

High-performance, Vector Control Inverter



Interface Card: OPC-VG1-PNET Applicable Inverter: FRNDDVG1S-DDPN Product Specifications

Applicable inverter ROM Version : H1 02 . / H2 02 .

Detail description is omitted for the subjects described in the VG1S manuals. Refer to the VG1S manual and catalog together with this specification document.

- FRENIC-VG USER'S MANUAL MHT286
- Functional Vector Control Inverter FRENIC-VG Series MH659
- External Dimensions SA5A0414

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Contents

1. Overview	4
1-1 Overview	4
1-2 Special Instruction	4
2. General Specifications	5 10
3-1 Basic Connection	10
3-2 Related function code	12
3-3 Protective action 3-3-1 Minor fault and serious fault of the PROFINET communication	15 15
3-4 Communication Formats 3-4-1 Applicable formats 3-4-2 Data format details	19 19 20
 3-5 Operation when Transmission Format or PZD Allocation Is Changed Halfway 3-5-1 Restrictions when transmission format or PZD allocation is changed halfway 3-5-2 Resetting restriction and checking transmission format determination status 	29 29 29
 3-6 Procedure for connecting PROFINET-IRT communication	30 30 35 36
 3-7 Synchronization between PROFINET-IRT and inverter control cycle	37 37 37 37 38
 3-8 Asynchronous communication 3-8-1 Overview of asynchronous communication 3-8-2 Asynchronous communication through STEP7 3-8-3 Application example of asynchronous communication through STEP7. 	45 45 45 48
 3-9 Notes for exchanging interface cards	53 53 53

1. Overview

1-1 Overview

This specification document describes PROFINET-IRT Interface Card "OPC-VG1-PNET" for FRENIC-VG and applicable inverter "FRN□□VG1S-□□PN". PROFINET-IRT communications on this product have the following features:

<Features>

- 1. Applicable with PROFINET-IRT and RT
- 2. In conformity to PROFIdrive
- 1-2 Special Instruction
- (1) Option card which is prohibited to mount together with PROFINET-IRT Interface Card

You cannot mount the following option cards while PROFINET-IRT Interface Card is mounted on the inverter unit.

[Option card prohibited to mount together with PROFINET-IRT Interface Card]

- CC-Link interface card (Model: OPC-VG1-CCL) (*E₁-E₁* alarm occurs when mounted together)
- T-link Interface Card (Model: OPC-VG1-TL) (E-E alarm occurs when mounted together)
- PROFIBUS-DP interface card (Model: OPC-VG1-PDP) (This card cannot be mounted together with PROFINET-IRT Interface Card for the structural reason.)
- DeviceNet Interface Card (Model: OPC-VG1-DEV) (This card cannot be mounted together with PROFINET-IRT Interface Card for the structural reason.)
- (2) Applicable Inverter

To use this option card requires a dedicated type and ROM version of inverter that mentioned below. Please Note that this option cannot be worked except applicable inverter below mentioned. You can confirm the ROM version on mentainace view in the keypad.

- Type of Inverter : FRN DDVG1S-DDPN (Dwill be any character or number)
- ROM Version : H1 02 . / H2 02 . (Dwill be any value of 10 to FF)

2. General Specifications

Item	Specification					
Name	PROFINET-IRT interface card					
Transmission mode	100BASE-TX					
Baud rate	100Mbps					
Cable length	100m / 1 segment					
Number of words occupied for transmission	32 words max. (I area 16 words/ Q area 16 words)					
Terminal/Bus cable	2 ports / PROFINET special cable					
Status indicator LEDs	The indicator LEDs displays the status (communication status/error status) of the self-station.					

Table 2.1 Hardware specifications

(1) Appearance



Figure 2-1 Apperance

(2) Status display LED

LEDs on the option card display the statuses of local stations.

Name	Color	Display	Status	Remarks
MS	Red/green	OFF	Resetting Interface Card CPU now	
	_	Red and	Initializing Interface Card CPU	
		green blink.	now	
		Red blinks.	PROFINET setting error	IP address error,
		(1Hz)		etc.
		Red lights.	This card is failed or card is poorly inserted.	
		Green	Initializing connection with	
		blinks. (1Hz)	FRENIC-VG now	
		Green lights.	Normal operation	
NS	Red/green	OFF	No PROFINET communications	
	-	Red blinks.	Minor fault occurs in PROFINET	When
		(2Hz)	communications .	sending/receiving
				error occurs 6
				times
				continuously.
		Red blinks.	Mismatched telegram between	It occurs when
		(1Hz)	master and inverter.	telegram set is
				different bitween
				PLC and oluli of
		Pod lights	Serious fault accurs in	Mostor shute
		ited lights.	PROFINETcommunications	down etc
		Green	Establishing PROFINET	down, oto.
		blinks.	communications now.	
			(PLC STOP)	
		Green	Establishing PROFINET	
		lights.	communications now.	
		_	(PLC RUN)	
LINK1/2	Green	OFF	No Ethernet communications	
		Green	Establising Ethernet	
		lights.	communications now.	
ACT1/2	Green	OFF	No Ethernet sending/reception	
		Green	Sending/receiving via Ethenet now.	
Dovice	Croor	lights.	Interface of this acrid is ON	
Power	Green	Green	interface of this card is UN.	
supply		lights.		

Table 2-2 LED Display Statuses

Item		Specifications		
Data updating cycle		1ms(*1) min.		
Data reflection delay (during synchronization with tact)		For 2-tact cycles (2ms delay for 1ms tact cycle)		
	Run command	Forward/Reverse rotation commands, alarm reset command X11 – X14 commands		
uc	Speed /Torque command	1word data (Any function code can be allocated to Q area as other commands.)		
Operatic		Bit data, such as running, braking, torque limitation, and alarm relay output		
	Operation running status output	Any function code can be allocated to I area as output of motor speed (1word), torque current commands(1word), current returned position one-rotation data (2word), acceleration monitor (1 word, 2 words) or others.		
Option function code		030, 031, 0101~0116, 0122~0133, 0160~0171		
Option function code Protective function		\mathcal{E}_{r} - \mathcal{L}' : Network error (PROFINET communication error) (*2)•Minor fault: The \mathcal{E}_{r} - \mathcal{L}' alarm can be controlled with o30 or o31.•Serious fault: Instantaneous alarm(\mathcal{E}_{r} - \mathcal{L}') \mathcal{P}_{r} - \mathcal{F} : Toggle fault error (*3)This error occurs when the 2 bit toggle signals [TGL1] and[TGL2] sent by PLC constantly have not been received overthe time that set by H144. \mathcal{P}_{r} - \mathcal{E} : PROFINET-IRT synchronize errorThis error occurs when synchronization between invertercontrol cycle and PROFINET-IRT sync signal cycle fails. Itis usually caused by noise.		

Table 2-3 Software Specifications

*1 The data update cycle depends on the carrier frequency setting and PROFINET communication. For details, refer to (3) and (4) mentioned below.

*2 For minor faults and serious faults, see "3-3 Protective Action".

*3 For details of toggle signals and toggle fault error, please refer to description of [TGL1] and [TGL2] about E01~E13 code in "4.3 Function Code Details" of FRENIC-VG User's Manual, unit type and function code ". In addition, it is necessary to make a program in PLC for generating ON / OFF pattern of [TGL1] and [TGL2] signal.

(3) Conditions required for synchronization of PROFINET-IRT

Connecting the card to the PROFINET-IRT makes it possible to synchronize the cycle of sync signal of PROFINET-IRT and the inverter control cycle. By doing this, the control timing of multiple inverters can be synchronized, making it easy to implement control that requires high-accuracy timing.

However, the processing that synchronizes the inverter control cycle and the E-SX bus tact cycle requires that the following conditions (1), (2) and (3) are satisfied all. If any condition is not satisfied, the cycle of sync and inverter control cycle will operate asynchronously. When the conditions are both satisfied, synchronization is performed automatically after PROFINET communication is established.

	Conditions					
(1)	Connected by PROFINET-IRT High performance					
(2)	Cycle of Sync of PROFINET is one of the follwing.					
	1ms, 2ms, 4ms					
(3)	Inverter function code F26 is set as one of the following.					
	In case of Unit type : 4kHz, 8kHz(*1), In case of Stack type : 2kHz					

Table 2-4 Synchronization conditions

*1 In case of MD (F80=3), F26 is set to 2kHz.

(4) Data Updating cycle

Sync. Cycle of PROFINET-IRT	Inverter function code F26	Data updating cycle in VG(*3)				
1ms	2 ^(*1) , 4, 8	1ms	Synchronized			
	3, 6, 12 to14	0.667ms or 1.334ms	The cycle is indeterminate			
	2 ^(*2) , 5, 10,11	0.8ms or 1.2ms	because of not synchronized			
2ms	2 ^(*1) , 4, 8	2ms	Synchronized			
	3, 6, 12 to 14	1.334ms or 2ms	The cycle is indeterminate			
	2 ^(*2) , 5, 10,11	1.6ms or 2ms	because of not synchronized			
4ms	2 ^(*1) , 4, 8	4ms	Synchronized			
	3, 6, 12 to 14	3.34ms or 4ms	The cycle is indeterminate			
	2 ^(*2) , 5, 10,11	3.6ms or 4ms	because of not synchronized			

Table 2-5 Data updating cycle

*1 Only MD (F80=3) or Stack type

*2 Except MD or Unit type

*3 Except Operation command, Xterminals command, Status of operation and Y terminals states.



Figure 2-2 Timing chart in case of Synchronization (i.e 1ms sync.)

3. Detail Specifications

3-1 Basic Connection



Figure 3-1 Connecting PROFINET Cable

With reference to "the attachment means of 6.1.4 incorporation form optional (OPC-VG1-DD)" of FRENIC-VG User's Manual (MHT286D), perform wiring, work of the connection.

- Improper wiring causes an electric shock, fire or other disasters. Wiring must be performed by a qualified person. Before touching the electric circuits for wire connection after the power has been turned ON, turn OFF (open) the power breaker to prevent an electric shock.
- Even if the breaker is turned OFF (open), the smoothing capacitor is still charged. So, you get an electric shock if you touch it. Confirm that the CHARGE indicator lamp for the inverter is OFF, and check the DC voltage of the inverter with a tester to see that it has dropped to or below the safe level.

- Do not use the product if any part is damaged or missing. Injury or damage may result.
- Improper operation during mounting or removal of the product may cause damage to it.

Observe the following precautions when connecting the product.

[Precautions about connection]

- (1) Use the cable dedicated to PROFINET (for example, a PROFINET cable manufactured by Siemens)
- (2) Before starting operation, confirm that the power for the PLC and for the inverter is turned OFF.
- (3) To prevent malfunction of the inverter due to noise, <u>keep the PROFINET cable</u> <u>at least 30 cm away</u> from the main circuit wire and other power lines of the inverter, and do not place these wires together in a single duct.
- (4) Connect the PROFINET cable to either of two Ethernet connectors (P1, P2). Cascade wiring is also available.

Example of basic connection diagram



Figure 3-2 Example of basic connection diagram

- If the data of a function code is incorrect, the system may fall into a dangerous status. Recheck data whenever you have finished setting or writing data.

An accident may occur.

The list of the inverter function cords in conjunction with the PROFINET interface card is shown below.

	Function c	ode name	Setting	Change	
No.	Name	Keypad display	range	in running	Setting contents
H30	Link function	LINK FUNC	0 to 3	√	Set 3 :run command , speed command via PROFINET are valid
H107	Definition for ,minor fault 2	L-ALM 2	0000 to 1111	✓	Select the alarm operation when $\not \vdash \neg \not \lor$ occurs. $\not \vdash \neg \not \neg \not $ is indicated in 100-digit value. In the appropriate digit, 0: Alarm arises, 1: Minor fault $(\not \vdash \neg \neg \not \vdash)$
			0		Forced to stop immediately after a communication error(minor fault) occurs ($E - 4$ alarm: coast-to-stop)
			1		Continue timer-controlled operation after communication error (minor fault) occurs. (HOLD the run command from the previous communication in the status of communication error.) Forced to stop after timer setting period is over $(\underline{\mathcal{E}}_{r}, \underline{\neg}_{r}')$ alarm: coast-to-stop) When communication is recovered within timer setting period, follow the communication command. However, forced to stop after timer setting period is over.
o30 (*1)	Link setting (Action on communicati on error)	MODE ON ER	2	-	Continue timer-controlled operation after communication error (minor fault) occurs. (HOLD the run command from the previous communication in the status of communication error.) Forced to stop after the setting period is over if the communication has not recovered. When communication is recovered within timer setting period, follow the communication command and roturn to portation
			3		Continue operation even if a communication error (minor fault) occurs. Holding the last run command directed through communication in the communication error state. When communication is recovered, follow the communication command and return to normal operation.
o31 (*1)	Link setting (Action time on communicati on error)	TIMER TL	0.01 to 20.00s	-	Timer for the operation period [s] after a communication error. Effective when o30=1, 2
0101	Reflect all allocations	Enable allocation	0,1	-	By changing 0 to 1, reflect intermediate change of transfer format (o102) and PZD allocation setting (set in o122 or subsequent function codes to the master unit.) After setting to 1, return to 0.
	Select		1		Standard telegram1 (2 words +2 words)
o102	PROFINET	Option	101		Free format (12 words +12 words + PCV)
(*2)	transmission format	function	Other than above		Spare (Do not set here.) *Treat as o102=1

Table 3-1 Related function codes

	Function co	ode name	Setting	Change		
No.	Name	Keypad display	range	in running	Setting contents	
o122 to o133(*2)	OUT area PZD allocation 1 to 12	Write code 1 to 12	0 to FFFF	-	Specify the function code to be allocated to the function code OUT area using RS485No. (Allocate the function code to be written.) (*3)	
o160 to o171(*2)	IN area PZD allocation 1 to 12	Read code 1 to 12	0 to FFFF	-	Specify the function code to be allocated to the function code IN area using RS485No. (Allocate the function code to be written.) (*3)	
F26	Carrier frequency	CAREER FRQ	2 to 15	-	Specify carrier frequency (inverter control cycle). Only when F26 = 4 or 8 that PROFINET-IRT tact cycle and inverter control cycle are possible to synchronize. In case of Stack type : 2kHz	
H108	L-ALM object definition 3	L-ALM 3	0000 to 1111	1	Select the alarm operation when \mathcal{A} - \mathcal{E} occurs. \mathcal{A} - \mathcal{E} is indicated in 1-digit value.	
					fault $(\underline{l} - \underline{\beta}\underline{l})$	
E10 E13	X11~X14 function selection	X11~X14 FUNC	(*4)	-	Select the function when X11 \sim X14 terminal status is ON. When using X terminals to monitor toggle signals, please set any two X terminals as [TGL1] and [TGL2].	
E15 E27	Y terminals function selection	Y FUNC	(*4)	-	Select the function of terminals Y1~Y5 and Y11~Y18. When using Y terminals to confirm whether PROFINET-IRT is in tact synchronized status please set any Y terminal as [C-Do10].	
o103 o104	IP address monitor 1, 2	BUS SET 3, 4	0000 to FFFF	✓	Monitor IP address (4byte). o103 displays upper 2byte and o104 displays lower 2 byte in hex. Example: On the occasion of o103=C0A8, o104=0002, it means that IP address is [0xC0.0xA8.0x00.0x02] in hex therefore [192.168.0.2] in decimal. (* 5)	
o105 to o107	MAC address monitor 1~3	BUS SET 5~7	0000 to FFFF	~	Monitor MAC address (6byte). o105 displays upper 2byte, o106 displays middle 2 byte and o107 displays lower 2 byte in hex. Example: On the occasion of o105=0040, o106=1A15, o107=3001 it means that MAC address is [00-40-1A-15-30-01].	
o108 to o115	Device name monitor 1~8	BUS SET 8~15	0000 to FFFF	✓	Monitor device name (16 characters). Device name is displayed in ASCII code. From o108 to o115, each o code displays 2 words from beginning of device name. Example: On the occasion of o108=0x7667,o109=3100,o110~o115=0x0000,devi ce name is [vg1]. But this monitor function does not work when o116 = 1 or 2.	
			0		Device name monitor mode o108~o115 monitor device name.	
0116	Device name	e BUS SET	1	✓	Device name edit mode The value set in o108~o115 will be saved as new deice name when o116 is changed from 1 to 0 (*6). As long as o116=1, o108~o115 stop monitoring function.	
			2		Device name all clear	
					$0108 \sim 0115$ stop monitoring function.	
			_		will be cleared and o108~o115 will all be cleared as 0x0000(return to default status).	

*1 For more information about o30, o31, please refer to "3-3-1-2 Operation Setting at occurrence of minor fault (o30, o31)"

*2 After changing o102, o122 to o133 or o160 to o171, you must set o101=1 or turn ON the inverter power supply again so as to reflect the setting details. If any one of these function codes is changed halfway, Y terminal function [AS-RDY]turns OFF and the system disables to send or receive transmission data until you set o101=1 or turn ON the inverter power supply again. (All the commands in OUT area are ignored and all the responses in IN area become 0.) By turning ON the inverter power supply, [AS-RDY]= ON and

communications using the updated function code allocation data can be restarted. For details on[AS-RDY], see section 3-5.

- *3 For the function codes and measures for RS485No. refer to "4.2.3 Function Code List" of FRENIC-VG User's Manual (MHT286) ".
- *4 For details please refer to "4.3 Function Code Details" of FRENIC-VG User's Manual) ".
- *5 IP address may be displayed as "0.0.0.0" on occasion that inverter fails to link to master device.
- *6 Characters valid for displaying device name in o108~o115 are listed below. (Refer to table 3-2 ASCII Codes)

Alphabet "A"~"Z", "a"~"z" ASCII codes : 0x41~0x5A, 0x61~0x7A

 Number
 "0"~"9"
 ASCII codes : 0x30~0x39 (Can not be used at the beginning of device name)

 Symbol
 "-"
 ASCIIcodes : 0x2D(Can not be used at the beginning or the end of device name)

 In addition, 0x00 is recognized as the end of device name (any character afterwards is invalid). If
 o108~o115 are set as invalid value, device name will remain unchanged when o116 is changed from 1 to 0.

$\begin{array}{c} 10_{H} \text{Digit} \\ 01_{H} \text{Digit} \end{array}$	00 _н	10 _н	20 _H	30 _н	40 _H	50 _н	60 _н	70 _Н
0 _H	NUL	DLE	SP	0	@	Р	`	р
1 _H	SOH	DC1	!	1	А	Q	а	q
2 _H	STX	DC2	"	2	В	R	b	r
3 _Н	ETX	DC3	#	3	С	S	с	S
4 _H	EOT	DC4	\$	4	D	Т	d	t
5 _Н	ENQ	NAK	%	5	E	U	е	u
6 _Н	ACK	SYN	&	6	F	V	f	V
7 _H	BEL	ETB	,	7	G	W	g	w
8 _H	BS	CAN	(8	Н	Х	h	х
9 _H	HT	EM)	9	I	Y	i	У
A _H	LF	SUB	*	:	J	Z	j	z
B _H	VT	ESC	+	;	K	[k	{
Сн	FF	FS	,	<	L	\sim	I	
D _H	CR	GS	—	=	М]	m	}
E _H	SO	RS		>	N	^	n	~
F _H	SI	US	/	?	0	_	0	DEL

Table 3-2 ASC II Codes (grey colr means valid)

Example : "0" in ASCII code should be "30 $_{\rm H}$ ", and "1" in ASCII code should be "31 $_{\rm H}$ ".

- 3-3-1 Minor fault and serious fault of the PROFINET communication
- 3-3-1-1 Factors of minor fault and serious fault ($E_{-}-4'$)

The PROFINET interface card triggers minor fault or serious fault depending on the fault level.

If a fault occurs, the inverter issues E - 4 "communication fault", and the motor coasts-to-stop. (*1)

*1 Depending on the setting of inverter function code H107, the operation can continue by displaying a generated fault as $\frac{1}{2} - \frac{1}{2}\frac{1}{2}$. Refer to chapter 3-2 "Related function code".

Item	Minor fault	Serious fault 1	Serious fault 2
Card LED status	MS ■ (green lights) NS ▲ (red blinks)	MS ■ (green lights) NS ■ (red lights)	MS ■ (red lights) NS □ (No lights)
Cause (*2)	 Data is temporarily damaged by applying noises to communication line. 	 Card hardware fault Improperly installed card Setting error 	
Resetting method	Reset after the cause of a (automatically cleared up communication). Or rese 0,1or[LE]=OFF (*3)	alarm has been cleared on recovery of t after H30 is	Turn ON the power to the inverter again after the cause of the alarm has been cleared. (Not resettable until power OFF)
Control of fault status	The alarm can be controlled with the function code o30 and o31.	The alarm <i>Er- '</i> 'is imme fault occurs.	ediately issued when serious
Keypad indication communication error code (*4)	1	2	3
Alarm subcord (*5)	01(hex)	02(hex)	04(hex)

Table 3-3 Factors of minor fault and serious fault ($\mathcal{E} - \mathcal{L}$)

- *2 For a minor fault, $\underline{\not{}}_{r}$ - $\underline{\not{}}_{r}$ is issued when the command via PROFINET is enabled (when H30=2, 3 and [LE] =ON: for details, see the explanation of H30 in FRENIC-VG User's Manual (MHT286 \Box)). For a serious fault 1, $\underline{\not{}}_{r}$ - $\underline{\not{}}_{r}$ is issued when the command via PROFINET is enabled and the run command via PROFINET is ON. For a serious fault 2, $\underline{\not{}}_{r}$ - $\underline{\not{}}_{r}$ is issued when an erroneous factor occurs, regardless of the above conditions.
- *3 "Apply reset command" for minor fault and serious fault 1 means reset input to the inverter using any of the following methods:
 - Enter 📾 key on the keypad.
 - Allocate abnormal reset [RST] when selecting X function and enter it as digital data.
 - Reset alarm from PROFINET communications

However, for a serious fault 1, you might have to reset the PROFINET master unit together with the alarm depending on the condition of the master unit.

*4 You can check the communication error codes for minor fault and serious fault on the communication status screen in Maintenance Information menu on the keypad. To see the communication status screen, click m key on the Operation Mode screen to change the screen to Menu. Then, move the arrow at the left end of the screen to "Maintenance" using $\textcircled{m}} \bigcirc \textcircled{m} \bigcirc$ key and click m key. Then, click \bigcirc key three times to display the following screen. This error code presents the first factor that generates $\underleftarrow{m} - \oiint{m}$. When serious fault 1 occurs, a minor fault must have occurred in advance. When o30=0, this code presents a minor fault code even if it is serious fault 1.



Figure 3-4 Communication error $(\not{E_r} - \not{-})$ cord confirmation screen

*5 You can check the alarm sub code of $\frac{1}{2}e^{-\frac{1}{2}t}$ by selecting alarm history in Alarm Information program on the keypad. On the sub code check screen, click key on the Operation Mode screen to change the screen to Menu. Then, move the arrow at the left end of the screen to "7. Alarm Information" using $\frac{1}{2}e^{-\frac{1}{2}t}$ key and click key. Select the alarm you want to see from the list of the latest alarm and previous three alarms and click key. Then, click key once to display the following screen. This sub code presents the first factor that generates $\frac{1}{2}e^{-\frac{1}{2}t}$. When serious fault 1 occurs, a minor fault must have occurred in advance. When o30=0, this code presents a minor fault code even if it is serious fault 1.

SUB = x x x	1:Minor fault
AL=Er 4 AL=x x x	2:Serious fault 1
AL=x x x AL=x x x	4:Serious fault 2
20∧V→PAGE SHIFT <mark>23</mark>	

Figure 3-5 Subcord confirmation screen

3-3-1-2 Operation Setting at occurrence of minor fault (o30, o31)

This subsection describes how to control the - 4 alarm using the inverter function codes o30, o31 when a communication error (in the state of minor fault) arises while applying an run command via PROFINET from PLC.

(1) o30 = 0 (Forced to stop immediately after a communication error (minor fault) occurs ($\frac{f}{L} - \frac{f}{2}$ alarm: coast-to-stop))



(2) o30 = 1, o31 = 5.0 (The mode to stop the inverter for five seconds after a communication error(minor fault).)



Figure 3-7

(3) o30 = 2, o31 = 5.0 (The communication does not recover from a communication error (minor fault) in five seconds and trips on \mathcal{E}_{r} - \mathcal{L}_{r} .)



(4) o30 = 2, o31 = 5.0 (The communication recovers from a communication error (minor fault) in five seconds.)



(5) o30 = 3, (Driving continuation)



Figure 3-10

*1 During this period, the system retains the commands (run commands, speed commands or both) from communications at occurrence of communication error unless communications recover and new commands or settings are sent.

3-4 Communication Formats

3-4-1 Applicable formats

You can select the following transmission formats using function code o102 "Select Transmission Format".

Format	t nam	e				N	umbe	er of v	vords	occu	pied				
Standard telegram 1(ST1)						C	OUT area: 2 words, IN area: 2 words								
Freely mappable format (FM)						C)UT a	rea: 1	l6 wo	rds, I	N are	a: 16	word	ls	
Manuf	actu	er-sp	ecific	; teleo	, aram)					,					
ou set	anv	value	othe	r thar	n abo	ve to	o102	the	svste	m ass	ume	s o1()2=1		
00 001	uny	valuo	ouno	i tritai	labo	10 10	0102	, 110 .	byoto	in acc	Janno	0 010			
2	(word)														
NSOLL	OUT														
NIST	IN														
d area															
u alea															
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	(word)
PZD2	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD10 PZD10	PZD11 PZD11	PZD12 PZD12		P	ĊV CV	-	OUT
T ZDZ	1 203	I ZD4	1205	1 200	1 ZDI	1 200	1203	1 2D TO	1 2011	T ED IE			01	·	_ "`
				Freely	mappa	able are	а				•	Fixe	d area		
		C	Jutout	area	(data	direct	ion Pl	C→V	G)						
	:	Li Li	nut a	rea (c	lata di	rectio	n VG-	→PI C)						
1	:	Ċ	Contro	l word		10010		1 20)						
1	÷	S	Status	word	•										
	÷	S	Speed	comn	nand v	/alue	(Nmax	<=400	0Hex)						
<u>. L</u>	•	-		••••				4000							
LL	:	S	beed	detec	tion v	alue (inmax	=4000	пех						
LL -12	:	S F	peed roces	detec s data	tion v a (You	alue (I I can (nmax chang	e allo	cation	usina	l func	tion c	ode o	122 to	o 133
∟∟ ∣-12	:	S F o	peed roces r o160	detec s data 0 to 1	tion v a (You 71)	alue (l I can (nmax chang	e allo	cation	using	l func	tion c	ode o	122 to	o 133
	Format Standa Freely Manuf ou set 2 NSOLL NIST d area 2 PZD2 PZD2 PZD2 PZD2	Format nam Standard tel Freely mapp Manufactur Ou set any 2 (word) NSOLL NIST 0UT IN 0UT IN 0UT IN 0UT IN 0UT IN 1 1 1 L	Format name Standard telegran Freely mappable Manufacturer-sp ou set any value 2 (word) NSOLL NIST 0UT IN 0UT IN 0UT IN 0UT IN 0UT IN 0UT IN 1 1 1 1 1 2 3 4 PZD2 PZD3 PZD4	Format name Standard telegram 1(S Standard telegram 1(S Freely mappable format Manufacturer-specific Ou set any value othe 2 (word) NSOLL OUT NIST OUT PZD2 PZD3 PZD4 PZD2 PZD3 PZD4 PZD2 PZD3 PZD4 Input a : Input a 1 : Contro 1 : Status L : Speed	Format name Standard telegram 1(ST1) Freely mappable format (FI Manufacturer-specific telegrouset any value other than 2 (word) NSOLL OUT NIST OUT A area 2 2 3 4 5 6 PZD2 PZD3 PZD4 PZD5 PZD6 PZD2 PZD3 PZD4 PZD5 PZD6 Freely Control vord Input area (d 1 Status word L	Format name Standard telegram 1(ST1) Freely mappable format (FM) Manufacturer-specific telegram) ou set any value 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(FM) OUT area: 16 words, II Manufacturer-specific telegram) OUT area: 16 words, II ou set any value other than above to o102, the system ass 2 (word) OUT OUT NSOLL OUT NSOLL OUT NIST OUT A area 2 2 3 4 5 6 7 8 9 10 11 12 PZD2 PZD3 PZD4 PZD5 PZD6 PZD7 PZD8 PZD9 PZD10 PZD11 PZD12 PZD2 PZD3 PZD4 PZD5 PZD6 PZD7 PZD8 PZD9 PZD10 PZD11 PZD12 Freely mappable area : Output area (data direction PLC → VG) : Input area (data direction VG → PLC) 1 : Status word 1 : Speed command value (Nmax=4000Hex) OUT OUT OUT <td>Format name Number of words occupied Standard telegram 1(ST1) OUT area: 2 words, IN area Freely mappable format (FM) OUT area: 16 words, IN area Manufacturer-specific telegram) OUT area: 16 words, IN area ou set any value other than above to o102, the system assume 2 (word) NSOLL OUT NINT OUT NSOLL OUT NINT OUT NINT OUT NINT OUT NINT PZD4 PZD4 PZD5 PZD6 PZD7 PZD8 PZD9 PZD10 PZD10 PZD11 PZD12 Freely mappable area : Output area (data direction PLC→VG) : Input area (data direction VG→PLC) 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Table 3-4 Applicable Transmission Formats

3-4-2 Data format details

3-4-2-1 Standard telegram 1 (o102=1)

	bit15 bit0
OUT area	STW1 control word
$(PLC \rightarrow VG)$	NSOLL_A speed command (Nmax=4000Hex)
IN area	ZSW1 status word
(VG→PLC)	NIST_A speed detection value (Nmax=4000hex)

Figure 3-11 Standard Telegram 1 (ST1)

(1) STW1 control word

This area is used to issue run commands from PLC to the inverter.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit)
b15	b14	b13	b12	b11	b10	b9	b7	b7	b6	b5	b4	b3	b2	b1	b0	

Table 3-5 Explanation of STW1

bit		False (0)	True (1)
b0	ON/OFF	Turn a run command OFF	Turn a run command ON
b1	ON2/OFF2	OFF2: Coast to a stop	ON2: Request the inverter to be ready for turning a run command ON (1)
b2	ON3/OFF3	OFF3: Stop command following the deceleration time specified by the function code H56	ON3: Request the inverter to be ready for turning a run command ON (2)
b3	Enable operation	Disable inverter operation	Enable inverter operation
b4	Enable Ramp generator	Fix speed command to 0	Enable the ramp frequency generator (RFG)
b5	Unfreeze Ramp generator	Freeze ramp generator (accelerator/decelerator). Fix speed command to the value at that time.	Unfreeze RFG command
b6	Enable setpoint	Disable	Enable ON-bit
b7	ALM RST	Do not reset alarm	Reset alarm (Resetting an alarm makes the communications card unready to turn a run command ON.)
b8, b9	-	-	-
b10	Enable PZD	Disable input of PCD, STW1 and NSOLL_A. Retain previous status.	Enable input of PCD, STW1 and NSOLL_A.
b11	Run direction	Run in the forward direction	Reverse direction
b12	X11	X11 terminal = OFF	X11 terminal = ON
b13	X12	X12 terminal = OFF	X12 terminal = ON
b14	X13	X13 terminal = OFF	X13 terminal = ON
b15	X14	X14 terminal = OFF	X14 terminal = ON

(2) ZSW1 status word

STW is a word area for monitoring the inverter's running status.

STW indicates the status transition of the PROFIdrive. The status transition details are shown in Figure 3-12.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit)
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	

bit		False (0)	True (1)
b0	Ready to switch ON	Not ready to turn a run command ON	Ready to turn a run command ON
b1	Ready to run	Not ready to run	Ready to run
b2	Running state	Running disabled	Running
b3	ALM	No inverter alarm	Inverter alarm activating now
b4	ON2/OFF2	OFF2: ON2 bit in CTW is "0"	ON2: ON2 bit in CTW is "1"
b5	ON3/OFF3	OFF3: ON3 bit in CTW is "0"	ON3: ON3 bit in CTW is "1"
b6	Run command ON inhibited	Ready to turn a run command ON (logical negation of bit0)	Not ready to turn a run command ON (logical negation of bit)
b7	-	-	-
b8	N-AR	Not reached to the specified speed	Reached to the specified speed
b9	R/L	Both speed command and run command from PROFIBUS are disabled. (H30=0)	Either speed command or run command from PROFIBUS-DP is enabled. (H30=1, 2, 3)
b10	N-DT1	Detected speed is less than the value set by inverter function code E39.	Detected speed is greater than the value set by inverter function code E39.
b11	SYNC	Not synchronized with PROFINET	Synchronized with PROFINET
b12	Y11	Y11 terminal = OFF	Y11 terminal = ON
b13	Y12	Y12 terminal = OFF	Y12 terminal = ON
b14	Y13	Y13 terminal = OFF	Y13 terminal = ON
b15	Y14	Y14 terminal = OFF	Y14 terminal = ON

Table 3-6 Bit Definition in STW

(3) NSOLL_A speed command

This area issues speed commands from PLC. It is indicated as the value of ratio by setting the maximum speed F03 (r/min) of the inverter function code to 4000Hex.



Speed command (r/min) = Function code F03 (r/min) $\times \frac{\text{NSOLL}_A}{4000 \text{ Hex}}$

(4) NIST_A speed detection value

This is a motor speed detection value. Like the speed command value, this is indicated as the value of ratio by setting the maximum speed F03 (r/min) of the inverter function code to 4000Hex.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	_(bit)
						I				1	1	ı		1	1	
NIST_A speed detection value (Nmax=4000Hex)																
		l	Ì	j.						ĺ.	1	1	1	1	1	

or

Speed command (r/min) = Function code F03 (r/min)
$$\times \frac{NIST_A}{4000 \text{ Hex}}$$

Figure 3-12 shows a status transition diagram of the PROFIdrive profile. Immediately after the inverter is turned ON, the status first moves to S1 "Not ready to turn a run command ON." Bit manipulation in STW1 shifts the status to S2 "Ready to turn a run command ON," S3 "Ready to run" and finally S4 "Running" in sequence. In S4 state, the inverter enters the running state. Turning a run command OFF in S4 state shifts the status to S5 "Turn a run command OFF." After the motor stops, the status moves to S2 or S1 state.

Note In Figure 3-12, to simplify the description, values of Bit 4 to Bit 6 and Bit 10 in STW1 are always "1." If any one of these bit values is not "1," the inverter will not enter the running state even if the status transition properly proceeds.



Figure 3-12 STW1/ ZSW1 Status Transition Diagram

b	bit15	bit0
OUT area	PZD 1	
(PLC→VG)	PZD 2	
	PZD 3	
	PZD 4	
	PZD 5	
	PZD 6	
Γ	PZD 7	
	PZD 8	
	PZD 9	
	PZD 10	
	PZD 11	
	PZD 12	
	PCV (PCA)	
	(IND)	
	(PVA)	
	(PVA)	
IN area	PZD 1	
(VG→PLC)	PZD 2	
Γ	PZD 3	
	PZD 4	
	PZD 5	
Γ	PZD 6	
	PZD 7	
Γ	PZD 8	
Γ	PZD 9	
Γ	PZD 10	
Γ	PZD 11	
	PZD 12	
Γ	PCV (PCA)	
	(IND)	
	(PVA)	
	(PVA)	

3-4-2-1 Free allocation format (12W+12W+PCV4W) (o102=101)

Figure 3-13 Freely mappable Format (FM)

(1) PZD1-PZD12 Process Data 1-12

These settings always write to the function codes preset in o122 to 133 (OUT area). Also, the settings always monitor the function codes specified in o160 to 171 (IN area).

□ For individual formats of the inverter function codes, see Chapter 4 "4.2 Function Code List" of FRENIC-VG User's Manual.

Allocate the function code to each PZD by referring to the inverter function codes or PNU given below.

Item	PZD	Function	PNU	Remarks
		code		
OUT area	PZD1	0122	PNU915[0]	Specify the function
(Function code is always	PZD2	o123	PNU915[1]	code using
written)	PZD3	0124	PNU915[2]	485No.
	PZD4	o125	PNU915[3]	
	PZD5	0126	PNU915[4]	
	PZD6	0127	PNU915[5]	
	PZD7	o128	PNU915[6]	
	PZD8	o129	PNU915[7]	
	PZD9	o130	PNU915[8]	
	PZD10	o131	PNU915[9]	
	PZD11	0132	PNU915[10]	
	PZD12	0133	PNU915[11]	
IN area	PZD1	o160	PNU916[0]	
(Function code is always	PZD2	0161	PNU916[1]	
monitored)	PZD3	0162	PNU916[2]	
	PZD4	0163	PNU916[3]	
	PZD5	0164	PNU916[4]	
	PZD6	0165	PNU916[5]	
	PZD7	0166	PNU916[6]	
	PZD8	0167	PNU916[7]	
	PZD9	0168	PNU916[8]	
	PZD10	0169	PNU916[9]	
	PZD11	0170	PNU916[10]	
	PZD12	0171	PNU916[11]	

 Table 3-7 Allocation of Function Codes to PCD1 to 12

For the correspondence between the function code and 485No., see Chapter 4 "4.2 Function Code List" of FRENIC-VG User's Manual.

You can also allocate the dedicated 485No. given in the list below to PZD besides those given in the above user's manual.

Table 3-8 485No. Dedicated to the Ca	ard
--------------------------------------	-----

485No.	Signal	Remarks
F001	STW1	Same as the signal for ST1
F002	NSOLL_A	
F101	ZSW1	
F102	NIST_A	

Note By allocating STW1 to OUT area PZD, the run command issued by the inverter function code S06 will be disabled. In the same manner, by allocating NSOLL_A, the speed command issued by the inverter function code S01 will be disabled.

- After changing o122 to o171, set the function code o101 to 1 or turn ON the inverter power supply again so as to reflect the settings to the inverter.
- When specifying the same function code to two or more OUT area PZD (o122 to o133), the allocation to the one having the largest o code number will be enabled and others are treated as no allocation. (Ex.: When specifying the same function code to be written to o122 and o124, the function code is specified to o124 only and o122 is treated as no function code specified.) However, there is no restriction when allocating the same function code to two or more N area PZD (o160 to o171).
- (2) Reading/writing PCV parameters

PCV is an area where parameters (inverter function codes and PNU) are read and written sporadically.

Because the PCV area is fixed, you cannot change the allocation.



Figure 3-14 PCV Area Total Structure

(i) PCA and IND

These two word areas specify a parameter. Their structures are shown below.



RC part	Request/response	Descriptions	
0	Request	No request	
1	(Master \rightarrow Slave)	Read parameter value	
2		Write parameter value in word	
3 to 5		Not used.	
6		Read array parameter value	
7		Write array parameter in array word	
8		Not used.	
9		Read element count of array parameter	
10 to 15		Not used.	
0	Response	No response	
1	(Slave \rightarrow Master)	Parameter value in word sent normally	
2, 3		Not used.	
4		Parameter value in array word sent normally	
5		Not used.	
6		Normal response to the request of array element count	
7		Transmission error (Error code stored in PVA) ^{*1}	
8 to 15		Not used.	

Table 3-9 RC Part

*1 For error codes and information, see Table 3-10.

Table 3-10 List of Error Codes for Parameter Access Errors

RC part	Error code stored in PVA word	Error information		
7	0	Nonexistent parameter specified		
	1	Inhibited to write the parameter value		
	2	Specified parameter value out of range		
	3	Invalid Subindex specified		
	11	Parameter write-inhibited error during inverter running or digital input terminal (for run command) being ON		
17 Read process not executable		Read process not executable		
	104	Busy error during parameter writing		

(ii) PVA word area

PVA is a two-word area that represents write/read parameter values. The communications card uses the lower one word (the fourth word counted from the PCV word head).

To write a parameter value into an inverter (slave node), enter the value to the master node and send the word to the slave. To read a parameter value, refer to this area of the slave node in response to the previous request. If a parameter access error occurs (Response to RC part is "7"), the slave node outputs an error code (Table 3-10) to this area and returns the response to the master node.



- (iii) Accessing inverter function code and PNU
 - 1. Specify 485No. or PNU number of the function code to access PNU area.
 - 2. Specify how to access the specified parameter, for example, Write or Read, in the RC area. For details about the RC area, see Table 3-9.
 - 3. To write a parameter value, enter the write data into the PVA lower area and send the word to the salve node. To read a parameter value from the slave, refer to the PVA lower area in the response from the slave node. If a parameter access error occurs, the RC part of the response is filled with "7" and the PVA area contains one of the error codes listed in Table 3-10.



Figure 3-14 How to Access Parameters

(iv) PROFIdrive specific parameters Table 3-11 shows the PROFIBUS specific parameters supported by this card.

			-	D A 4 4			
PNU	Index	Description	Range	R/W	Remarks		
915	0 to 11	Function code allocation to OUT area PZD1 to 12	0000 to FFFFHex	R/W	Same as for o122 to o133		
916	0 to 11	Function code allocation to IN area PZD1 to 12	0000 to FFFFHex	R/W	Same as for o160 to o171		
922	None	Select telegram (ReadOnly)	1, 21	R	Same as for o102		
930	None	Operation mode	1	R	Fixed 1		
944	None	Error occurrence count (inverter alarm count)	0 to 65535	R			
947	0	Alarm history (latest alarm or current alarm)	0 to 65535	R	Fuji Electric alarm code		
	1	Alarm history (previous alarm)	0~65535	R	Response in format		
	2	Alarm history (alarm 2 times before)	0 to 65535	R			
	3	Alarm history (alarm 3 times before)	0 to 65535	R			
965	None	PROFIdrive version	4	R	PROFIdrive V4 is indicated.		

rs
r

- 3-5 Operation when Transmission Format or PZD Allocation Is Changed Halfway
- 3-5-1 Restrictions when transmission format or PZD allocation is changed halfway

When any one of the following function keys is changed halfway, the system assumes that the transmission format is not determined and sets Y terminal function [AS-RDY]=OFF and operates with restrictions given in Table 3-12:

- o102 transmission format
- PZD allocation to OUT area from o122 to o133 and PZD allocation (*1) to IN area from o160 to o171

Even if you return the value to the original one after changing it once, the system assumes that the value is still changed and operates with restrictions.

* 1 A transmission format where PZD area does not exist (ST1) is excluded from the above condition.

Table 3-12 Restriction Operation when Function Code Allocation Is Changed Halfway (during[AS-RDY]=OFF)

Restriction du	Remarks	
Free allocation format (FM1) (o102=101)	IN area: Set all response data to be read from function code to 0.	
Standard telegram 1(ST1) (o102=1)	OUT area: Ignore all command data to be written to function code.	For ST1, restriction occurs only when o102 is changed halfway.

3-5-2 Resetting restriction and checking transmission format determination status

You can reset the restriction by executing any one of the following actions:

- Set 1 to function code o101.
- Turn ON the inverter main power supply again.

After the above operations, the transmission format and PZD allocation details are checked and Y terminal function is set as [AS-RDY]=ON.

You can check [AS-RDY] signal using the method given in Table 3-12.

Table 3-13 Checking Transmission Format Determination Status Signal[AS-RDY]

Check method		Operation		
Y terminal [AS-RDY]	function	Determining the function code allocation now. [AS-RDY] *1		
		[AS-RDY] = ON : Determining function code allocation details now (without restriction)		
		[AS-RDY]= OFF: Function code allocation details not determined (with restriction given in Table 3-13)		
Function code	M143	M143 bit0=1 : [AS-RDY]= ON *2		
		M143 bit0=0 : [AS-RDY]= OFF		

*1 To allocate [AS-RDY]to Y terminal , select "64:AS-RDY" from "Select Y function from function codes E15 to E27 ".

*2 Even if [AS-RDY] is not allocated to Y terminal, you can check the status by monitoring M143.

3-6 Procedure for connecting PROFINET-RT communication

The procedure for connecting PROFINET-RT communication between master device and inverters is described in this chapter.

In this chapter, the most universal PROFINET master device -- SIEMENS's PLC and setup tool " SIMATIC STEP7 (omit as STEP7) " are used as examples for explaining how to setup option card. And the version of STEP7 is v5.5 SP2.

- Note This document is for explaining connection of PROFINET communication between Fuji inverters and master device, therefore instruction of basic operation of STEP7 is not included. If there is any question about technical terms or operation method of STEP7, please refer to user's mannual of SIEMENS STEP7 or directly contact SIEMENS.
- Note The GSD file is necessary for the following setup, and it can be downloaded from the URL below.(Registration as a member is necessary(Free)).

URL: https://felib.fujielectric.co.jp/download/index.htm

Search for "OPC-VG1-PNET" with the search box in the bottom right after entering the page above.

3-6-1 Configuration of PROFINET master device on STEP7

(1) Open HW Config with SIMATIC Manager in STEP7.

SIMATIC Manager - [Untitled C:¥Program Files¥Siemens¥Step7¥s] File Edit Insert PLC View Options Window Help File Stime State St	
🙀 HW Config - [SIMATIC 300(1) (Configuration) Untitled]	
🕼 Station Edit Insert PLC View Options Window Help	_ 8 ×
D ☞ ≌~ ♥ ♥ ● ● € ▲ ▲ ● □ ♥ ♥	
<u>^</u>	
	FROFIBUS DP FROFINET 10 SIMATIC 300 SIMATIC 400 SIMATIC CPC Based Control 300/400 SIMATIC PC Station
SIMATIC 300(1)	
SL. Designation	
	PROFINET ID-System
1	
Press F1 to get Help.	

(*1) For how to enter the interface in SIMATIC Manager as shown in figre above, please refer to user's manual of STEP7 provided by SIEMENS.

Install the GSD file for OPC-VG1-PNET.
 Select [Options] -> [Install GSD File] in menu.



Use the [Browse] to select the folder containing GSD file, and select the GSD file, finally click the [Install] button.

Install GSD Files	×
Install GSD Files: from the directory	
C:¥Program Files¥Siemens¥Step7¥S7tmp¥20130620 (1)Select the GSD file containing folder GSDML-V2.25-FujiElectric-OPCVG1PNET-20130620.xml 06/20/2013 12:00:00 AM V2:25 English	
(2)Select the GSD file.	
(3) Click Install button.	_
Close Help	_

The following message box will be shown if succeeded. Click [OK] and then click [Close] in "Install GSD Files" window.

Install GSD File (13:4986)	
Installation was completed successfully. (4) Click [OK]	
\int	
Install Show Log Select <u>A</u> ll <u>D</u> esel	ect All
(5) Click [Close] to finish installation GSD file.	of Help

(3) Configuration of PROFINET master interface

After inserting the CPU, the configuration window in the figure below (*2) will be shown and IP address of master device can be set up.

Bit HW Config - [SIMATIC 300(1) (Configuration) Untitled] Image: Configuration Untitled] Image: Configuration Untitled] Bit Station	
	t mi
2 3 CPU-Standard	
4 5 Properties - Ethernet interface, PN-IO (R0/S2.2)	
6 General Parameters CPU 312C CPU 313	
CPU 313C CPU 313C-2 DP	
If a subnet is selected, CPU 313C-2 PtP CPU 313C-2 PtP CPU 314	
(1) Set up IP address CPU 314 IFM CPU 314C-2 DP	
IP address: 192168.01 Gateway CPU 314C-2 PN/DP © Do not use router GEOGE 5E 50 Gateway CPU 314C-2 PN/DP © Do not use router GEOGE 5E 50 Gateway	B0 🔳
Sugret mask. 2002002000 C Use router Use different method to obtain IP address OPU 3140-2 PtP	
SL. Module CPU 315-2 PN/DP CPU 315F-2 DP	
(2) Click [New] button Properties CPU 315F-2 PN/DP CPU 315F-2 PN/DP	
3 Depice CPU 316-2 DP 4 CPU 317-2 CPU 317-2	
5 CPU 317-2 PN/DP 6 OK Cancel Help OPU 317F-2	
7 8 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	~
Properties - Ethernet interface PN-10 (R0/S2.2)	
Properties - New subnet Industrial Ether General Parameters	
Name If a subnet i §7 subnet ID: 006C - 0007 the next available	
Project path: (3) Type in a name	
Storage location of the project: C¥Program Files¥Siemens¥Step7¥s7prc IP address: 1921680.1 Cateway O Do not	
Author:	
Date created: 08/13/2013 10:51:26 AM	
Comment: Ethernet(1)	
(4)Click [OK] button	
ОК	
The following window will be shown when finishing $\sqrt{2}$ the configuration above.	
Image HW Config = LSIMATIC 300(1) (Configuration) Untitled] Image Station Edit Insert PLC View Options Window Help	- X
1 Success (100)	↓
X2 PN=10 X2 P1 R □ Port 1	
X2 P2 R Part 2 25 A line will be drawn	

(*2) For how to insert the CPU please refer to user's manual of STEP7 provided by SIEMENS. According to the model of CPU it is possible that no window will emerge after inserting the CPU. In this case please contact SIEMENS.

(4) Installation of interface card, setup of device name and IP address

Drag [Standard] from the tree on the right side of the screen below "PROFINET IO > Additional Field Devices > Drives > OPC-VG1-PNET > VG1 PROFINET Option Card" and drop it onto the line as shown in figure below.



(*3) Make sure that device name and IP address are set as the same with [3-6-2 Configuration of interface card on STEP7].

(5) Configuration of transmission format

The transmission format for communication between PLC and interface card can be selected. Drag items under [Standard] in the tree on the right side of the screen, and drop them in green block on the bottom side of the screen. Make sure both I and O of the format are set.



(*4) Make sure the transmission format here is configured as the same with the format on interface card side (function code o102).

(6) Download the project to PLC

Click [Save & Compile] botton and then click [Download to Module] button to download this configuration to PLC.

👪 HW Config - [SIMATIC 300(1) (Configuration) Untitled]	
🕅 Station Edit Insert PLC View Options Window Help	_ 8 ×
] D 🛩 ≌~ 🖉 🐘 📇 🛍 🛍 🏥 🗊 🗖 🔣 👷	
	Suchen: nt ni
(1) Save & Compile (2) Download to Module	Profile: Standard
X1 MP/DP	PROFIBUS DP
x2 PN-30	
Y2 P2 R Port 2	ROFINET IO Additional Field Devices
25 10124/D016	

By far the configuration of PROFINET master device on STEP7 is finished.

<u>3-6-2 Configuration of interface card on STEP7</u>

This chapter describes how to set device name and IP address of interface card on STEP7. Please connect the interface card with PROFINET cable and power on the inverter before configuration.

(1) Click [PLC > Edit Ethernet Node] in SIMATIC Manager's menu on STEP7.

SIMATIC Manager	
jile P <u>L</u> C <u>V</u> iew <u>O</u> ptions <u>W</u> indow <u>H</u> elp	
Display Accessible Nodes	
PROFI <u>B</u> US	(1) Click
Edit Ethernet Node	
opdate (<u>n</u> e operating oystem	
	₹ }
dit Ethernet Node	
Ethernet node	Nodes accessible online
MAC address:	(2) Click [Browse] botton
IMAG guuress. JI	<u>B</u> rowse
- Set IP configuration	
Use IP parameters	

After clicking [Browse] button, all nodes connected to Ethernet are shown.

Browse Network - 2	Nodes	
<u>S</u> tart S <u>t</u> op	IP address MAC address Device type 192.168.0.1 00-1B-1B-2C-00-1C \$7-300 0.0.00 00-40-1A-15-30-04 OPC-VG1-PN	Name Subnet mask pn-io NET
I Fast search		(3) Select the inverter (make sure Device type is OPC-VG1-PNET)
Elash	MAC address: 00-40-1A-15-30-04 (4) Click [OK] button	Cancel Help
Ethernet node MAC <u>a</u> ddress:	Nodes accessible online 00-40-1A-15-30-04 Browse	
Set IP configuration Guse I <u>P</u> parameters	(5) input the IP address (*1)	
<u>I</u> P address: Subnet mas <u>k</u> :	J192168.02 Construction 255255255.0 Lase router Address Address	
C Obtain IP address Identified by Client ID Client ID:	from a DHCP server (6) Click [Assign IP Configuration] butto	on
A <u>s</u> sign IP Config	uration	

(*1) Make sure that device name and IP address are set as the same with Configuration of PROFINET master device.

The window below will emerge after finishing IP address configuration of interface card.

Edit Eth	nernet Node (4502:703)	×
(The parameters were transferred successfully. Please refer to the information on this message in the help system	
	(7)Click [OK] button	
[C	K Help	

Set the device name after returning from [Edit Ethernet Node] window.

Assign IP Configuration (8) Input a device name (8) Assign device name Device name OPC-VG1-PNET	*1) Assign Name
Reset to factory settings	(9) Click [Assign Name] button
	Help

The window below will emerge after the device name of interface card is set.

Edit Ethernet Node (4502:703)	×
The parameters were transferred successfully. (10) Click [OK] button Help	

By far the configuration of interface card on STEP7 is completed.

3-6-3 Configuration of inverter function codes

(1) Set the relevant inverter function codes

The transmission format of interface card is set by inverter function code o102 (table below). Make sure this format is set as same with the one on STEP7.

Function code	Name	Description	Default
o102 PROFINET		1 : Standard Telegram 1 (ST1) (2word+2word)	0
transmission format	101 : Free Management format (FM1) (12word+12word+PCV)		
	Other : same as o102=1		

Table 3-14 Setting of function code o102

For setting of function codes other than o102 please refer to relevant instructions.

(2) Activate the setting

To activate the setting of inverter function codes, it is necessary to set o101 from 0 to 1 or restart the inverter power. After the setting of function codes are activated, with PLC power on and the PROFINET cable connected correctly, PROFINET communication will be established therefore the LED MS and NS on interface card will turn green.

3-7 Synchronization between PROFINET-IRT and inverter control cycle

3-7-1 Necessary conditions for synchronization

By using this interface card to connect with PROFINET, synchronization between PROFINET-IRT signal and inverter control cycle become possible. Therefore it is possible to synchronize multiple inverters and is especially helpful for accurate timing control.

Meanwhile to achieve the synchronization between PROFINET signal and inverter control cycle, conditions $(1)\sim(3)$ below are necessary. With all three conditions met, synchronization process will run automatically after PROFINET communication is established. If any of the three conditions is not met, synchronization can not be achieved.

	Necessary conditions	
Condition (1)	[RT Class] = IRT and [IRT Option] = High performance (*1)	
Condition (2)	The cycle of PROFINET signal should be one of these:	
	1ms, 2ms, 4ms	
Condition (3)	Inverter function code F26 [carrier frequency] should be set as one of these:	
	Unit type HD or LD : 4kHz, 8kHz Unit type MD : 2kHz, 4kHz Stack type MD or LD : arbitrary (automatically fixed as 2kHz)	

Table 3-15	Conditions for	PROFINET	synchronization
------------	----------------	----------	-----------------

(*1)For details of setting method please refer to [3-7-4 PROFINET-IRT configuration on STEP7].

3-7-2 Confirmation of synchronization

The status of PROFINET synchronization can be checked with following methods.

Table 3-16	Confirmation	of PROFINET	synchronization
------------	--------------	--------------------	-----------------

Methods	Results
Y Terminal function [C-Do10]	If synchronized : [C-Do10] = ON (*1)
Function code M142	If synchronized : M142 (bit0) = 1 (*2)

(*1) For how to set Y terminal function as [C-Do10] please refer to Chapter 4 [4.3 Details of function codes] in [FRENIC-VG User's Manual, Unit type • Function code].

(*2) M142 can be checked at keypad display without setting Y terminal functions.

3-7-3 Alarm of synchronization failure (A-E)

If the synchronization between PROFINET signal and inverter control cycle is interrupted by noise or other problems after it is established, inverter will perform as follow.

Table 3-17 Performance when out of synchronization

Cause	Performance
Out of synchronization	$\beta = E$ (sub code 1) (*1) (*2) will occur as alarm of PROFINET synchronization failure
	Try to re-synchronize automatically and once synchronization is established again $\beta - \epsilon$ alarm can be reset.

(*1) If inverter function code F26 is changed during synchronized, it may cause synchronization failure but in this case A-E alarm will not occur.

(*2) It is possible to set synchronization failure as a light alarm by using inverter function code H108, therefore it can carry on running with a $\angle \neg \partial'_{-}$ display. For details please refer to Chapter 4 [4.3 Details of function codes] in [FRENIC-VG User's Manual, Unit type • Function code].

3-7-4 PROFINET-IRT configuration on STEP7

This chapter describes how to setup PROFINET-IRT on STEP7. Please carry out the following configuration after [3-6-1 Configuration of PROFINET master device on STEP7] is finished.

- Note The following description is merely one example of the PROFINET-IRT configuration and in fact the display and setting method may be different according to master device. For details of setting method, OB and SFC please refer to STEP7 user's manual or contact SIEMENS directly.
- (1) Run [PROFINET IO Topology] from PROFINET-IO-System menu in HW Config.

👪 HW Config - [SIMATIC 300(1) (Configuration) Untitled]	
🛍 <u>S</u> tation <u>E</u> dit Insert <u>P</u> LC <u>V</u> iew <u>O</u> ptions <u>W</u> indow <u>H</u> elp	_ & ×
D 😅 🖫 星 🎼 🎒 🗈 🗈 🖬 🏜 🌆 🛐 🗔 🞇 👀	
🚍 (I) UR	(1) Display the menu by right click
1 CPU 314C-2 PN/DP Ethernet(1): PROFINE	Profile: Standard
X1 MP/DP X2 PN-10	Qopy Ctrl+C Paste Ctrl+V
X2 P1 R Port 1	Paste Shared
X2 P2 R Port 2 2.5 PreNIC-VG	Insert Object Edit PROFINET IO System IP addresses
	PROFINET IO Domain Management Based Control 300/400
Fuji Electric	PROFINET IO Topology
	Specify Module (2) Click here
	Delete

Setup the topology in [Graphic view] tab of [Topology Editor]. Make sure the configuration match the actual PROFINET cable connection.

a' <u>a</u> Topology Editor
Table view Graphic view Offline/online comparison
(3) Click the [Graphic view]
SIMATIC 300(1) PN-IO(CPU 314C-2 PN/DP) P2
P1 OPC-VG1-PNET (4) According to PROFINET cable connection, drag and drop one green block to another.
Interconnection Properties
Port Interconnection Port SIMATIC 300(1) ¥ PN-IO(CPU 314C-2 PN/DP) ¥ Port 1 (x2 P1 R) Partner port OPC-VG1-PNET ¥ RJ45 10/100 MBit/s (P1) Medium: Port: Copper Partner port: Copper Cable name: Copper
Cable Data
(● <u>Cable length</u>) (Signal delay time: 0.600 才s)
(5)Click [OK] button
QK Qancel Help

The figure below is an example of P1 of PLC connected to interface card P1.

a's Topology Editor	
Table view Graphic view Offline/online comparison	
SIMATIC 300(1) P1 P2 P1 OPC-VG1-PNET P1 P2 Move picture mode deactivated Of (6) Click [OK] button	

Topology Editor (2252:40164)
Do you want to accept the modified data?
Yes No
(7) Click [Yes] button

(2) Change property of master device.

🙀 HW Config - [SIMATIC 300(1) (Configuration) Untitled]				
🕅 Station Edit Insert PLC View Options Window Help				_ 8 ×
D 😅 💱 🖳 🐘 🎒 💼 💼 🎪 🍿 🗊 🖽 👯 💦				
(1) Double click	^	S <u>u</u> chen:		
2 Ethernet(1): PROFINET-IO-System (100)		<u>P</u> rofile:	Standard	-
$\begin{array}{c cccc} XT & & & & & & & & \\ \hline & & & & & & \\ X2 & & & & & & \\ X2 & PI & & & & & \\ X2 & PI & & & & & \\ X2 & PI & & & & & \\ X2 & PI & & & \\ X2 & PI & & & \\ X2 & PI & & & \\ Y3 & PI & \\ Y3 &$		H H H H H H H H H H H H H H H H H	ROFIBUS DP ROFIBUS-PA ROFINET IO MATIC 300	
25 DU4/D016		🗄 🛄 SI	MATIC 400	

Select [Synchronous Cycle Interrupts] tab and specify the IO system no. for OB61, then click [detail] button.

Properties - CPU 314C-2 PN/DP - (R0/S2) (2) Click [Synchronous Cycle Interrupt]				
Time-of-Day Interrupte Cyclic Interrupte Discognitics/Cline Communication Web General Startup Synchronous Cycle Interrupts Cycle/Clock Memory Retentive Memory Interrupts				
Process image partition(s) (e.g.: 1,4) (SFC126 / SFC127 call Delay time is required) OB61: 25				
OB62 Detail (4) Click [Details] button 0.000 μs				
0B6 <u>2</u> : 0 ▼ 0.000 μs				
OB6 <u>4</u> : 0 ν 0.000 μs				
(7) Click [OK] button after return from OB61.				
OK Cancel Help				

Input 1 into [Process image partition(s)] and click [OK] button in OB61 window.

0B61			
Application			
Priority:	25		
Application cycle [µs]:	1000.000	= 1 → × 1000.000	
<u>D</u> elay time [µs]:	1.000	Automatic settings	
Process image partition(s):	1	(5) Input "1"	
<u>T</u> i/To mode:	Automatic	-	
Time Ti (read in process values) [μs]: TiMinTiMax [μs]: (0.0000.00)	0.000	Timebase [#s]: 0000	
<u>T</u> ime To (output process values) [μs]: ToMinToMax [μs]: (0.0000.000)	0.000		
_I/0			
<u>I</u> O system no.:	100 💌		ovela [// e]
<u>D</u> ata cycle [µs]:	1000.000	= 1 x 1000.000	
(6)Click [OK] butto	ı D		
<u></u> K		Cancel	Help

Click [OK] again after returning to Properties window.

(3) Change the property for PROFINET communication of master device.



Select [Synchronization] tab, and specify [Synchronization role] as [Sync master] then click [OK].

Properties - PN-IO (R0/S2.2)	×
Media Bedundancy	(2) Click [Synchronization]
General Addresses	PROFINET I-Device Synchronization
Parameter → Configuration → B Synchronization role → B Name of sync domain → RT class ↓ IRT option	Value Sync master syncdomain-default RTJRT High performance (3) Select [Sync master]
(4) Click [OK]	Cancel Help

(4) Change property of inverter PROFINET communication.

🙀 HW Config - [SIMATIC 300(1) (Configuration) Untitled]						
📲 Station Edit Insert PLC View Options Window	Help	_ 8 ×				
😑 (0) UR						
1		Suchen:				
2 CPU 314C-2 PN/DP	Ethernet(1): PROFINET-IO-System (100)	Profile: Standard				
X1 MPL/DP						
X2 PN-10	T (1) OPC-VO1-PNET					
X2 P1 R Port 1		🕀 📅 PROFINET IO				
X2 P2 R Port 2	FRENIC-VG					
25 11 11/24/18/38		E SIMATIC 400				
	Fuji Electric					
(1) Click icon						
(2) Double click I	Interface					
SL 🚺 Module number I ad	ddress Qaddress Diagnostic address: Commer	nt				
	2042*					
Xi Interface	2041*					
PT TAS TO THE MOTOR	2040*	_				
P2 HJ45 TU/TUU MBH/s	2039*	_				
2 B FreeAlloc(32 bytes 0)	0.21	_				
	001	-				

Select [Synchronization] tab and do the following configuration:

Synchronization role = Sync slave, RT class = IRT, IRT option = High performance

Properties - Interface (X1)	(3)Select [Synchronization] tab
General Addresses Synchronization D Cycle	
Parameter	(4) Select [Sync slave]
🖃 🔄 Configuration	
 Synchronization role 	Sync slave
— 🗐 Name of sync domain	syncdomain-default
🗄 🚖 RT class	IRT
L IRT option	High performance
	(5)Select [IRT], [High performance]

Select [IO Cycle] tab, specify [Assign IO device in isochronous mode] as [OB61] and then click [OK].

Properties - Interface (X1)	(6) Click [IO Cycle] tab
General Addresses Synchronization IO Cycle	
Update Time	
Mode: Fixed factor	
Update time [ms]:	Eactor Send clock [ms]
Watchdog Time	
Number of accepted update cycles with missing IO data	с <mark>З _</mark>
Watchdog time [ms]:	(7) Select [OB61]
Isochronous Mode	
Assign IO device in isochronous mode: 0861	
Application cycle [µs]:	00 Data cycle [µs]: 1000.000
Ti/To mode: in the	network
Time Ti (read in process values) [µs]: [375.00 TiMinTiMax [µs]: (375.0001000.000)	10 Timebase Ti/Te [un] 125.000
Time To (output process values) [µs]: [375.00 ToMin_ToMax [µs]: (375.000_1000,000)	
Isochronous Mode Modules / Submodules	
(8) Click [OK]	Cancel Help

Click [Yes] button if the following window emerges.



(5) Click [PROFINET IO Domain Management] in the menu of [PROFINET-IO-System].

👪 HW Config - [SIMATIC 300(1) (Configuration) Untitled]	
💵 <u>S</u> tation <u>E</u> dit Insert <u>P</u> LC <u>V</u> iew <u>O</u> ptions <u>W</u> indow <u>H</u> elp	_ & ×
D 😂 💱 🖳 🐘 🎒 🐚 🖻 🖬 🏜 🛍 📳 🗁 👯 📢	
► (0) UB	(1) Right click to show menu
2 CPU 314C-2 PN/DP Ethernet(1): PROFINET	-IO-System (100)
	Cupy CtrI+C Paste CtrI+V
X2 P1 R Port 1	Paste Shared
X2 P2 R Port 2 FRENIC-VG	Insert Object
	Edit PROFINET ID System IP addresses PROFINET ID Domain Management Based Control 300/400
Fuji Electric	PROFINET IO Topology
	Specify Module (2) Click
	Delete Del

Select [Send clock time] in [Domain management] window and then click [OK].

Domain management - Ethernet(1)				×
Sync Domain MRP Domain				
Sync Domain				
Sync domain: syncdomain-defa	ault	New	Delete	<u>E</u> dit
Send clock time [1000 [ms]:	र्	De <u>t</u> ails]	
Nodes	(3) Sel	ect [Send clock	time]	
Station / IO system		Subnet		
Add <u>R</u> emove				
Station / Device Name	Synchronization R	ole RT Class	IRT Option	Media Redunda
SIMATIC 300(1) / PN-IO SIMATIC 300(1) / (1) OPC-VG1-PNET	Sync master Sync slave	RT, IRT IRT	high flexibility, high perform high performance	n
Device Properties				
Modules				
(4) Click [OK]				
ок				Cancel Help

Finally perform [Save&Compile] and [Download to Module] following the procedure described in [3-6-1 Configuration of PROFINET master device on STEP7].

(6) Insert [OB61].



Input [OB61] into [Name] column and then click [OK].

Properties - Organizat	ion Block (4) Input I	OB611
General - Part 1 General	- Part 2 Calls Attribut	
<u>N</u> ame:	OB61	
<u>S</u> ymbolic Name:		
Symbol <u>C</u> omment:		
Created in <u>L</u> anguage:	LAD	
Project path:		
of project:	C:¥Program Files¥Siemens¥Step7¥	∕s7proj¥Untitled
Data avaatad	Code	Interface
Last modified:	08/20/2013 11:35:15 AM	08/20/2013 11:35:15 AM
C <u>o</u> mment:		<u>^</u>
(5) Clie	ж [ОК]	×
OK		Cancel Help



Add SFC126 and SFC127 process to renew PIP1 in [OB61] and then click [Save]. After that please click [Download] to download newly created [OB61] into the PLC.



By far all the configuration has been completed.

For details of setting methods and SFC please refer to STEP7 user's manual from SIEMENS or directly contact SIEMENS.

3-8 Asynchronous communication

3-8-1 Overview of asynchronous communication

Data interchange of inverter function codes and parameters of PROFIdrive can be performed with asynchronous communication.

The flowchart of asynchronous communication is shown as in Figure 3-15. Master sends the [Write request] (parameter access request data) to slave, and slave replies with [Write response].Then master sends [Read request] and slave replies with response data of parameter access in [Read response].



Figure 3-15 Flowchart of asynchronous communication

When writing function codes or PNU with asynchronous communication, all written data is saved in inverter internal RAM instead of nonvolatile memory (EEPROM). Therefore data will be ereased if inverter is powered off. To save those data it is recommended to set function code H02 = 0 -> 1 to perform [all save] so that all data in RAM will be saved into EEPROM.

3-8-2 Asynchronous communication through STEP7

Asynchronous communication can be achieved by using SFB52 and SFB53 in STEP7.

Note This description is for communication between PROFIBUS master and Fuji inverters. For details of SFB52 and SFB53 please refer to STEP7 user's manual or directly contact SIEMENS.

							-
	RD	RDREC			WR	REC	
BOOL	REQ	VALID	BOOL	BOOL	REQ	DONE	BOOL
DWORD	ID	BUSY	BOOL	DWORD	ID	BUSY	BOOL
INT	INDEX	ERROR	BOOL	INT	INDEX	ERROR	BOOL
INT	MLEN	STATUS	DWORD	INT	LEN	STATUS	DWORD
		LEN	INT	ANY	RECORD	RECORD	
ANY	RECORD	RECORD					

Figure 3-16 SFB52(RDREC)と SFB53(WRREC)

(1) SFB53(WRREC)

SFB53(WRREC) can be used to send [Write request]. Please specify [INDEX] as [0xB02E] when trying to access parameters of Fuji inverter. As the result of [Write request], set parameter access request data will be set into RECORD (refer to following table).

		Set ı		
Field	Size	Function code access	PROFIdrive parameter access	Remark
Request No.	Byte	1~255		
Request ID	Byte	0x01:Read parameter		
		0x02:Write parameter		
DO-ID	Byte	1		fixed as 1
Parameter number	Byte	1	fixed as 1	
Parameter property	Byte	0x10 : parameter value		
Array element number	Byte	1	fixed as 1	
Parameter No.	Word	485No.Upper byte PNU No.		
		+0x0100		
Subindex	Word	485No.lower byte Subindex		
Format (*1)	Byte	0x42:WORD		
Write data number (*1)	Byte	1	fixed as 1	
Write data (*1)	Word	According to parameter		

Table 3-18	Parameter access	request data

(*1) Necessary only when Request ID = 0x02 (performing parameter write).

(2) SFB52(RDREC)

SFB52(RDREC) can be used to send [Read request]. Please specify [INDEX] as [0xB02E] when trying to access parameters of Fuji inverter. As the result of [Read response], set parameter access response data will be set into RECORD (refer to following table).

Field	Size	Range	Remark
Response No.	Byte	1~255	Return request No.
Response ID	Byte	0x01: Read parameter OK	
		0x02: Write parameter OK	
		0x81: Read parameter NAK	
		0x82: Write parameter NAK	
DO-ID	Byte	1	
Parameter Number	Byte	0, 1	
Format (*1)	Byte	0x42: WORD	
		0x44: Error No.	
Read data number (*1)	Byte	1	
Read data (*1)	Word	Parameter value or error No.(Table 3-20)	

 Table 3-19
 Parameter access response data

(*1) Necessary only when Request ID \neq 0x02 (performing parameter read).

Table 3-20 Error No.

Error No.	Information
0	Specified parameter does not exist
1	Unable to write parameter
2	Parameter is out of range
3	Specified SubIndex is invalid
4	Subindex has been specified in non-array parameter
11	Unable to write parameter during running
104	Busy error during writing a parameter

3-8-3 Application example of asynchronous communication through STEP7

Application example of asynchronous communication by using SFB52 and SFB53 of STEP7 is described in this chapter. Please carry out the following configurations after [3-6-1 Configuration of PROFINET master device on STEP7] is completed.

- Note This description is for communication between PROFIBUS master and Fuji inverters. For details of SFB52 and SFB53 please refer to STEP7 user's manual or directly contact SIEMENS.
- (1) Insert a [Function] into the asynchronous communication.



Type in "FC + arbitraty number" (For example FC901) in Name block then click [OK].

Properties - Function	(4) Input [FC901]	×
General - Part 1 General -	Part 2 Calls Attribuy	
<u>N</u> ame:	FC901	
<u>S</u> ymbolic Name:		
Symbol <u>C</u> omment:		
Created in <u>L</u> anguage:	LAD	
Project path:		
Storage location of project:	C:¥Program Files¥Siemens¥Step7¥s7proj¥Untitled	
Data anata t	Code Interface	
Last modified:	08/26/2013 07:03:42 PM 08/26/2013 07:03:42 PM	
C <u>o</u> mment:		
(F) Clip		
ОК	Cancel Help	



(2) Add SFB53 to FC901, and setup Instance DB (automatically).



Setup the input/output of SFB53. Set [INDEX] as 0xB02E(-20434), and [RECORD] as parameter access request data(for example DB131). And set [ID] as Slot0 address of inverter (which can be checked in HWConfig).



(3) Add SFB52 and setup the Instance DB in the same way with SFB53.



(4) Add DB131 for parameter access request data and DB121 for response data.



Type in the DB name (For example DB131) specified by RECORD of SFB53 in Name block then click [OK]. Then add the DB (For example DB121) specified by RECORD of SFB52 in the same procedure.

Properties – Data Block	(4) Input DB131	X
General - Part 1 General -	Part 2 Calls	
<u>N</u> ame and type:	DB131 Shared DB	~
<u>S</u> ymbolic Name:		
Symbol <u>C</u> omment:		
Created in <u>L</u> anguage:	DB	
Project path: Storage location		
of project:	U#Program Files#Siemens#Step/#s/proj#Untitled	
Date created: Last modified:	08/26/2013 07:27:49 PM 08/26/2013 07:27:49 PM 08/26/2013 07:27:49 PM 08/26/2013 07:27:49 PM	
C <u>o</u> mment:		~
(5) Click	k [OK]	~
ОК	CancelH	lelp

Setup the definition and value of parameter access request data for DB131.

🛃 SIMATIC Manager - [Untitled	C:¥Program Files¥Siemer	ns¥Step7¥s7proj¥Unt	it led]		
🞒 Eile Edit Insert PLC View Q)ptions <u>W</u> indow <u>H</u> elp				- 8 ×
🗅 😅 🔡 🛲 👗 🖻 💼 🚵		< No Filter >	- 7/ 🔡 🖲	🖷 🖃 🔟 😽	
Dutitled SIMATIC 300(1) GOU 314C-2 PN/DP GOU 314C-2 PN/DP GOU 314C-2 PN	System data GOB1 DB130 GDB131	Double click	DB120 SFB53 k on newly ad	DB121	

Here is an example of setting request reference of function code F03.

🗱 LAD/STL/FBD – [DB131 –– Untitled¥SIMATIC 300(1)¥CPU 314C-2 PN/DP]					
Eile Edit Insert PLC Debug View	<u>O</u> ptions <u>W</u> indow	v <u>H</u> elp			
🗋 😂 🏪 🎒 👗 🛍 🛍 🗠 🗠	64 🏜 🖂	º_ &	k?		
	Address	Name	Туре	Initial value	Connent
	0.0		STRUCT		
⊞∰ Libraries	+0.0	Request_Reference	BYTE	B#16#1	
	+1.0	Request_ID	BYTE	B#16#1	
	+2.0	DO_ID	BYTE	B#16#1	
	+3.0	No_of_Parameter	BYTE	B#16#1	
	+4.0	Attribute	BYTE	B#16#10	
	+5.0	No_of_Elements	BYTE	B#16#1	
	+6.0	Parameter_Number	WORD	W#16#100	
	+8.0	Subindex	WORD	W#16#3	
	=10.0		END_STRUCT		

DB121 is defined as parameter access response reference.

🗮 LAD/STL/FBD – [DB121 Untitl	ed¥SIMATIC 3	00(1)¥CPU 314C-2 PN/	DP]		
Eile Edit Insert PLC Debug View	Options Window	∾ <u>H</u> elp			
D 🚅 🔓 🖬 🎒 👗 🖻 🖻 🗠 🗠	6% 🏜 🔽	º_ 60' !≪ ≫! [□ [□]	N ?		
	Address	Name	Туре	Initial value	Connent
	0.0		STRUCT		
⊞	+0.0	Response_Reference	BYTE	B#16#0	
	+1.0	Response_ID	BYTE	B#16#0	
	+2.0	DO_ID	BYTE	B#16#0	
	+3.0	No_of_Parameter	BYTE	B#16#0	
	+4.0	Format	BYTE	B#16#0	
	+5.0	No_of_Values	BYTE	B#16#0	
	+6.0	Value	WORD	W#16#0	
	=8.0		END_STRUCT		

(5) Add FC901 so that it can be processed in OB1.

🔣 LAD/STL/FBD – [OB1 Untitled	¥SIMATIC 300(1)¥CPU 314C-2 PN/DP]
t⊒ <u>F</u> ile <u>E</u> dit <u>I</u> nsert PLC <u>D</u> ebug <u>V</u> iew	<u>O</u> ptions <u>W</u> indow <u>H</u> elp
🗋 😂 🔓 🔚 🎒 X 🖻 💼 🗠 🗠	· [44 🏜 🔁 🗣 🕼 ! « »! 🔲 🖪 🛤 ++ ++ -() 🕾 🕞 그 노 🍂
New network Gal Bit logic Comparator Gorverter For Counter Do DB call	El Contents Of: 'Environment¥Interface'
G Jumps Jinteer function Flating-point fct. G Move G Shift/Rotate G Shift/Rotate G Timers G Word logic FB blocks FC SFB blocks FC SFB blocks FC SFB blocks G SFB blocks G SFB blocks G SFB blocks G SFB blocks Multiple instances Multiple instances Multiple instances	OB1 : "Main Program Sweep (Cycle)" Comment: Comment: Comment: ENFC901 EN

Download all the blocks that have been changed or newly added into PLC.



Firstly SFB53 is processed (REQ=M30.0=true), then SFB52 is processed (REQ=M20.0=true), threrby function code F03 is read and the response data being read is set into DB121.

🗱 LAD/STL/FBD – [@DB121 Untitled¥SIMATIC 300(1)¥CPU 314C-2 PN/DP_ONLINE])								
🖅 Eile Edit Insert PLC Debug View Options Window Help								
	Address Name	Туре	Initial value	Actual value	Conner			
	0.0 Response_Refere	nceBYTE	B#16#0	B#16#01				
	1.0 Response_ID	BYTE	B#16#0	B#16#01				
	2.0 DO_ID	BYTE	B#16#0	B#16#01				
	3.0 No_of_Parameter	BYTE	B#16#0	B#16#01				
	4.0 Format	BYTE	B#16#0	B#16#42				
	5.0 No_of_Values	BYTE	B#16#0	B#16#01				
	6.0 Value	WORD	W#16#0	W#16#05DjC				
		· ·	_					
		Examp F03=0	ple of reading F D5DC Hex(=150	=03: 00)				

3-9 Notes for exchanging interface cards

3-9-1 Notes for exchanging interface cards

The IP address and device name of the card are saved in nonvolatile memory inside. When exchanging interface card mounted in inverter, the IP address and device name change too. Therefore when a malfunction happens on the interface card and it needs to be exchanged, make sure the IP address and device name of interface card are set as the same with those in PLC. To make this exchange job easier, it is recommended to activate the IP address auto assignment function in PLC. The procedure is described later in this chapter.

- Note By using the function described below (IP address auto assignment function in PLC), PLC will automatically assign the former setting information into the new interface card during the card exchange. As a result, system can function normally right after the exchange which makes the field installation work much easier. Therefore it is strongly recommended to activate this function (for both PROFINET-RT/IRT).
- Note It is also recommended to record the IP address and device name after the setting to make the exchange job easier.

3-9-2 Procedure to activate auto assignment function

(1) Setting in PLC

Please carry out step ① and ② to activate auto assignment function.

① Activate [Assign IP address via IO controller] Please carry out following steps in HW Config.

🔀 HW Config - [SIMATIC 300(1) (Configuration) Untitled]		
BN Station Edit Insert PLC View Options Window Help		_ 8 ×
D 🛩 🐂 🦉 🐐 🎒 🛍 🖻	i 🛍 🋍 🚯 🗖 💥 №?	
O UR 1 CPU 3140-2 PNJ XX MP2/OP XX PN-20 XP R Pnet 1 XP R Pnet 2 YS DPU-20116	Etherret(1): PROFINET-DD-System (0.00)	Bachen Brofile Standard Profile Standard Pro
General		
Short description:	OPC-VG1-PNET VG1 PROFINET Option Card, standard, no MRP	
Order No./ firmware:	/ 20.0	
Family:	OPC-VG1-PNET	
Device name:	OPC-VG1-PNET	
GSD file:	GSDML-V225-FujiElectric-OPCVG1PNET-20130620.xml Qhange Release Number	
Nede in RECEINET IO (
	Jystem	
Device number.	1 PROFINE T-IO-System (100)	Check here to activate
IP address:	192.168.0.2 Ethernet.	
✓ Assign IP address	via IO controller	
Comment:		
		_
ОК		

For procedures to move into the window above please refer to [3-6-1 Configuration of PROFINET master device on STEP7].

2 Configuration of PROFINET IO Topology

Move into the configuration window by carring out following steps in HW Config.

🖳 HW Config - [SIMATIC 300(1) (Configuration) Untitl	ed]
🕅 Station Edit Insert PLC View Options Window Help	_ 8 ×
D 😅 💱 🖩 🖏 🎒 🕒 🛍 🏜 🍈 🗔 💥 🕅	
Image: CPU 314C-2 PN/DP X1 MFUDP X2 PN-IO X2 P1 R Part 1 X2 P2 R Part 2 25 DI24/DO16	(1) Right click to show manu (1) Right click to show manu (1) PROFINET-IO-System (100) Profile: Standard Ctrl+C Paste Ctrl+C Paste Shared FRENIC-VG FreeNiC-VG FreeNiC-VG FreeNiC-VG FreeNic T IO System IP addresses PROFINET IO System IP addresses PROFINET IO System IP addresses PROFINET IO Topology Specify Module Delete (2) Click
Table view Graphic view Offline/online comparison	Connect the devices correctly according to the actual connection
Move picture mode deactivated Ogline Update Object Properties OK OK	

Do move into the window above please refer to [3-7-4 PROFINET-IRT configuration on STEP7].

(2) Configuration of inverters

To activate auto assignment function the following procedures are necessary.

① Clear the device name

In default status the device name is empty (0). In the case that device name has already been set pleas carry out the following preocedure to clear the device name. Change the function code o116 from [0] to [2] then to [0] again.

Futhermore there is no need to clear IP address.

By carrying out operations above auto assignment function will be activated.

In case that interface card has to be replaced, the IP address and device name will be automatically assigned by PLC when PROFINET communication is established, therefore system can function normally like before.