯▯▯▯⸥ is displayed on the inverter console, it is checked again whether the VF66B inverter is correctly equipped with CC66-Z.
- Once communication with a master office and CC66-Z is established, if communication breaks off for a fixed period according to a certain trouble, it will become a communication timeout error (state where ⸤▯▯▯▯▯⸥ is displayed on the inverter console). Please check again that VF66 inverter is correctly equipped with CC66-Z.

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3.1 Before operation

In order to validate the various commads by the communication to a VF66B inverter, it is necessary to set correctly the inverter setting parameter shown in the following table. In order to validate an operation control signal, the forward operation terminal "ST-F" of terminal block TB1 of control board VFC66-Z of a VF66B inverter is turned ON. For details, refer to the instructions manual of the main part of VF66 inverter.

Table 3.2   Input Position Selection Settings for Various Commands

Console Display	Contents	Configuration Range (Item Selection)	Default Setting	Rewriting During Operation
b-09	Command input position selection for interlocking	0: Terminal block 1: Console (SET66-Z) 2: Digital communication option	1	×
b-10	Rotation speed command input position selection[*1]	0: Interlocking 1: Analog Input (1) [Terminal block] (AIN1) 2: Console (SET66-Z) 3: Digital communication option 4: Analog Input (2) 5: (For external optional expansions) 6: Analog Input (3) 7: Built-in PLC	0	×
b-11	Operation command input position selection	0: Interlocking 1: Terminal block 2: Console (SET66-Z) 3: Digital communication option	0	×
b-12	Jog command input position selection	0: Interlocking 1: Terminal block 2: Console (SET66-Z) 3: Digital communication option	0	×
i-07	Operation mode selection[*2]	0: Speed control (ASR) mode 1: Torque command minus (-) direction priority 2: Torque command plus (+) direction priority 3: Torque control (ATR) mode 4: Speed/torque control contact switching	0	×
i-08	Torque command input position selection[*2]	0: Analog Input (1) (AIN1) 1: Analog Input (2) (AIN2) 2: Digital communication option 3: Built-in PLC output	1	×

(*1) If the inverter is in V/f mode, this becomes "Frequency command input position selection".

When input place selection of rotation speed commands is a digital communication option (when b-09=2 and b-10=0, or when you are b-10=3), please do not use i00010 as an input register of a built-in PLC function.

(*2) If the inverter is in V/f mode, this is disabled.

In the case of input place selection i-08=2 (digital communication option) of torque commands, please do not use i00011 as an input register of a built-in PLCH function.

3.2 Remote output RY (master station to slave station) specification

The remote output specification of CC66-Z is shown below. Remote output specification is common to either the number of occupancy station is CC-Link ver1 of 1-4 or the number of occupancy station is CC-Link ver2 of twice to 8 times, and mark are 32-point fixation in it.

Table 3.3 Specification of remote input

Device No. (*1)	Signal name	PLCL function OFF		PLCL function ON
		Contents	Remark	Contents
RY0	Forward rotation command	ON：Motor operated by forward. Jog operation if RY2 is ON simultaneously OFF：Motor stop if it is the reverse command OFF	If forward command and reverse command are ON simultaneously, motor will stop.	Invalid
RY1	Reverse rotation command	ON：Reverse command ON OFF： Reverse command OFF		
RY2	Jogging operation selection	ON：Jogging operation select RY0+RY2 simultaneous ON：Forward jog operation RY1+RY2 simultaneous ON：Reverse jog operation	Refer to VF66B inverter instructions manual for initial excitation command, DC breke command, and reset of protection command.	
RY3	Initial excitation	ON：Initial excitation command		
RY4	DC brake command	ON：DC brake command		
RY5	Reset command	ON：Reset of protection state		
RY6	System reservation			
RY7	System reservation			
RY8	System reservation			
RY9	Operation stop	Not based on a setup of RY0, RY1, and RY2, but an inverter stops operation. Refer to the VF66B inverter instructions manual for a setup in operation stop mode.		
RYA	System reservation			Same as the left
RYB (*2,*4)	Effective in torque command	The torque commands set as remote register RWw4 become effective when RYB is ON, and RXB turns them on in the meantime. The renewal of RWw4 is effective between ON of RYB. In the case of J-07=0, RWw is invalid.	In the case of i-08=2 and i-07!=0, it is effective. In detail, refer to VF66B inverter instructions manual	Same as the left
RYC	Monitor command	The monitor value 1 to 24 corresponding to the monitor code 1 to 24 is transmitted to Master station when RYC is ON, and RXC turns on in the meantime. The monitor value 1-24 is updated between ON of RYC. If RYC is OFF, RXC will serve as OFF.		Same as the left
RYD (*3,*4)	Speed command is effective/ Frequency command is effective	The speed command / frequency command set as remote register RWw1 become effective when RYD is ON. RXD turns them on in the meantime. The renewal of speed command / frequency command is effective between ON of RYD. If RYD is OFF, RXD will serve as OFF.	When inverter mode is V/f mode, it becomes frequency commnad, and in the case of IM vector or ED vector mode, it becomes speed command.	Same as the left
RYE	System reservation			Same as the left
RYF (*4)	Command code execution demand	The command code（RWw2）and wirite-in data（RWw3）become effective when RYF is ON, and after the command is executed, RXF turns on. Change of command code and write-in data is received with an inverter at any time during ON of RYF.		Same as the left
RY10-9	System reservation			Same as the left
RY1A	Error reset	Same function as RY5		Invalid
RY1B ～RY1F	System reservation			Same as the left

(*1):Device No. shows the case where Slave station is station No.1. The subsequent devices No change a setup from station No.2. In detail, refer to the manual of a master unit.

(*2): When RYF is turned ON and torque commands are set up by an command code (refre to table3.17), the torque commands by RYB are invalid until RYF serves as OFF.

(*3): When RYF is turned ON and speed or frequency command is set up by an command code (refre to table3.17), speed or frequency command by RYD is invalid until RYF serves as OFF.

(*4): When using RYB, RYD, and RYF (when commad codes are 0x1001, 0x1002, 0x1050, and 0x1060), i00010 and i00011 are not used as an input register of a built-in PLC function.

3.3 Remote input RX (slave station to master station) specification

  The remote input specification of CC66-Z is shown below. Remote input specification is common to either the number of occupancy station is CC-Link ver1 of 1-4 or the number of occupancy station is CC-Link ver2 of twice to 8 times, and mark are 32-point fixation in it.

Table 3.4   Specification of remote input

Device No (*1)	Signal name	Contents	Remarks
RX0	Under operation by forward operation command	ON : Under operation by forward operation command (Jogging operation is also included.)	It turns on also during a slowdown operation stop.
RX1	Under operation by reverse operation command	ON : Under operation by reverse operation command (Jogging operation is also included.)	
RX2	Under Normal operation / Jogging opereation command input	ON:Under Normal operation / Jogging opereation command input	Refer to the instructions manual of VF66B inverter.
RX3	Under inverter operation	ON:Under inverter operation	
RX4	Under jogging operation	ON:Under jogging operation	
RX5	Under DC excitation	ON:Under DC excitation	
RX6	Under power failure	ON:Under power failure	
RX7	Under auto-tuning operation	ON:Under auto-tuning operation	
RX8	Under gate signal drive	ON:Under gate signal drive	
RX9 (*2)	Under excitation (*2)	ON:under excitation (*2)	
RXA	Under DC brake	ON:Under DCbrake	
RXB	The completion of a torque command input	The torque commands set as remote register RWw4 become effective when RYB is ON, and RXB turns them on in the meantime. If RYB is OFF, RXB will serve as OFF.	
RXC	Under the monitor	The monitor value 1 to 24 corresponding to the monitor code 1 to 24 is transmitted to Master station when RYC is ON, and RXC turns on in the meantime. If RYC is OFF, RXC will serve as OFF.	
RXD	Completion of speed or frequency setup	The speed command / frequency command set as RWw1 become effective when RYD is ON and RXD turns them on in the meantime. If RYD is OFF, RXD will serve as OFF.R	
RXE	Reservation		
RXF	Completion of command code execution	The command code (RWw2) and wirite-in data (RWw3) become effective when RYF is ON, and after the command is executed, RXF turns on. Change of command code and write-in data is received with an inverter at any time during ON of RYF.	
RX10-19	System reservation		
RX1A	Error frag	ON:RX1A turns on, when inverter protection and other errors occur.	It turns on at the time of inverter protection.
RX1B	Remote station READY	ON:In the case of a READY state of an inveter (state of preparation of communicating with Master station normally and receiving the command from Master station), RX1B turns on.	When RX(n+1)A is ON, remote station READY serves as OFF.
RX1C-F	System reservation		

(*1):Device No. shows the case where Slave station is station No.1. The subsequent devices No change a setup from station No.2. In detail, refer to the manual of a master unit.

(*2): An inverter turns on RX9 besides RXA during DC brake operation.

3.4 Remote register RWw (master office to slave office) specification

The remote register specification of CC66-Z is shown below.

Table 3.5   Remote register RWw specification

Set-up (*1) / Device No. (*2)	Contents				
	J-07=0	J-07=1,4	J-07=2	J-07=3,5	J-07=6
RWw	Monitor code 1 is specified.	Same as the left	Same as the left	Same as the left	Same as the left
RWw1	Speed commands (r/min) / frequency commands are inputted. (*3,*4) If RYD is turned on, an inverter will receive speed / frequency commands.	Same as the left	Same as the left	Same as the left	Same as the left
RWw2	An "command code" is specified. (*4) Refer to table 3.17.	Same as the left	Same as the left	Same as the left	Same as the left
RWw3	"Write-in data" is specified. (*4)	Same as the left	Same as the left	Same as the left	Same as the left
RWw4		Torque command input (Unit 0.1%) If RYB is turned on, an inverter will receive torque commands. (*4)	Same as the left	Same as the left	Same as the left
RWw5		Monitor code 2	Same as the left	Same as the left	Same as the left
RWw6		Monitor code 3	Same as the left	Same as the left	Same as the left
RWw7		Monitor code 4	Same as the left	Same as the left	Same as the left
RWw8			Monitor code 5	Same as the left	Same as the left
RWw9			Monitor code 6	Same as the left	Same as the left
RWwA			Monitor code 7	Same as the left	Same as the left
RWwB			Monitor code 8	Same as the left	Same as the left
RWwC				Reservation	Same as the left
RWwD				Reservation	Same as the left
RWwE				Reservation	Same as the left
RWwF				Reservation	Same as the left
RWw10-1F					Monitor code 9 to monitor code 24

(*1): Refer to table 3.1.

(*2): Device No. shows the case where Slave station is station No.1. The subsequent devices No change a setup from station No.2. In detail, refer to the manual of a master unit.

(*3): At the time of the setting parameter J-08≠1
  When inverter mode is V/f mode, it becomes frequency commads, and in the case of IM vector and ED vector mode, it becomes speed commads. Moreover, in the case of V/f mode, the minimum unit of a setup is set to 0.1Hz when the highest frequency of the setting parameter A-00 is 300Hz or more, and in the case of below it, it is 0.01Hz. For the details of an inverter setup, refer to the instructions manual of a VF66B inverter.
  : At the time of the setting parameter J-08=1
  RWw1 becomes the speed / frequency commands input by the scale of 0 to 20000 (digit) / the 0 to highest rotation speed (frequency) (A-00).

(*4): When you input speed commads / frequency commads, or torque commads into an inverter in RWw1, 4, and an commad code (in the case of 0x1001, 0x1002, 0x1050, and 0x1060), please do not use i00010 and i00011 as an input register of a built-in PLC function.

3.5 Remote register RWr (slave station to master station) specification

The remote register specification of CC66-Z is shown below.

Table 3.6   Remote register RWr specification

Set-up (*1) / Device No. (*2)	Contents				
	J-07=0	J-07=0	J-07=0	J-07=0	J-07=0
RWr	The monitor value of the monitor code 1 is set.	Same as the left	Same as the left	Same as the left	Same as the left
RWr1	Motor rotation speed (r/min) / output frequency (0.01Hz) is set. Use as a speed monitor. (*3,*4)	Same as the left	Same as the left	Same as the left	Same as the left
RWr2	The answer code of a command of Master station is set. Refer to Table 3.7.	Same as the left	Same as the left	Same as the left	Same as the left
RWr3	The reading data corresponding to a part of command of Master station is set.	Same as the left	Same as the left	Same as the left	Same as the left
RWr4		The torque command value of an inverter is set per 0.1%. Use as a torque command monitor. (*4)	Same as the left	Same as the left	Same as the left
RWr5		The monitor value of the monitor code 2 is set.	Same as the left	Same as the left	Same as the left
RWr6		The monitor value of the monitor code 3 is set.	Same as the left	Same as the left	Same as the left
RWr7		The monitor value of the monitor code 4 is set.	Same as the left	Same as the left	Same as the left
RWr8			The monitor value of the monitor code 5 is set.	Same as the left	Same as the left
RWr9			The monitor value of the monitor code 6 is set.	Same as the left	Same as the left
RWrA			The monitor value of the monitor code 7 is set.	Same as the left	Same as the left
RWrB			The monitor value of the monitor code 8 is set.	Same as the left	Same as the left
RWrC-E				The trace back data 1-3 demanded by a command code is set to RWrC, RWrD, and RWrE.	Same as the left
RWrF				Reservation	Same as the left
RWr10-1F					The monitor value of the monitor code 9-24 is set.

Table 3.7   Answer code

Answer code	Contents
0x0000	Normal answer (No error)
0x0002	Commmand code error
0x0003	Data setting error

(*1): Refer to table 3.1.

(*2): Device No. shows the case where Slave station is station No.1. The subsequent devices No change a setup from station No.2. In detail, refer to the manual of a master unit.

(*3): At the time of the setting parameter J-08≠1

When inverter mode is V/f mode, it becomes frequency commads, and in the case of IM vector and ED vector mode, it becomes speed commads. Moreover, in the case of V/f mode, the frequecy minimum unit of a setup is set to 0.1Hz when the highest frequency of the setting parameter A-00 is 300Hz or more, and in the case of below it, it is 0.01Hz. For the details of an inverter setup, refer to the instructions manual of a VF66B inverter.

: At the time of the setting parameter J-08=1

RWr1 becomes the speed / frequency monitor by the scale of 0 to 20000 (digit) / the 0 to highest rotation speed (frequency) (A-00).

(*4): When you use RWr1 and 4 (rotetion speed / output frequency monitor, or a torque command monitor), please do not use a PLCH function (i-01=0). RWr1 and 4 will become an unfixed value if a PLCH function is used.

3.6 Monitor code specification

CC66-Z differs in the composition of a monitor code by use of a built-in PLC function (PLCH), or un-using it. A setup for use of a built-in PLC function or un-using it is set up with the setting parameter (i area) of a VF66B inverter, as shown in Table 3.8. In detail, refer to VF66B inverter instructions manual. The description of VF66 PCTool is referred to for a built-in PLC function.

The details of the monitor code in the case of not using PLCH function are shown in Table 3.9. The details of the monitor code in the case of using PLCH function are shown in Table 3.10. Set a monitor code in the remote register RWw suitable in a master station.

When the value of i-01 is changed, please re-switch on the power supply of an inverter.

If the monitor code of contents to monitor is written in the corresponding remote register RWw with reference to Table 3.9 or 3.10 and the remote input RYC is turned on, the information corresponding to the contents of the code No. will be transmitted to a master station from a slave station.

Table 3.8   Built-in PLC function usage selection

Console Display	Items	Item Selection	Default Data	Rewrites during Operation
i-01	PLCH function usage selection	0: OFF (not use) 1: PLCH ON 2: PLCH ON (speed command input = PLCH output)	0	×

(*1): When you use i00010 and i00011 as an input register of a built-in PLC function, please do not use the speed command / frequency command, or torque command by communication of CC66-Z. Moreover, when using a PLCH function, RWr1 and 4 (revolving speed / output frequency monitor, or a torque commad monitor) are not used.

In the case of V/f mode, the frequecy minimum unit of code No.0x0001 is set to 0.1Hz when the highest frequency (A-00) is 300Hz or more, and in the case of below it, it is set to 0.01Hz. In the case of IM vector mode and ED vector mode, the setting minimum unit of Code No.0X0001 is set to 0.1Hz when the frequency which is converted from pole numbers (A-06) and highest rotarion speed (A-00) set as the inverter, is 300Hz or more, and in the case below it, it is set to 0.01Hz.

Moreover, in the case of the inverter capacity of 45kW or more in 200V system and 110kW or more in 400V system, the current monitor minimum unit of code No.0x0002 is set to 0.1A. in the case of inverter capacity is except the above, the current monitor minimum unit is set to 0.01A.

For example, the minimum unit of a current monitor is set as 0.1A, and when inverter output current is 25.0A, CC66-Z replies the value 250 to Master station.

Table 3.9 Monitor code in PLCH function OFF

Code No.	Contents		Unit
i-01=0			
0x0001	The output frequency of an inverter is transmitted to a master station.		0.01Hz or 0.1Hz It changes to pole number (A-06) and a highest rotation speed (A-00).
0x0002	Output current (Actual value current) is transmitted to a master station.		0.01A or 0.1A　(*1) It changes with the set-up inverter capacity.
0x0003	The output voltage of an inverter is transmitted to a master station.		0.1V
0x0006	The motor rotation speed is transmitted to a master station.		r/min
0x0007	The motor torque command is transmitted to master station.		0.1%
0x0017	Real operating time of an inverter is transmitted to a master office.		hour
0x1001	A motor opration speed / output frequency is transmitted to Master station. Unit of measures differ in the monitor code 0x0001 or 0x0006.		IMV mode,EDV mode：20000/ The highest rotational speed（A-00） V/f mode：20000/ The highest frequency（A-00）
0x1002	The speed command after restricting a timed acceleration or a deceleration is transmitted to Master station.		IMV mode,EDV mode：20000/ The highest rotational speed（A-00） V/f mode：20000/ The highest frequency（A-00）
0x1003	An actual current is transmitted to a master station.		10000/Rated current (A)
0x1004	A torque command value is transmitted to a master station.		5000/100(%)
0x1005	D.C. voltage is transmitted to a master station.		D.C. voltage ×10(200V series)(V) D.C. voltage × 5(400V series)(V)
0x1006	Output voltage is transmitted to a master station.		Output voltage×20(200V 系)(V) Output voltage×10(400V 系)(V)
0x1007	Output frequency is transmitted to a master station.		20000/ The highest frequency（A-00）
0x1008	An overload counter is transmitted to a master station. Refer to VF66B inverter instruction manual about the further description of an overload counter		(%)
0x1009	A motor temperature (*5) is transmitted to a master station.		10/1(℃)
0x100A	A motor fjux is transmitted to a master station.		1024/rated flux
0x100B	Protection frag 1　(*2) is transmitted to a master station.		
0x100C	Protection frag 2　(*2) is transmitted to a master station.		
0x100D	Contuct input state 1 (*3) is transmitted to a master station.		
0x100E	Contuct input state 2 (*3) is transmitted to a master station.		
0x100F	PLCL function OFF	Multifunction output state 1 (*4) is transmitted to a master station.	
	PLCL function ON	PLC output coil is transmitted to a master station.	
0x1010	Multifunction output state 2 (*4) is transmitted to a master station.		
0x1011 ～ 0x1015	Reservation		

(*1): In the case of the inverter capacity of 45kW or more in 200V system and 110kW or more in 400V system, the current monitor minimum unit is set to 0.1A.

(*2): When an inverter is a protection state, it can be known with the protection flag 1 and the protection flag 2 by what kind of factor the protection operated. The description of the protection flag 1 is shown in Table　3.11, and the description of the protection flag 2 is shown in Table 3.12.

(*3): The status of ON/OFF of the multifunction input contacts MI1‐ MI17, such as inverter and CC66-Z, is ransmitted to a master station. The further description of the contact input status 1 and a contact input status 2 is shown in Table 3.13 and Table 3.14.

(*4): The multifunction output state, such as inverter and CC66-Z, is transmitted to a master office. The further description of a multifunction output state is shown in Table 3.15 and Table 3.16.

(*5): TVPT66-Z option or TVTH66-Z option as well as a motor temperature sensor are required for this function.

Table 3.10 Monitor code in PLCH function ON

i-01=1,2	
Code No.	Contents
0x0001	Output register o00016
0x0002	Output register o00012
0x0003	Output register o00015
0x0006	Output register o00010
0x0007	Output register o00013
0x0017	Real operating time
0x1001	Output register o00010
0x1002	Output register o00011
0x1003	Output register o00012
0x1004	Output register o00013
0x1005	Output register o00014
0x1006	Output register o00015
0x1007	Output register o00016
0x1008	Output register o00017
0x1009	Output register o00018
0x100A	Output register o00019
0x100B	Protection state 1
0x100C	Protection state 2
0x100D	ST-F and the terminal block contact input state 1 of a multifunction input are replied.
0x100E	The multifunction input equivalent terminal stand contact input state 2 is replied.
0x100F	Multifunction output state 1
0x1010	Multifunction output state 2
0x1011	Output register o0001A
0x1012	Output register o0001B
0x1013	Output register o0001C
0x1014	Output register o0001D
0x1015	Output register o0001E

Table 3.11 Protection flag 1

Bit	Contents
0	Over current protection
1	IGBT protection
2	Not used (undefined)
3	Not used (undefined)
4	Gate PCB abnormality
5	DC part over-voltage
6	Overload protection
7	Current sensor abnormality
8	Starting stagnation
9	Over-speed protection
10	Over-frequency protection
11	Insufficient voltage (Power failure)
12	Over-torque protection
13	Unit overheat
14	Storage memory abnormality
15	Option error

Table 3.12 Protection flag 2

Bit	Contents
0	Sensor-less start error
1	Communication time-out error
2	Speed control error
3	Motor overheat (When using temperature detection option)
4	Charging resistor overheat
5	FCL operation
6	Setting error
7	Open phase
8	CPU processing abnormality
9	Fan failure
10	PG error
11	Sensor error
12	External failure 1
13	External failure 2
14	External failure 3
15	External failure 4

Table 3.13 Contact input state 1

Bit	Contents
0	Contact state of forward operation terminal "ST-F"
1	Contact state of Maltifunctional input terminal (1) MI1
2	Contact state of Maltifunctional input terminal (2) MI2
3	Contact state of Maltifunctional input terminal (3) MI3
4	Contact state of Maltifunctional input terminal (4) MI4
5	Contact state of Maltifunctional input terminal (5) MI5
6	Contact state of Maltifunctional input terminal (6) MI6
7	Contact state of Maltifunctional input terminal (7) MI7
8	Contact state of Maltifunctional input terminal (8) MI8
9	Contact state of Maltifunctional input terminal (9) MI9
10	Contact state of Maltifunctional input terminal (10) MI10
11	Contact state of Maltifunctional input terminal (11) MI11
12	Contact state of Maltifunctional input terminal (12) MI12
13	Contact state of Maltifunctional input terminal (13) MI13
14	Contact state of Maltifunctional input terminal (14) MI14
15	Contact state of Maltifunctional input terminal (15) MI15

Table 3.14 Contact input state 2

Bit	Contents
0	Contact state of Maltifunctional input terminal (16) MI16
1	Contact state of Maltifunctional input terminal (17) MI17
2-15	No function

Table 3.15 Multifunction output state 2 and PLC output coil

Bit	In case of i-00 =OFF Contents	In case of i-00 =ON Contents(PLC output coil)
0	No function	O000040
1	Motor speed detection (1) (vector mode) (Motor speed = detection setting)	O000041
2	Motor speed detection (1) (vector mode) (Motor speed $\geqq$ detection setting)	O000042
3	Motor speed detection (1) (vector mode) (Motor speed $\leqq$ detection setting)	O000043
4	Motor speed detection (2) (vector mode) (Motor speed = detection setting)	O000044
5	Motor speed detection (2) (vector mode) (Motor speed $\geqq$ detection setting)	O000045
6	Motor speed detection (2) (vector mode) (Motor speed $\leqq$ detection setting)	O000046
7	Reach setting	O000047
8	Torque detection	O000048
9	Torque detection (absolute value)	O000049
10	Power failure	O0004A
11	Overload pre-alarm	O0004B
12	Restart mode	O0004C
13	In reverse operation	O0004D
14	2nd set-up block selected	O0004E
15	Fan motor failed	O0004F

Table 3.16 Multifunction output state 2

Bit	Cintents
0	Under operation
1	No function
2	goes through the preset value of timer 1
3	goes through the preset value of timer 2
4-15	No function

3.7 Command code specification

Commnad code list is shown in Table 3.17.

Table 3.17 Command code

Code No.	Name	PLCH function OFF			PLCH function ON
		Contents		Remarks	Contents
0x0000 ~ 0x03FF	First setting data read-out	One which corresponds in the first setting data No.0 to 1023 is read, and it stores in "read-out data" (RWr3). In that case, the value of an instruction code serves as a setting data address of the inverter read.		***Please ask separately about correspondence with the setting data address and setting data of a VF66B inverter.**	Same as the left
0x0400 ~ 0x07FF	Second setting data read-out	One which corresponds in the second setting data No.0 to 1023 is read, and it stores in "read-out data" (RWr3). In that case, it becomes a setting data address to which the value which subtracted 0x0400 from the value of an instruction code is read.			
0x0800 ~ 0x0BFF	First setting data writing	The contents of "write-in data" (RWw3) are written in an inverter to one which corresponds in first setting data No.0 to 1023. In that case, it becomes a setting data address to which the value which subtracted 0x0800 from the value of an instruction code is written.		***Please ask separately about correspondence with the setting data address and setting data of a VF66B inverter.** ***Please use this function after checking that the setting data b-00 is ON. (*1)**	Same as the left
0x0C00 ~ 0x0FFF	Second setting data writing	The contents of "write-in data" (RWw3) are written in an inverter to one which corresponds in second setting data No.0 to 1023. In that case, it becomes a setting data address to which the value which subtracted 0x0C00 from the value of an instruction code is written.			
0x1001	First speed command / frequency command	If an inverter inputs speed commands (r/min) in IMV/EDV mode and frequency commands (0.01Hz) in V/f mode into "write-in data" (RWw3) and RYF is turned on, speed commands / frequency commands will be inputted into an inverter. Although it is the same function as the speed instructions / frequency instructions using RWw1 and RYD, it is exclusively used only using the function of which or one of the two.			System reservation
0x1002	Torque command	Torque commands will be inputted into an inverter, if torque commands are inputted into "write-in data" (RWw3) for a unit by % and RYF is turned on. Although the torque command input same also as RYB and RWr4 can be performed, please control exclusively only using the function of which or one of the two.		***It is i-08=2, and it is effective when i-07 is except zero. Refer to the instructions manual of a VF66B inverter for details.** ***Notice the torque command input by RYB and RWr4 about units differing.**	System reservation
0x1003	Multifunction input 1 writing	PLCL function OFF	The multifunction input 1 is set up. Refer to the following paragraph and 3.7.1 for details.	***Refer to the instructions manual of a VF66B inverter about the details of a multifunction input.**	Same as the left
		PLCL function ON	The relay input 1 is set up. refer to the following paragraph and 3.7.1 for details.		
0x1004	Multifunction input 2 writing	PLCL function OFF	The multifunction input 2 is set up. Refer to the following paragraph and 3.7.1 for details.		Same as the left
		PLCL function ON	The relay input 2 is set up. refer to the following paragraph and 3.7.1 for details.		
0x1010	Protection history read-out	If 0-5 are specified as "write-in data" (RWw3) and RYF is turned on, the past 6 times of the protection information produced in the inverter can be read. The input of "write-in data" (RWw3) specifies the what time past protection it is. 0 points out the newest protection. 5 becomes the oldest protection. The protection history data in which the contents of protection are shown is returned to			Same as the left

Code No.	Name	PLCH function OFF		PLCH function ON
		Contents	Remarks	Contents
		"reading data" (RWr3). The details of protection history data are shown in Table 3.23. Refer to Section 3.7.2.		
0x1020	Trace-back data read-out	The trace back data memorized by the inverter is read. Refer to Section 3.7.3 for details.	***Refer to the instructions manual of a VF66B inverter about the details of a trace back function.**	Same as the left
0x1030	Check of current unit	If the minimum unit of the current which CC66-Z deals with is 0.1A, 1 is stored in "reading data" (RWr3), and 2 is stored in "reading data" (RWr3) if it is 0.01A.	**The minimum unit of the current dealt with with inverter capacity changes. Refer to 3.6.**	Same as the left
0x1040	Check of frequecy unit	If the minimum unit of the frequency which CC66-Z deals with is 0.1Hz, 1 is stored in "reading data" (RWr3), and 2 is stored in "reading data" (RWr3) if it is 0.01Hz.	**The minimum unit of the frequency to deal with changes according to the number of inverter poles (A-06), and the highest revolving speed (A-00). Refer to 3.6.**	Same as the left
0x1050	Torque command(High resolution)	digit unit input Input range 0〜5000(digits) It is a 100% torque command input at the time of 5000digits.		System reservation
0x1060	Speed command(High resolution)	digit unit input Input range 0〜20000(digits) It is the highest rotation speed instruction input at the time of 20000digits.	It controls by exclusion in RYD.	System reservation
0x2000	PLCH register data input	System reservation		Input register i00010 (*2)
0x2001		System reservation		Input register i00011 (*2)
0x2002		System reservation		Input register i00012
0x2003		System reservation		Input register i00013
0x2004		System reservation		Input register i00014
0x2005		System reservation		Input register i00015
0x2006		System reservation		Input register i00016
0x2007		System reservation		Input register i00017
0x2008		System reservation		Input register i00018
0x2009		System reservation		Input register i00019

(*1): **The setting data of a VF66B inverter can perform protection of rewriting by the rewriting protection shown in the following table. In an initial, rewriting protection is in a release state. Check release of rewriting protection before rewriting setting data.**

(*2): **When you input speed commands / frequency commands, or torque commands into an inverter in an commad code (in the case of 0x1001, 0x1002, 0x1050, and 0x1060), please do not use i00010 and i00011 as an input register of a built-in PLC function.**

Tbale 3.18 Setup of inverter setting data rewriting protection

Console Display	Items	Item Selection	Default Data	Rewrites during Operation
b-00	Setting data rewrite protection	OFF (Inactive) ON (Activate protection)	OFF	×

Caution: **The setting data changed by the setting data write-in command is written in EEPROM of the main part of VF66 inverter. The number of times of EEPROM which can be written in has restriction, and does not carry out use which rewrites setting data too much.**

3. 7. 1 <u>Write-in command of multifunction input and relay input command</u>

At the time of the PLCL function OFF, the instruction code 0x1003 and 0x1004 become a write-in command of the multifunction input 1 and the multifunction input 2. The various functions of a multifunction input exist in a VF66B inverter, and it can control by CC-Link communication. The various functions shown in Table 3.20 can be controlled by the instruction code 0x1003, and the various functions shown in Table 3.21 can be controlled by the instruction code 0x1004. Refer to the instructions manual of a VF66B inverter about the details of a function. For validating the writing of a multifunctional input, it is necessary to set the inverter setup C-00 to 1.

At the time of the PLCL function ON, the instruction code 0x1003 and 0x1004 are write-in commands of the relay input 1 and the relay input 2. Refer to a "VF66PCtool instructions manual" for details.

Tbale 3.19 Setup of multifunction input place selection

Console Display	Items	Item Selection	Default Data	Rewrites during Operation
c-00	Multifunction input place selection	0: Terminal block (Multifunction input is performed on terminal block) 1: Digital communication option (Multifunction input is performed as a communication option)	0	×

In order to perform a write-in command of the multifunction input 1, please input into "write-in data" (RWw3) the data which set the instruction code 0x1003 to RWw2, and set the bit of the applicable function according to Table 3.20, and turn on RYF.

For example, input 0x2000 into "write-in data" (RWw3) to perform Rotation speed hold.

Table 3.20   Multifunction input 1 setup and the relay input 1

Bit	Contents of PLCL function OFF	Contents of PLCL function ON
0	No function	I00020
1	No function	I00021
2	No function	I00022
3	No function	I00023
4	No function	I00024
5	No function	I00025
6	<Multifunction input> Preset speed selection bit 8-6	I00026
7	=001: Preset speed 1, 010: Preset speed 2, 011: Preset speed 3 =100: Preset speed 4, 101: Preset speed 5, 110: Preset speed 6	I00027
8	=111: Preset speed 7, 000: Preset speed not used	I00028
9	<Multifunction input> Acceleration/deceleration time selection bit10-9	I00029
10	=00:Acc1/dEc1,01:Acc2/dEc2 =10:Acc3/dEc3,11:Acc4/dEc4	I0002A
11	<Multifunction input> Rotation speed UP command (MRH mode)	I0002B
12	<Multifunction input> Rotation speed DOWN command (MRH mode)	I0002C
13	<Multifunction input> Rotation speed hold	I0002D
14	<Multifunction input> S-pattern acceleration/deceleration prohibited	I0002E
15	<Multifunction input> Max rotation speed reduction	I0002F

Table 3.21   Multifunction input 2 setup and the relay input 2

Bit	Contents of PLCL function OFF	Contents of PLCL function ON
0	<Multifunction input> Droop control inactive	I00030
1	<Multifunction input> Speed/torque control selection	I00031
2	<Multifunction input> Forward/reverse operation command selection	I00032
3	<Multifunction input> External failure signal 1 (Protection relay 86A active)	I00033
4	<Multifunction input> External failure signal 2(Protection relay 86A active)	I00034
5	<Multifunction input> External failure signal 3 (Protection relay 86A active)	I00035
6	<Multifunction input> External failure signal 4(Protection relay 86A active)	I00036
7	<Multifunction input> External failure signal 1 (Protection relay 86A inactive)	I00037
8	<Multifunction input> External failure signal 2(Protection relay 86A inactive)	I00038
9	<Multifunction input> External failure signal 3 (Protection relay 86A inactive)	I00039
10	<Multifunction input> External failure signal 4 (Protection relay 86A inactive)	I0003A
11	<Multifunction input> Trace-back external trigger	I0003B
12	<Multifunction input> Second setting block selection	I0003C
13	<Multifunction input> Emergency stop input	I0003D
14	No function	I0003E
15	<Multifunction input> Rotation speed command terminal block selection	I0003F

3. 7. 2 Protection History Data

The protection history data read by protection history read-out of the instruction code 0x1010 is shown. If RYF is turned on after it sets the instruction code 0x1010 to RWw2 and the protection data to read inputs into "write-in data" (RWw3) the number which shows the what position past it is, the protection code shown in Table 3.23 is set to "reading data" (RWr3), and it is transmitted to a master station.

For example, when the protection history data which set 0 to "write-in data" and was read to it is 0x0001, it turns out in the newest protection "inverter mode is V/f mode and the inverter protection operated by over-current protection using the first setting block."

Table 3.22   Protection History Data

Bit	Contents	Explanation of Contents
0 to 7	Protection code	Refer to Table 3.23
8, 9	Inverter mode	00: V/f mode 01: Induction motor vector mode 10: ED motor vector mode 11: Not used
10, 11	Not used (Undefined)	—
12	Setting block	0: First setting block 1: Second setting block
13 to 15	Not used (Undefined)	—

Table 3.23 Protection Codes

Protection Code	Protection Contents	Explanation of Protection Operation
1	Over-current protection	Protection of the instantaneous value of output current works by 3.58 or more times of an inverter amperage rating value.
2	IGBT protection	Protection works at the time of the over-current of IGBT, or a gate power supply fall.
3	Emergency stop A input contact is ON	In the multifunction input set as the emergency stop A, an emergency stop works by ON.
4	Emergency stop B input contact is OFF	In the multifunction input set as the emergency stop B, an emergency stop works by OFF.
5	Gate PCB abnormality	Protection detection by a GAC board. (only for models using GAC PCB)
6	DC part over-voltage	200V model: When D.C. part voltage exceeds 400V, protection works. 400V model: When D.C. part voltage exceeds 800V, protection works.
7	Overload protection	If an output current effective value operates for more than 1 minute with 150% of motor amperage rating values, overload protection will work.
8	Current sensor abnormality	Protection works by failure of a current sensor.
9	Un-starting	After operation or jog commad input, even if 10 seconds pass, when operation is impossible, protection works.
10	Over-speed protection	When motor speed exceeds fault speed setting, protection works. (Induction motor vector mode / ED motor vector mode)
11	Over-frequency protection	When output frequency exceeds a fault frequency setup, protection works. (V/f mode)
12	Insufficient voltage (Power failure)	200V model: If D.C. voltage becomes less than 180V during operation, protection will work. 400V model: If D.C. voltage becomes less than 180V during operation, protection will work.
13	Over-torque protection	When over-torque protected operation is set as ON and it operates for more than 1 minute by 150% of rated torque, protection works. (Induction motor vector mode / ED motor vector mode)
14	Unit overheat	When the temperature of IGBT becomes beyond a predetermined value, protection works.
15	Storage memory abnormality	When the setting data memorized by the built-in memory cannot be acquired correctly, protection works.
16	Option error	If option substrate use is set as ON and an option substrate causes a defect of operation, protection will work.
17	Sensor-less start error	In sensor-less mode, when the phase detection at the time of starting goes wrong, protection works. (ED motor vector mode)
18	Communication time-out error	When a communication error (timeout) is caused between an option and a master at the time of the option use which performs network communication, protection works.
19	Speed control error	When rate control unusual detection is set as ON and the deviation of motor speed and an commad value (rate control input) exceeds a preset value (console setup), protection works. (Induction motor vector mode / ED motor vector mode)
20	Motor overheat	When motor temperature exceeds 150 degrees C at the time of ON at the time of temperature detection option use in a motor overheating selection setup (F-06), protection works.
21	Charging resistor overheat	In a model of 7.5kW or less, when charge resistance is overheated, protection works.
22	FCL operation	When an instant current limit (FCL) continues for 10 seconds (near 0Hz 2 seconds) continuously, protection works.
23	Setting error	When it starts in the state where a setup of motor rating and a motor constant has abnormalities, protection works.
24	Open phase	When an output line is disconnected, protection works.
25	CPU processing abnormality	When CPU performs unusual processing due to the instant sag of 5V power supply for control, protection works.
26	Fan failure	When the fan in an inverter breaks down, protection works. (no protection stop).
27	PG error	- Even if a motor rotates above by two cycles by an electric phase, when there is no input of U, V, and W signal from PG, protection works. - When a motor is two or more revolutions in a machine phase and there is no input in Z signal of PG, protection works. (ED motor vector mode)
28	Sensor error	When there is no input of a current sensor or PG, protection works. (ED motor vector mode)
29	External failure 1	When the external failure 1 of a multifunction input is inputted, protection works.
30	External failure 2	When the external failure 2 of a multifunction input is inputted, protection works.
31	External failure 3	When the external failure 3 of a multifunction input is inputted, protection works.
32	External failure 4	When the external failure 4 of a multifunction input is inputted, protection works.

※Please also refer to the VF66B inverter manual.

3. 7. 3 Trace-Back Data Read-out

VF66B inverter memorizes the data of the current at the time of protected operation, voltage, etc., and contains the trace back function which reads afterwards and is used for analysis. In order to use a trace back function effectively, it is necessary to set a setting parameter (F area) correctly in the main part of an inverter beforehand.   For details, refer to the instructions manual of the main part of VF66 inverter.

The following procedures perform read-out of the trace back data of VF66B inverter.

The instruction code 0x1020 is set to RWw2. The contents of "write-in data" (RWw3) are as follows.

Table 3.24   The contents of write-in data at the time of a Trace-Back Data demand

Specification bit	Contents	Input range (HEX)
0 to 7 bit	The sample point of the trace back data to 0 to 99 is specified.	0 to 0x63
8 to 11 bit	0 to 15 channels of trace back data are specified.	0 to 0x0F
12 to 15 bit	The storing block of trace back data is specified. The VF66B inverter saves the past 4 times of trace back data. If 0 is specified, the newest trace back data will be required, and if 3 is specified, the oldest trace back data will be required.	0 to 0x03

ON of RYF will require trace back data of VF66B inverter. The data of the specified channel (ch) is stored in "reading data" (RWr3). Furthermore, the trace back data of the channel (ch) of the three point is stored in "the trace back data 1" (RWrC), the "trace back data 2" (RWrD), and the "trace back data 3" (RWrE).

Example :

When the write-in data at the time of a trace back data demand is 0x1120, the data in front of one of the newest trace back data is required. Since 1 is specified as the trace back data channel, it is the 32nd sample data of the trace back data of V phase current, W phase current, D.C. voltage, and output voltage from Table 3.25, is stored in "reading data" (RWr3), the "trace back data 1" (RWrC), the "trace back data 2" (RWrD), and the "trace back data 3" (RWrE), respectively.

Table 3.25 Trace-Back Data Contents (When F-15 to 26 are "0")

ch	V/f Mode Contents	V/f Mode Scale	Induction Motor Vector Mode Contents	Induction Motor Vector Mode Scale	ED Motor Vector Mode Contents	ED Motor Vector Mode Scale
0	U-phase current	2357/100%	U-phase current	2357/100%	U-phase current	2357/100%
1	V-phase current	2357/100%	V-phase current	2357/100%	V-phase current	2357/100%
2	W-phase current	2357/100%	W-phase current	2357/100%	W-phase current	2357/100%
3	D.C.voltege	10/V (*1)	D.C.voltege	10/V (*1)	D.C.voltege	10/V (*1)
4	Output voltage	20/V (*2)	Output voltage	20/V (*2)	Output voltage	20/V (*2)
5	Motor speed	20000/Max (*3)	Motor speed	20000/Max (*3)	Motor speed	20000/Max (*3)
6	Not used	Undecided	Speed commnad	20000/Max (*3)	Speed command	20000/Max (*3)
7	Torque	5000/100%	Torque	5000/100%	Torque	5000/100%
8	Output frequency	20000/Max (*3)	Output frequency	20000/Max (*3)	Output frequency	20000/Max (*3)
9	Not used	Undecided	Slip frequecy	20000/Max (*3)	d axis current	10000/100%
10	Not used	Undecided	Flux command	1024/100%	q axis current	10000/100%
11	Temperture (*4)	10/℃	Temperture (*4)	10/℃	d axis position	65536/360 degree
12	Protection flag (1)	Refer to table 3.11	Protection flag (1)	Refer to table 3.11	Protection flag (1)	Refer to table 3.11
13	Protection flag (2)	Refer to table 3.12	Protection flag (2)	Refer to table 3.12	Protection flag (2)	Refer to table 3.12
14	Status flag	Refer to table 3.26	Status flag	Refer to table 3.26	Status flag	Refer to table 3.26
15	Command flag	Refer to table 3.27	Command flag	Refer to table 3.27	Command flag	Refer to table 3.27

*1: The scale is 5/V in 400V system.

*2: The scale is 10/V in 400V system.

*3: Themaximum value is the inverter configuration parameter A-00 value.

*4: TVPT66-Z option or TVTH66-Z option as well as a motor temperature sensor are required for this function.

Table 3.26 Status Flags

Bit	Meaning	Bit	Meaning
0	Under normal operation or jog operation commnad input	8	Excitation
1	Under inverter operation (It contains also during slowdown stop operation.)	9	DC brake
2	Jog operation	10	Stronger flux when starting
3	Reverse command	11	End of program operation
4	DC excitation	12	Not used (Undefined)
5	Power failure	13	Reverse command state just before operation
6	Automatic measuring	14	Not used (Undefined)
7	Energization	15	High speed current limiting FCL in operation

Table 3.27 Command Flags

Bit	Meaning	Bit	Meaning
0	Normal operation command	8	DC excitation command
1	Jog operation command	9	0 speed maintenance command
2	Reverse command	10	Automatic measuring command
3	Excitation command	11	Emergency B-contact command
4	DC brake command	12	Not used (Undefined)
5	Reset command	13	Not used (Undefined)
6	Initial excitation command	14	Not used (Undefined)
7	Emergency stop command	15	Constant recalculation request

Contents of this manual are subject to change without notice.

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