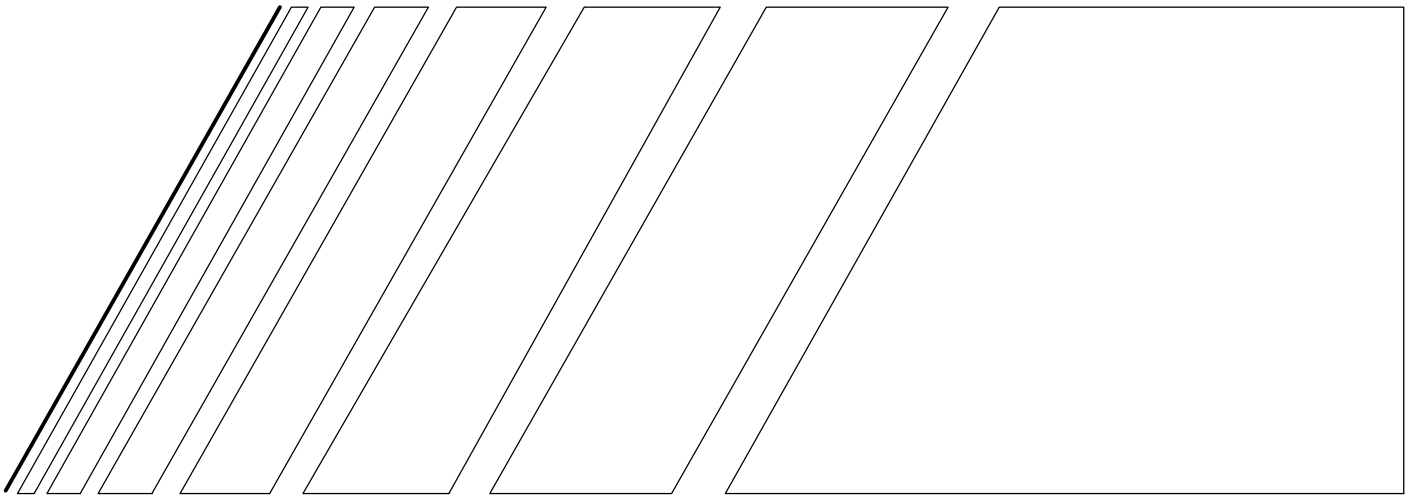
OMRON



USER'S MANUAL

3G3IV-PSIG

Wired SYSMAC BUS Interface Card for SYSDRIVE 3G3FV Inverter

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to the product.

⚠DANGER Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

⚠WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

⚠Caution Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

Thank you for choosing the high-function, general-purpose SYSDRIVE 3G3FV-series Inverter and the dedicated 3G3IV-PSIG Interface Card. This manual provides information on the specifications and operation of the Interface Card used in the wired SYSMAC BUS system to exchange data between the Inverter and a SYSMAC Programmable Controller. Refer to the following manuals for the SYSDRIVE 3G3FV-series Inverter and SYSMAC BUS wired system in detail.

- SYSDRIVE 3G3FV High-function General-purpose Inverter User's Manual (I516-E1-□)
- SYSMAC C-series Rack PCs Wired Remote I/O System Manual (W120-E1-□)

NOTICE

1. This manual describes the functions of the product and relations with other products. You should assume that anything not described in this manual is not possible.
2. Although care has been given in documenting the product, please contact your OMRON representative if you have any suggestions on improving this manual.
3. The product contains potentially dangerous parts under the cover. Do not attempt to open the cover under any circumstances. Doing so may result in injury or death and may damage the product. Never attempt to repair or disassemble the product.
4. We recommend that you add the following precautions to any instruction manuals you prepare for the system into which the product is being installed.
   - Precautions on the dangers of high-voltage equipment.
   - Precautions on touching the terminals of the product even after power has been turned off. (These terminals are live even with the power turned off.)
5. Specifications and functions may be changed without notice in order to improve product performance.

Items to Check when Unpacking

Check the following items when removing the product from the package:

- Has the correct product been delivered (i.e., the correct model number and specifications)?
- Has the product been damaged in shipping?

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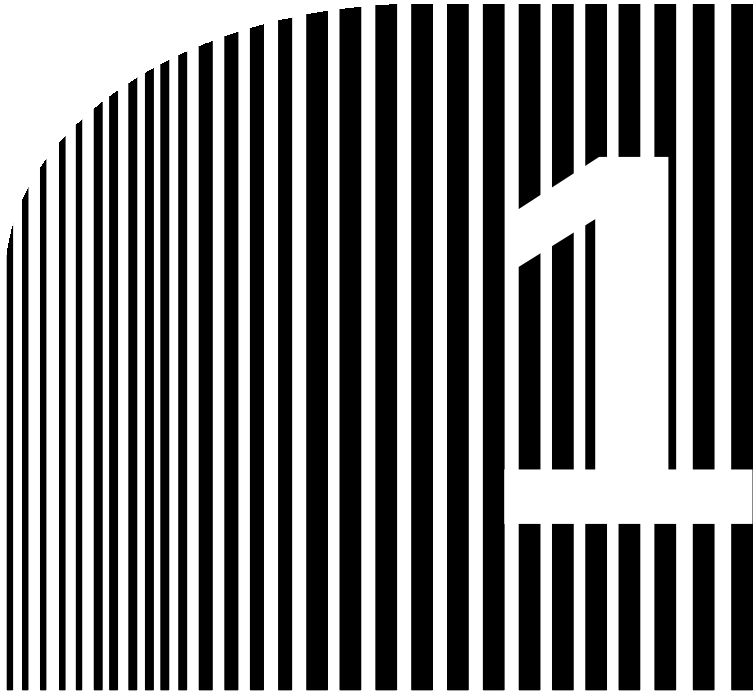


Chapter 1

• Features and System Configuration •

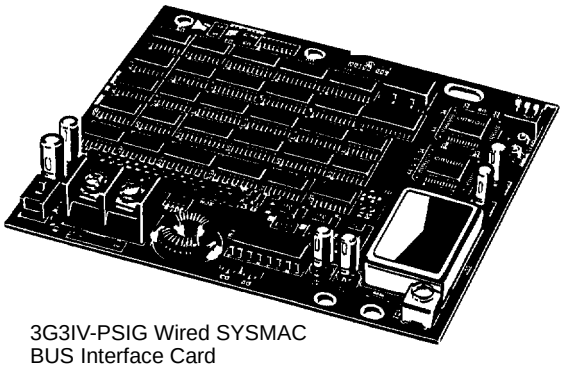
Abbreviations

The following abbreviations are used in this manual.

SYSDRIVE 3G3FV:	SYSDRIVE 3G3FV-series High-function General-purpose Inverter
PC:	SYSMAC C/CV-series Programmable Controller (not including C-series models that cannot be linked with the SYSMAC BUS System)
PSIG:	3G3IV-PSIG SYSMAC BUS (Wired) Interface Card

1-1 Features

The 3G3IV-PSIG (for SYSMAC BUS) is a dedicated communications interface card which makes it possible for the SYSDRIVE 3G3FV to communicate with SYSMAC Programmable Controllers. Installing these interface cards in the SYSDRIVE 3G3FV permits a Programmable Controller to monitor RUN/STOP and operating conditions, and to make changes in set values.



3G3IV-PSIG Wired SYSMAC BUS Interface Card

Program-less Data Exchange

Communications between a Programmable Controller and the SYSDRIVE 3G3FV take place within four words of the PC's IR area, so no special communications program is required. For data communications to be executed automatically, it is only necessary to set the data and the codes for reading and writing in the fixed data area.

Communications with SYSMAC C/CV-series PCs

SYSMAC BUS Wired Remote I/O Systems can be used with either SYSMAC C-series or CV-series Programmable Controllers.

C-series: C200H/HS, C200HX/HG/HE, C500, C1000H, and C2000H

CV-series: CV500, CV1000, CV2000, and CVM1

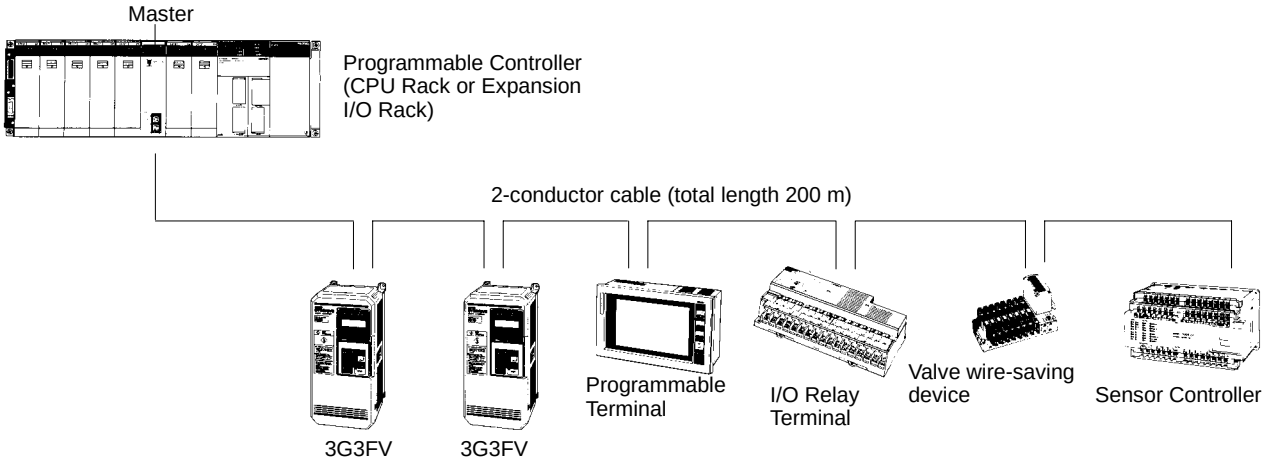
Ample Functions

- The Interface Card makes it possible to make use of all the functions of the Inverter through communications.
- The ample monitoring capability of the Interface Card makes it possible to monitor the operating status and conditions of the Inverter including current, voltage, frequency, power conditions, and errors in detail through communications.

1-2 System Configuration

1-2-1 SYSMAC BUS Wired System

When a PSIG Interface Card is installed, the SYSDRIVE 3G3FV can communicate with Programmable Controllers through 2-wire cable.



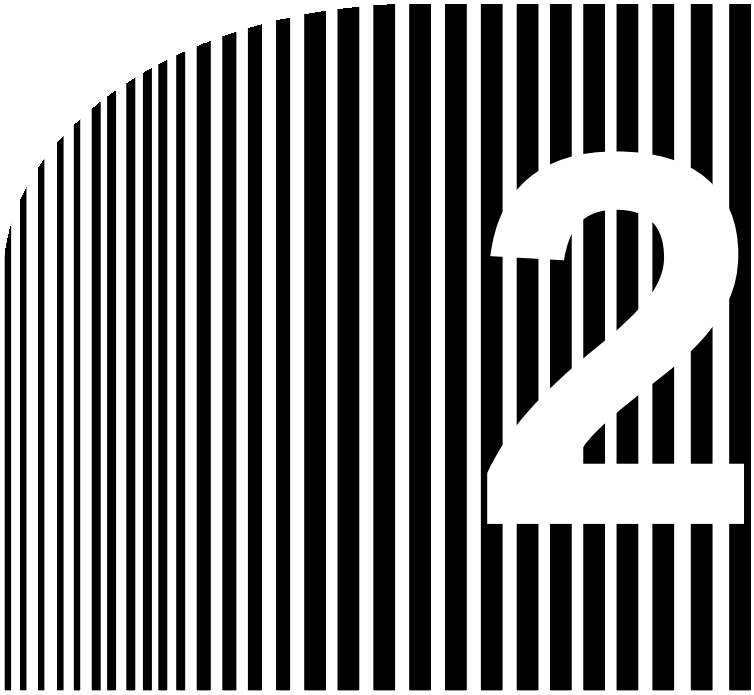
Number of Connectible Inverters

SYSMAC CPU Rack	Master	No. of Inverters per Master	No. of Inverters per CPU Rack	SYSMAC BUS I/O points per CPU Rack
C200H/HS C200HX/HG/HE	C200H-RM201	8 max. (32 words)	8 max.	512 max. (32 words: 200 to 231)
C500	C500-RM201	8 max. (32 words)	8 max.	512 max. (32 words)
C1000H			32 max. (4 Masters)	2,048 max. (128 words)
C2000H				
C2000				
CV500			8 max.	512 max. (32 words)
CV1000/2000 CVM1-CPU11-EV2			16 max. (2 Masters)	1,024 max. (64 words)
CVM1-CPU21-EV2			32 max. (4 Masters)	2,048 max. (128 words)

Note A single SYSDRIVE 3G3FV uses four words.

Communications Specifications

Item	Specifications
Transmission path	2-conductor cable (VCTF0.75 x 2C recommended)
Transmission speed	187.5 kbps
Transmission distance	200 m (total)
Communications method	Two-wire system, half duplex
Synchronization method	Start/stop synchronization

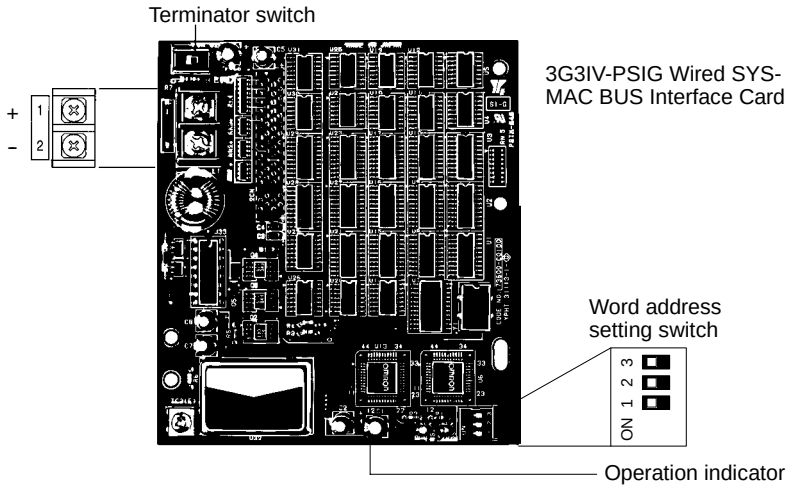


Chapter 2

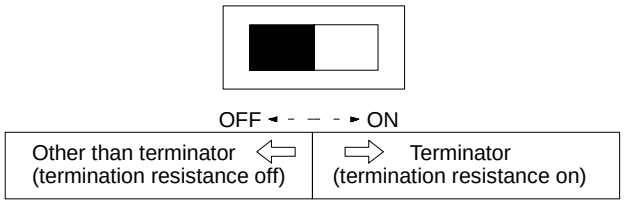
• Wired SYSMAC BUS System Setup •

2-1 Nomenclature and Settings

● Nomenclature



Terminator Switch



Note If the end terminator is not set or if two or more end terminators are provided, the Master will detect an "END RS" and will not operate.

The terminator switch also serves as the termination resistance switch. Set this switch to ON for the Unit connected farthest in line from the Master. (The terminator switch is factory set to OFF.)

Operation Indicators

Display		Function
RUN (green)	Lit	Lit when power is on and PC is in RUN or Monitor Mode.
	Not lit	Transmission error or when PC is in Program Mode.
T/R ERR Transmitting/Error (red)	Blinking	Blinks during normal transmission.
	Lit	Lit while waiting or at time of transmission error.
	Not lit	Off at time of communications CPU Unit error (watchdog timer monitoring error).

Word Number Setting Switch

With the settings for switches 1 to 3, the SYSDRIVE 3G3FV will occupy four words (from n to n+3) as a Slave.

Switch No.			Words occupied				Switch No.			Words occupied			
1 (2^0)	2 (2^1)	3 (2^2)	n	n+1	n+2	n+3	1 (2^0)	2 (2^1)	3 (2^2)	n	n+1	n+2	n+3
OFF	OFF	OFF	0	1	2	3	OFF	OFF	ON	16	17	18	19
ON	OFF	OFF	4	5	6	7	ON	OFF	ON	20	21	22	23
OFF	ON	OFF	8	9	10	11	OFF	ON	ON	24	25	26	27
ON	ON	OFF	12	13	14	15	ON	ON	ON	28	29	30	31

2-2 Installation and Wiring

⚠ **Caution** When installing and wiring a SYSMAC BUS Interface Card, be sure to first turn off the power to the SYSDRIVE 3G3FV and wait for the CHARGE lamp to turn off.

2-2-1 Mounting Precautions

⚠ **WARNING** Do not touch the internal parts of the Inverter, otherwise an electric shock may be received.

⚠ **WARNING** Mount or dismount the Interface Card from the Inverter only after turning off the Inverter, checking that all the indicators of the Inverter are off, and the time specified on the front cover of the has Inverter elapsed, otherwise an electric shock may be received.

⚠ **WARNING** Be sure that the cable is free from damage and excessive force, no heavy objects are placed on the cable, and that the cable is not seized by anything; otherwise an electric shock may be received.

⚠ **Caution** Do not touch the parts of the Interface Card by hand; otherwise generated static electricity may damage the Interface Card.

⚠ **Caution** Be sure that the connector of the Interface Card is securely connected to the Inverter. Improper connection may cause injury, product malfunction or product damage.

2-2-2 Connecting and Setting Precautions

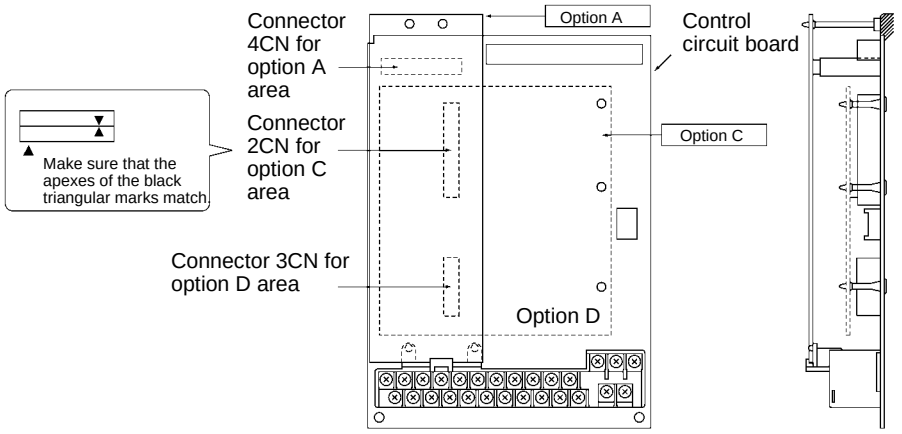
⚠ **Caution** Pay utmost attention when changing settings in the Inverter; otherwise injury or product damage may result.

⚠ **Caution** Do not mount or dismount the Interface Card to or from the Inverter unless the Inverter is turned off; otherwise product damage may result.

⚠ **Caution** The GND line of the Interface Card must be grounded; otherwise noise may be generated and product damage may result.

2-2-3 Mounting Procedure

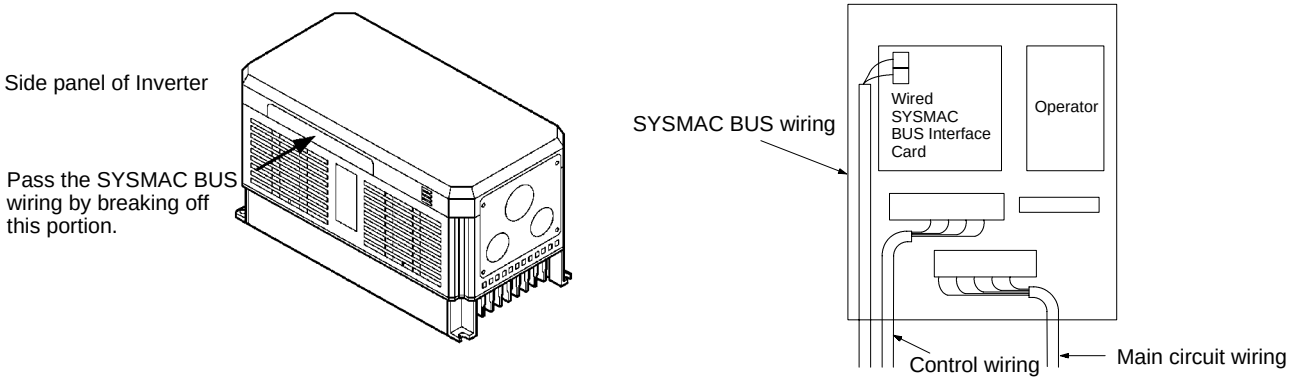
1. Turn off the Inverter, wait for at least one minute (or at least three minutes if the Inverter has an output capacity of 30 kW or more), remove the front cover of the Inverter, and check that the CHARGE indicator is not lit.
2. Mount the Interface Card to the option C area.
3. Insert the provided spacers into the spacer holes on the mounting base of the Inverter.
4. After properly engaging the connectors of the Interface Card and control circuit board, insert the spacers to the spacer holes of the Interface Card, and press the Interface Card until the spacers click.
5. Press the top of the connector 2CN and check that the apexes of the black triangular marks on the side match.
6. Connect the GND wire of the Interface Card to FG terminal 12 (E) on the control circuit board of the Inverter.



Note When the SYSMAC BUS Interface Card is mounted, other Optional Cards cannot be mounted in the C or D area.

2-2-4 Internal Wiring

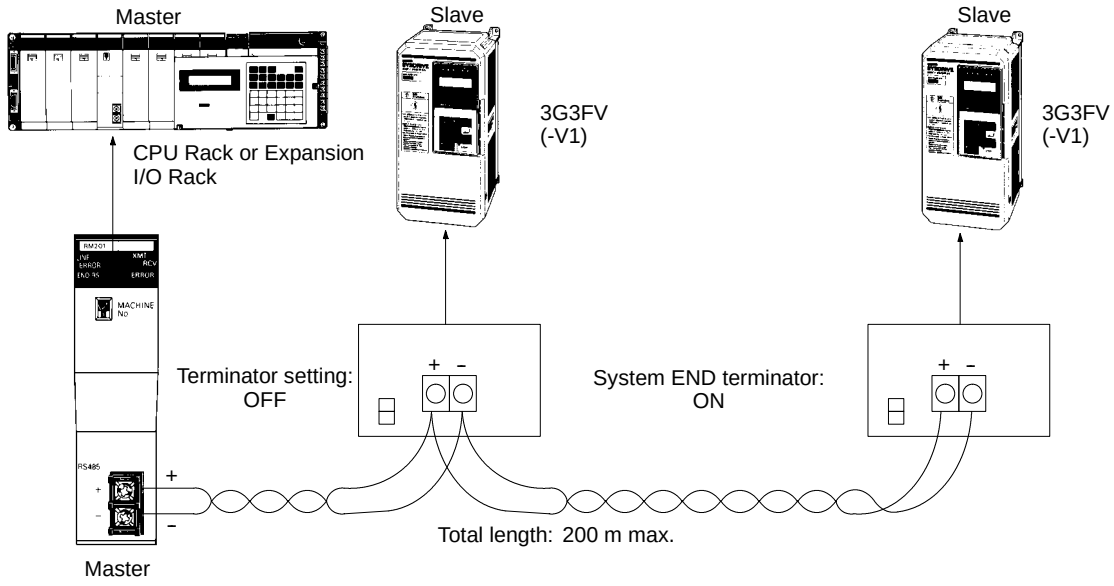
Keep the SYSMAC BUS wiring separated from the main circuit wiring as much as possible. Do not wire them together.



Pass the SYSMAC BUS wiring through the casing by breaking open the side portion of the Inverter casing.

2-2-5 System Wiring

When wiring a SYSMAC BUS Wired System, wire the Slaves in order from the Master of Programmable Controller with 2-conductor cable.



1. Use 0.75 mm^2 x 2C VCTF (vinyl cabtire cable) for Wired SYSMAC BUS Systems.
2. When connecting terminals, be sure to connect plus to plus and minus to minus.
3. Wire the Slaves in order from the Master, and set the last one as the terminator.
4. The maximum overall cable length is 200 meters.
5. It is all right to mix ordinary I/O wiring with power lines, but do not place high-voltage lines or lines with strong current in close proximity to, or parallel with, the SYSDRIVE 3G3FV output wiring.

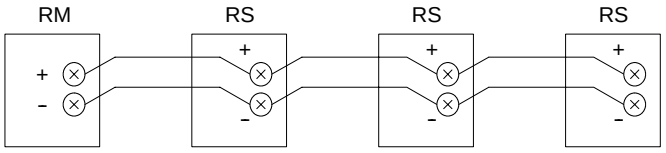
Note Use shielded cable if transmission errors occur due to noise. It is recommended that the shield of the shielded cable be grounded at a single point on the Master side.

Slave Connections

Wire C500 and C200H Masters to Slaves as shown below.

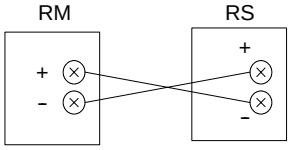
RM: Master
RS: Slave or Slave Rack (including 3G3IV-PSIG Interface Card)

Correct Connection Example

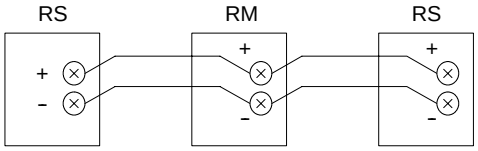


Connect Slaves in order from the Master.

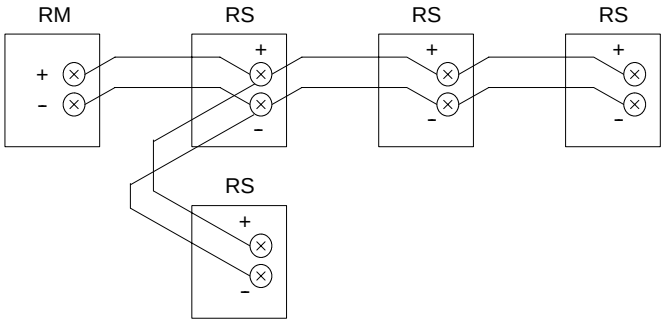
Incorrect Connection Examples



Do not cross plus and minus terminals.



No more than one Slave can be directly connected to a single Master.

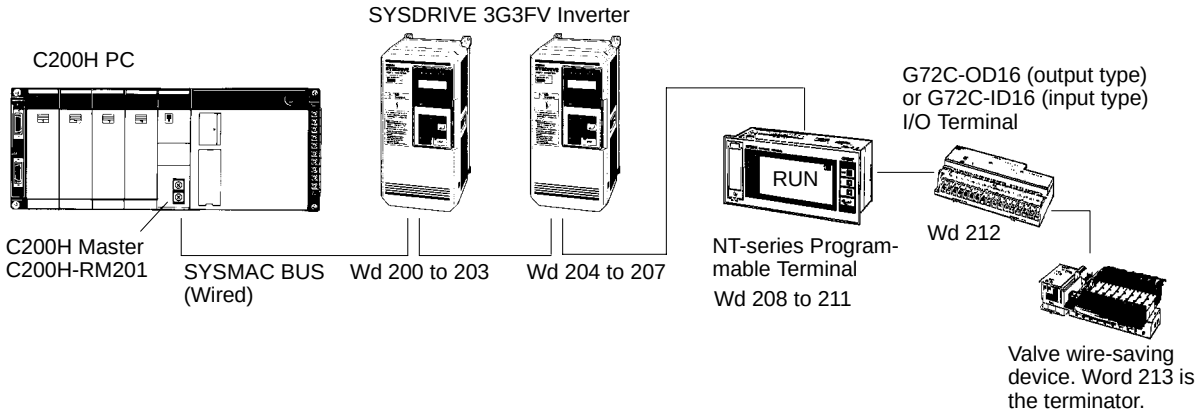


There can be no branching from a Slave.

2-3 System Settings

Each SYSDRIVE 3G3FV occupies four Programmable Controller I/O words. Set the words with the word number setting switches on the Wired SYSMAC BUS Interface Card. Be careful not to overlap SYSDRIVE 3G3FV word numbers with the word numbers occupied by other Slaves.

2-3-1 System Configuration Example



Number of Words Occupied

SYSDRIVE 3G3FV: 4
Programmable Terminal: 4
I/O Terminal: 1
Valve wire-saving device: 1

2-3-2 Relationship between Switches and Words Occupied

The correlation between switches and the words they occupy are summarized in the following tables.

C200H/HS, C200HX/HG/HE

Switch No.			Words occupied				Switch No.			Words occupied			
1	2	3	n	n+1	n+2	n+3	1	2	3	n	n+1	n+2	n+3
OFF	OFF	OFF	200	201	202	203	OFF	OFF	ON	216	217	218	219
ON	OFF	OFF	204	205	206	207	ON	OFF	ON	220	221	222	223
OFF	ON	OFF	208	209	210	211	OFF	ON	ON	224	225	226	227
ON	ON	OFF	212	213	214	215	ON	ON	ON	228	229	230	231

C500

Switch No.			Words occupied				Switch No.			Words occupied			
1	2	3	n	n+1	n+2	n+3	1	2	3	n	n+1	n+2	n+3
OFF	OFF	OFF	0	1	2	3	OFF	OFF	ON	16	17	18	19
ON	OFF	OFF	4	5	6	7	ON	OFF	ON	20	21	22	23
OFF	ON	OFF	8	9	10	11	OFF	ON	ON	24	25	26	27
ON	ON	OFF	12	13	14	15	ON	ON	ON	28	29	30	31

C1000H/C2000H

Switch No.			Base No. 0				Base No. 1				Base No. 2				Base No. 3			
1	2	3	n	n+1	n+2	n+3	n	n+1	n+2	n+3	n	n+1	n+2	n+3	n	n+1	n+2	n+3
OFF	OFF	OFF	0	1	2	3	32	33	34	35	64	65	66	67	96	97	98	99
ON	OFF	OFF	4	5	6	7	36	37	38	39	68	69	70	71	100	101	102	103
OFF	ON	OFF	8	9	10	11	40	41	42	43	72	73	74	75	104	105	106	107
ON	ON	OFF	12	13	14	15	44	45	46	47	76	77	78	79	108	109	110	111
OFF	OFF	ON	16	17	18	19	48	49	50	51	80	81	82	83	112	113	114	115
ON	OFF	ON	20	21	22	23	52	53	54	55	84	85	86	87	116	117	118	119
OFF	ON	ON	24	25	26	27	56	57	58	59	88	89	90	91	120	121	122	123
ON	ON	ON	28	29	30	31	60	61	62	63	92	93	94	95	124	125	126	127

CVM1/CV500/CV1000/CV2000

In the SYSMAC BUS Remote I/O Relay Area, each Master (#0 to #7) is allocated 32 words, beginning with word 2300, as the default (initial value).

Master address	RM0	RM1	RM2	RM3	RM4	RM5	RM6	RM7
Words allocated	2300 to 2331	2332 to 2363	2364 to 2395	2396 to 2427	2428 to 2459	2460 to 2491	2492 to 2523	2524 to 2555

Master Addresses

Master addresses are assigned automatically, in the order in which the Masters are mounted (including the setting order of Rack numbers), at the time of I/O table creation or I/O table editing. For the CV500, addresses are only allocated for Masters #0 to #3 (words 2300 to 2427).

Switch No.			RM0				RM1				RM2			
1	2	3	n	n+1	n+2	n+3	n	n+1	n+2	n+3	n	n+1	n+2	n+3
OFF	OFF	OFF	2300	2301	2302	2303	2332	2333	2334	2335	2364	2365	2366	2367
ON	OFF	OFF	2304	2305	2306	2307	2336	2337	2338	2339	2368	2369	2370	2371
OFF	ON	OFF	2308	2309	2310	2311	2340	2341	2342	2343	2372	2373	2374	2375
ON	ON	OFF	2312	2313	2314	2315	2344	2345	2346	2347	2376	2377	2378	2379
OFF	OFF	ON	2316	2317	2318	2319	2348	2349	2350	2351	2380	2381	2382	2383
ON	OFF	ON	2320	2321	2322	2323	2352	2353	2354	2355	2384	2385	2386	2387
OFF	ON	ON	2324	2325	2326	2327	2356	2357	2358	2359	2388	2389	2390	2391
ON	ON	ON	2328	2329	2330	2331	2360	2361	2362	2363	2392	2393	2394	2395

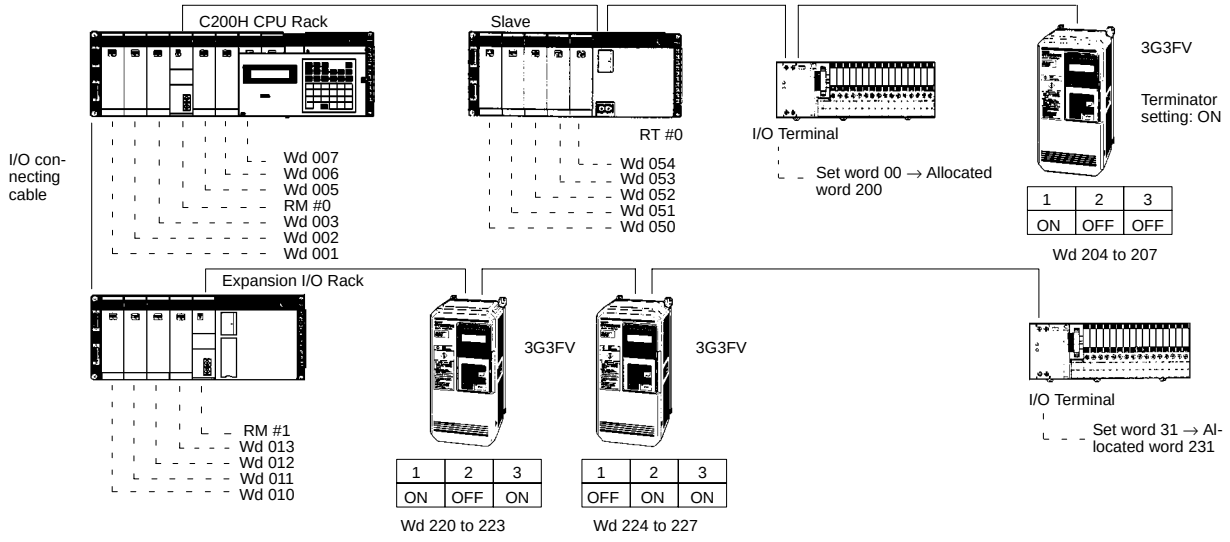
Switch No.			RM3				RM4				RM5			
1	2	3	n	n+1	n+2	n+3	n	n+1	n+2	n+3	n	n+1	n+2	n+3
OFF	OFF	OFF	2396	2397	2398	2399	2428	2429	2430	2431	2460	2461	2462	2463
ON	OFF	OFF	2400	2401	2402	2403	2432	2433	2434	2435	2464	2465	2466	2467
OFF	ON	OFF	2404	2405	2406	2407	2436	2437	2438	2439	2468	2469	2470	2471
ON	ON	OFF	2408	2409	2410	2411	2440	2441	2442	2443	2472	2473	2474	2475
OFF	OFF	ON	2412	2413	2414	2415	2444	2445	2446	2447	2476	2477	2478	2479
ON	OFF	ON	2416	2417	2418	2419	2448	2449	2450	2451	2480	2481	2482	2483
OFF	ON	ON	2420	2421	2422	2423	2452	2453	2454	2455	2484	2485	2486	2487
ON	ON	ON	2424	2425	2426	2427	2456	2457	2458	2459	2488	2489	2490	2491

Switch No.			RM6				RM7			
1	2	3	n	n+1	n+2	n+3	n	n+1	n+2	n+3
OFF	OFF	OFF	2492	2493	2494	2495	2524	2525	2526	2527
ON	OFF	OFF	2496	2497	2498	2499	2528	2529	2530	2531
OFF	ON	OFF	2500	2501	2502	2503	2532	2533	2534	2535
ON	ON	OFF	2504	2505	2506	2507	2536	2537	2538	2539
OFF	OFF	ON	2508	2509	2510	2511	2540	2541	2542	2543
ON	OFF	ON	2512	2513	2514	2515	2544	2545	2546	2547
OFF	ON	ON	2516	2517	2518	2519	2548	2549	2550	2551
ON	ON	ON	2520	2521	2522	2523	2552	2553	2554	2555

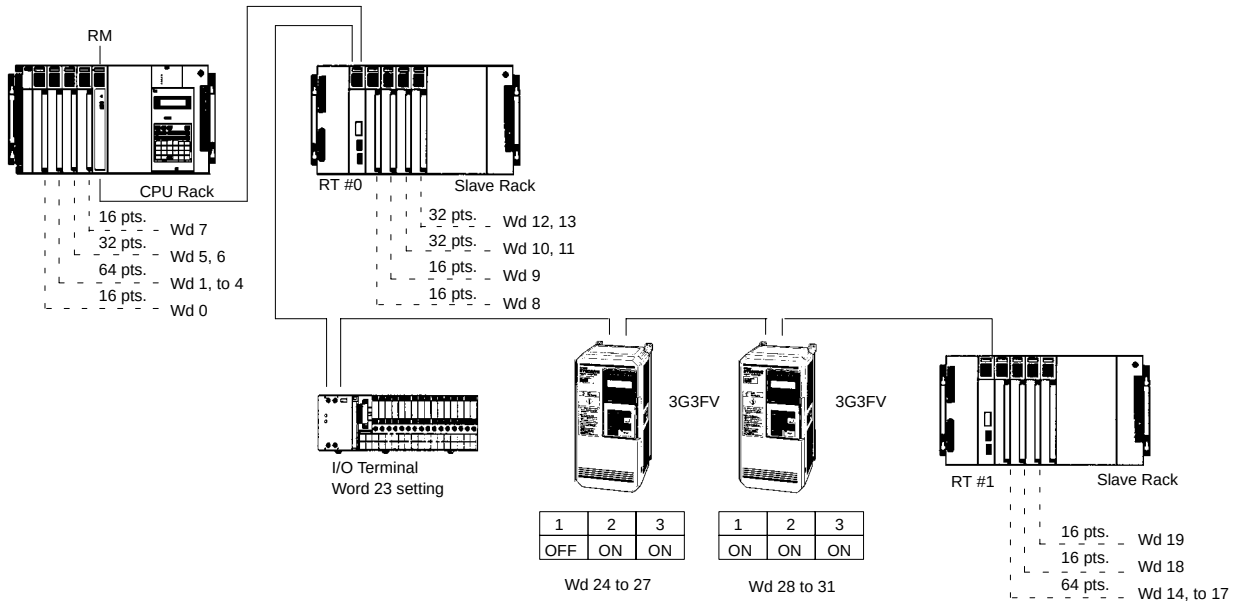
2-3-3 Word Number Setting Example

Setting word numbers is shown in the following illustrations. Settings for the C200H, C120/C500, C1000H/C2000H, and CV500/CV1000 system configurations are provided.

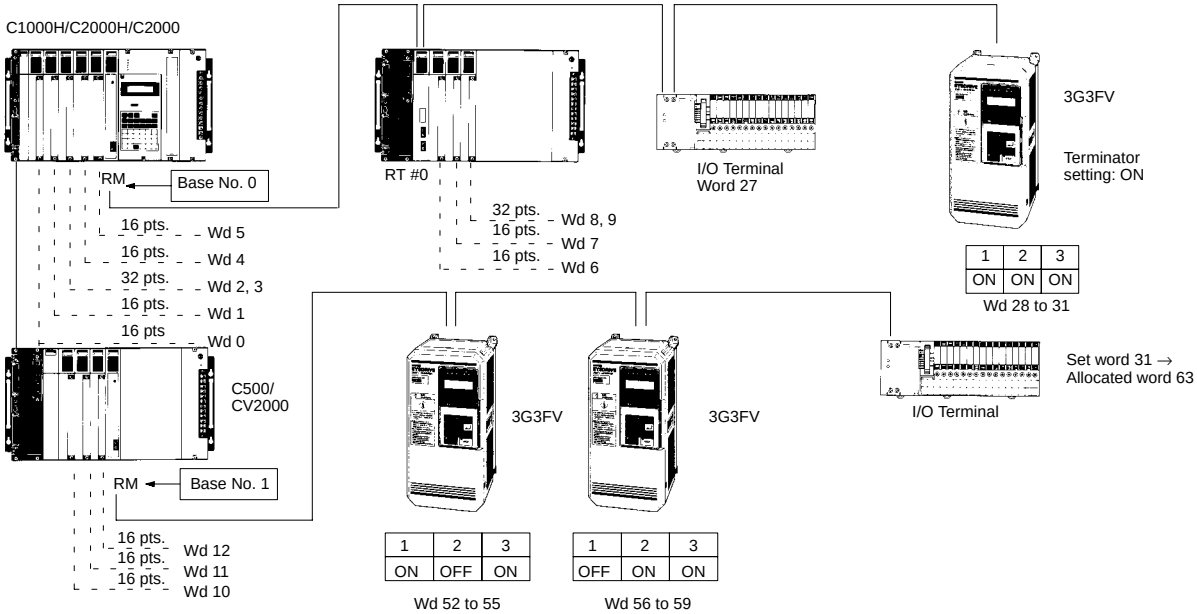
C200H



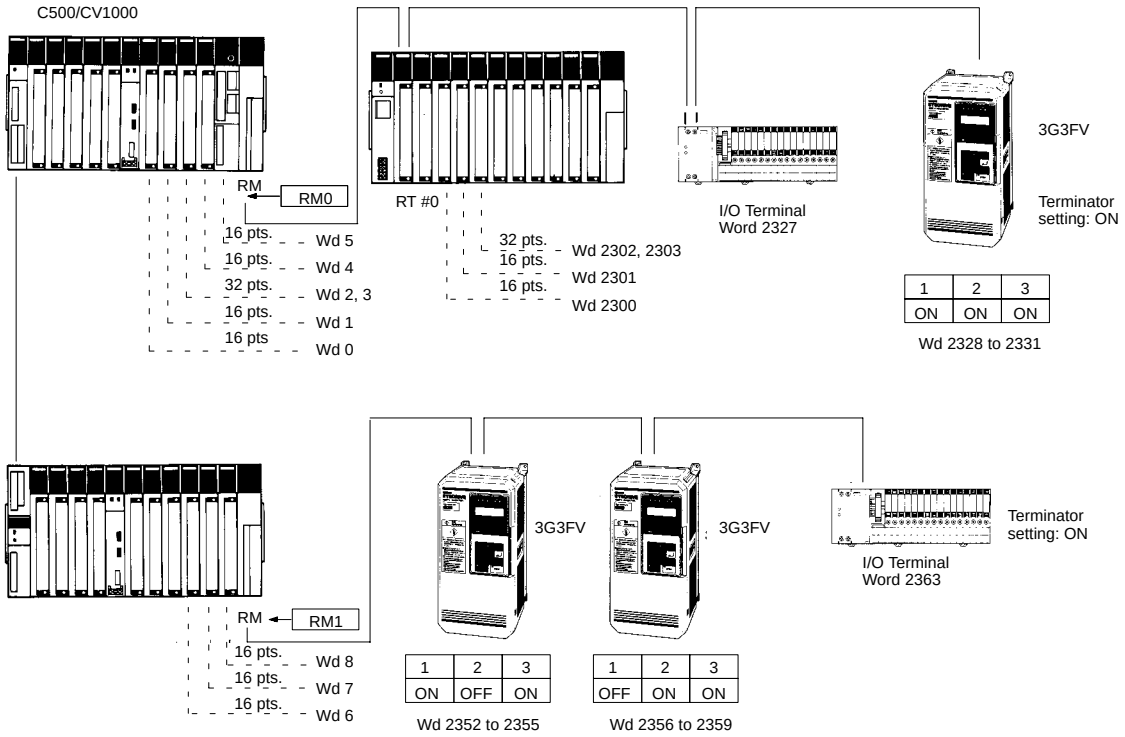
C120/C500



C1000H/C2000(H)



CV500/CV1000



2-3-4 SYSDRIVE Settings

Set the following constants according to the application before the Inverter is in SYSMAC BUS communications.

Note Shaded part in the table indicates the default setting.

■ Frequency Reference Selection

Constant No.		Content		REF indicator of Digital Operator
B1-01	0	D1-01	Frequency reference from D1-01	Not lit
	1	**External terminals**	**Frequency reference from external input**	**Lit**
	2	Do not set (not used)		
	3	Interface Card	Frequency reference from Optional Card (3G3IV-PSIG)	Lit

Set the frequency reference 1 input method.

- **B1-01 = 0**
  Frequency reference 1 (D1-01) is enabled.
  Frequency reference 1 can be set to D1-01 through communications.
- **B1-01 = 1**
  Control circuit analog input terminal is enabled.
  Frequency reference 1 is not set through communications and D1-01 is disabled.

- **B1-01 = 3**
  Frequency reference is set only through communications.
  (Data codes 65/E5 and 66/E6 are enabled. However, D1-01 is disabled.)
- **B1-01 = 2**
  Not used.

Note This setting enables frequency reference 1 only.
Frequency reference can be set for frequency references 2 to 8 through communications and Digital Operator without B1-01.

■ Inverter Run Command Selection

Constant No.		Content		SEQ indicator of Digital Operator
B1-02 Run Source Sel.	0	Digital Operator	Operation command from Digital Operator	Not lit
	1	**External terminals**	**Operation command from external input**	**Lit**
	2	Do not set (not used)		
	3	Communications	Operation command through communications	Lit

Select the Digital Operator, external input, or communications as the input means of operation commands.

Relationship between B1-02 and Communications

Function	B1-02 constant			
	0	1	2	3
FWD RUN/STOP (on: FWD RUN)	Disabled	Disabled	---	Enabled
REV RUN/STOP (on: REV RUN)	Disabled	Disabled	---	Enabled
Multi-function inputs 1 to 6 (see note)	Enabled	Enabled	---	Enabled
Read monitor (U1-01 to U1-28)	Enabled	Enabled	---	Enabled
Read constant	Enabled	Enabled	---	Enabled
Write constant	Enabled	Enabled	---	Enabled

Note There is a logical OR relationship between multi-function inputs 1 to 6 of communications and external inputs 3 to 8.

■ Operation Detected Communications Error

This is a new constant for the SYSMAC BUS and “E-15 Det Sel” is displayed.

Constant No.		Content	Inverter condition	Fault output
F8-01	0	Deceleration stop using C1-02 time	Error	Yes
	1	Coast to stop	Error	Yes
	2	Deceleration stop using C1-09 time	Error	Yes
	3	Continue operation (see note)	Minor error	No

Take the appropriate action according to the application to remedy the error.

Note When set to “Continue operation,” the Inverter itself will continue to operate. Therefore, provide other means such as a limit switch or emergency switch to secure safety.

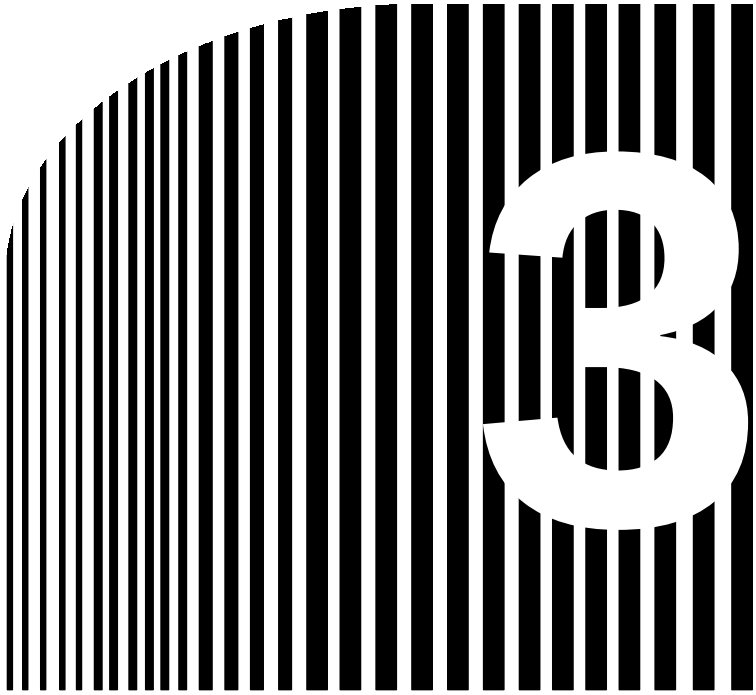
2-4 Power Supply Operation Procedure

1. Turn on the power to the SYSDRIVE 3G3FV and other Slaves.
2. Turn on the power at the CPU Rack where the Master is mounted.
3. Create the I/O table at the Programmable Controller. For C1000H and C2000(H) PCs, set the base numbers.
4. Confirming Data Reception and CALL Message
   After turning the Inverter on, transmit a data code other than “00” to the Inverter so that the Inverter can check the readiness of the transmission line and that of the host control equipment. The Inverter will continue to display the message “CALL” and the user will not be able to control the Inverter if no data code is transmitted.

   CALL Message
   After the Inverter is turned on, the Inverter waits for a data code other than “00” in order to prepare for proper communications with the host control equipment. During this period, the Inverter displays the message “CALL” and is on stand-by. Upon receipt of a data code other than “00”, the Inverter will automatically cancel the CALL status and the frequency reference will be displayed.

Note 1. If any constant of the Inverter is changed from the Digital Operator, be sure to press the Menu Key and then the Enter Key to reset the Inverter to drive mode. The Inverter will not operate unless the Inverter is in Drive mode.

Note 2. Creation of the I/O table or setting of the base numbers will become necessary only when the SYSMAC BUS system is used for the first time.



Chapter 3

• Communications Functions of Inverter •

3-1 SYSDRIVE Communications Data

The following provides information on data to be exchanged between the Inverter and SYSMAC Programmable Controller (PC).

3-1-1 Outline of SYSMAC BUS Communications Data

■ Words Occupied by the Inverter

The Inverter as a Slave occupies four I/O words of the PC in the wired SYSMAC BUS system.

I/O	Word	Bit	
		15 to 8	7 to 0
Output: PC to Inverter	n	Run command	Data code
	n+1	Write data	
Input: Inverter to PC	n+2	Inverter status	Data code
	n+3	Read data	

Note The word number setting switch of the Interface Card is used for setting words n through n+3. Refer to page 2-2, *Word Number Setting Switch*, for details.

■ Inverter Run Commands (PC to 3G3FV)

By turning each bit of the allocated word of the PC on and off, each Run command of the Inverter can be transmitted.

Word	Bit	Description	
Wd n	15	Multi-function input 6	(Default: Baseblock NO by H1-06) (see note 1)
	14	Multi-function input 5	(Default: Jog frequency ref. by H1-05) (see note 1)
	13	Multi-function input 4	(Default: Multi-step speed ref. 2 by H1-04) (see note 1)
	12	Multi-function input 3	(Default: Multi-step speed ref. 1 by H1-03) (see note 1)
	11	Multi-function input 2	(Default: Fault reset by H1-02) (see note 1)
	10	Multi-function input 1	(Default: External fault by H1-01) (see note 1)
	9	REV RUN/STOP	1: REV RUN 0: STOP (see note 2)
	8	FWD RUN/STOP	1: FWD RUN 0: STOP (see note 2)

Note 1. There is an OR relationship between multi-function inputs 1 through 6 via the communications and external control terminals 3 though 8.

Note 2. Settings in bits 9 and 8 will be valid if B1-02 for Run command selection is set to 3.

■ Inverter Status (3G3FV to PC)

Inverter status transmitted from the Inverter can be checked with the PC through the on/off condition of each allocated bit.

Word	Bit	Description	
Wd n+2	15	Multi-function output 2	(Default: Desired freq. agree 1 by H2-03)
	14	Multi-function output 1	(Default: Zero speed by H2-02)
	13	Multi-function contact output	(Default: During RUN by H2-01)
	12	Data setting error	(ON: Data link status error) (see note 1)
	11	Fault	1: Fault 0: Normal
	10	Inverter ready	1: Ready to operate 0: Not ready to operate (see note 2)
	9	FWD/REV RUN	1: Forward operation 0: Reverse operation
	8	RUN/STOP	1: Running 0: Not operating

Note 1. A data setting error will result if one of data link status bits 1 thorough 5 is set to 1.

Note 2. The Inverter is not ready to operate in the following cases.

- The Inverter is in initial processing operation after the Inverter is turned ON.
- The Inverter is set to program mode or any mode other than drive mode through the Digital Operator.
- The Inverter is in receipt of a constant other than one that can be changed while the Inverter is in operation and the Inverter has not finished writing the constant internally with the Enter command.

3-1-2 Basic SYSMAC BUS Communications

The Inverter's Run command (i.e., eight leftmost bits of word n) and Inverter status (i.e., eight leftmost bits of word n+2) can be transmitted or received by turning each of these bits ON and OFF. The handshake procedure with data codes is, however, required for the transmission and reception of data, such as frequency references, and parameters. The following provides information on data codes and base registers as well as the handshake procedure used for the transmission and reception of data and parameters.

■ Data Codes

A data code is used for writing and reading the data and parameter. The data code used depends on the type of data or parameter and whether such data or parameter is written or read.

Example of C1-01 Acceleration Time 1

Constant	Name	Setting unit	Base register	Data code		Register number
				Reading	Writing	
C1-01	Acceleration Time 1	0.1 s	03	00	80	0200

Note 1. To set data in acceleration time 1, set the data code 80 in the eight rightmost bits of word n.

Word number	15 to 8	7 to 0
n	XX	80
n+1	Data to be set	

Note 2. To read the data of acceleration time 1, set the data code 00.

Note 3. Refer to *3-2 Data Codes and Base Registers* for the data codes of other parameters.

■ Base Registers

Data and parameters are classified into groups according to the function. The base register function makes it possible to select and set these groups. A parameter written or read with a data code will not be processed as desired if the base register is wrong. Before writing or reading a parameter, it is necessary to set the base register of the group to which the parameter belongs.

Example of C1-01 Acceleration Time 1

Constant	Name	Setting unit	Base register	Data code		Register number
				Reading	Writing	
C1-01	Acceleration Time 1	0.1 s	03	00	80	0200

Note 1. Acceleration time 1 belongs to group C□. The base register of group C□ is 03.

Note 2. To set the base register, use the write data code FE.

Word number	15 to 8	7 to 0	
n	XX	FE	← Set the write data code in the eight rightmost bits.
n+1	0003		← Set the base register number 0003.

Note 3. Refer to *3-2 Data Codes and Base Registers* for the data codes of other parameters.

Note 4. No base register setting is required for writing or reading any frequency reference, frequency reference (substitute), or base register, and also not required for reading the data link status or writing the ENTER command.

Note 5. If the parameter to be written or read belongs to the base register that has been set, there will be no need to set the base register again.

■ Handshake

If data is written to I/O words n and n+1, the data will be transmitted to the Inverter through the SYSMAC BUS communications path. When the Inverter receives the data, the Inverter will return the same data to I/O words n+2 and n+3. The data code returned to the eight rightmost bits of word n+2 is the same as the data code written to the eight rightmost bits of word n.

Therefore, by comparing these data codes, proper data transmission and reception can be confirmed.

The data code set in word n is called the output data code and the data code returned to word n+2 is called the input data code.

Write a sequence not to go to the next process until the input data code coincides with the output data code.

Data Written from PC to Inverter

I/O	Word	Bit	
		15 to 8	7 to 0
Output: PC to Inverter	n	Run command	**Data code**
	n+1	**Write data**	
Input: Inverter to PC	n+2	Inverter status	Data code
	n+3	Read data	

Response from Inverter to PC

I/O	Word	Bit	
		15 to 8	7 to 0
Output: PC to Inverter	n	Run command	Data code
	n+1	Write data	
Input: Inverter to PC	n+2	Inverter status	**Data code**
	n+3	**Data received**	

■ Writing/Reading Data

Data items, such as parameter set values, are expressed in hexadecimal with a minimum setting unit of 1. Therefore, the following data conversion is required.

● Conversion of Data to Be Written

The set value divided by the minimum setting unit of the data must be set in hexadecimal.

Example: 5.0 is set for C1-01 acceleration time 1 with a minimum setting unit of 0.1 s.
5.0 ÷ 0.1 = 50 → 0032 (hexadecimal)

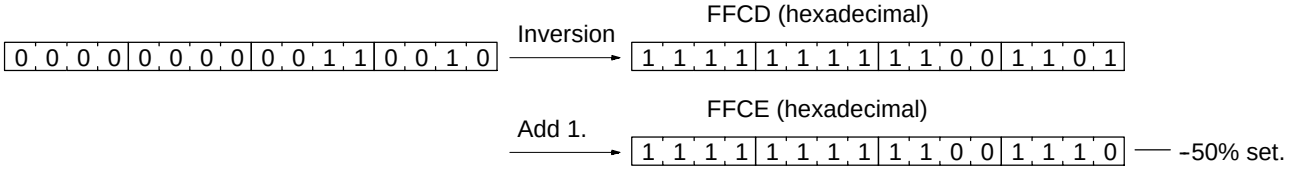
● Conversion of Data to Be Read

The read value must be converted into a decimal value to be multiplied by the minimum setting unit of the data.

Example: The read data of d1-01 frequency reference 1 with a minimum setting unit of 0.01 Hz is 1770 (hexadecimal).
1770 (hexadecimal) → 6000 × 0.01 = 60

Note If the set value is a negative value, the two's complement must be taken.

Example: –50% is set for d5-04 speed limit with a minimum setting unit of 1%.
50 to 0032 (hexadecimal): Convert 50 into a hexadecimal value.
Add 1 after inverting each bit.



3-1-3 Writing Parameters

To write a parameter from the SYSMAC PC to the Inverter, transmit corresponding data using the following three steps.

1. Transmit a corresponding base register.
2. Transmit the write data code of the parameter and the corresponding data to be written.
3. Transmit the Enter command.

At each step, check that the output data code and input data code coincide with each other before going to the next step.

■ Parameter Writing Procedure

1. Base Register Setting
   a) Registers for parameters are classified into groups according to the function. Before setting a parameter, it is necessary to set the base register of the group to which the parameter belongs.
   b) The base register can be set by writing the data code FE and the base register value to words n and n+1 respectively.
   c) When the Inverter receives the data code FE, the same data code is returned to word n+2.
   d) Check that the output data code and input data code coincide with each other.
2. Data Setting
   a) Set the write data code of the parameter and the corresponding data to be written to word n and word n+1 respectively. The data to be written must be set in hexadecimal on condition that the minimum setting unit is 1.
   b) When the Inverter receives the data code and the data to be written, the Inverter returns the same data code and data to words n+2 and n+3.
   c) Check that the output data code and input data code coincide with each other.
3. Enter Command
   a) Set word n to the data code FD for the Enter command and word n+1 to 0000.
   b) When the Inverter receives the Enter command, the Inverter will return the data code FD to word n+2.
   c) Check that the output data code and input data code coincide with each other.
4. End

Note 1. If the parameter to be written belongs to the base register that has been set, there will be no need to set the base register again.

Note 2. The base register value will be set to 00 when the Inverter is turned ON. Therefore, a parameter can be written with no base register setting if the base register of the parameter is 00.

Note 3. The Enter command must be transmitted whenever a parameter is written. The Inverter cannot use the parameter unless the Inverter receives the Enter command. An ENTFLAG error will result if the Inverter does not receive the Enter command within five seconds after receiving the last data item. If more than one parameter is written, the Enter command can be transmitted once after transmitting all the data codes and the corresponding data to be written.

Example of Acceleration Time 1: V1-01 set to 5.0 s

Constant	Name	Setting unit	Base register	Data code		Register number
				Reading	Writing	
C1-01	Acceleration Time 1	0.1 s	03	00	80	0200

1. Set 03 in the base register.

Word number	15 to 8	7 to 0	
n	XX	FE	← Set the write data code in the eight rightmost bits.
n+1	0003		← Set the base register number 0003.

2. Response from Inverter.

The data code received is returned to the eight rightmost bits. →
The set value is returned. →

Word number	15 to 8	7 to 0
n+2	XX	FE
n+3	0003	

3. Acceleration Time 1: Set C1-01 to 5.0 s.

Word number	15 to 8	7 to 0	
n	XX	80	← Set the write data code in the eight rightmost bits.
n+1	0032		← Set the writing data 0032.

5.0 s/0.1 s = 50 (32 hexadecimal)

4. Response from Inverter.

The data code received is returned to the eight rightmost bits. →
The set value is returned. →

Word number	15 to 8	7 to 0
n+2	XX	80
n+3	0032	

5. Enter command transmission.

Word number	15 to 8	7 to 0	
n	XX	FD	← Set the data code in the eight rightmost bits.
n+1	0000		← Be sure to set 0000.

Note An error will result if 0000 is not set.

6. Response from Inverter (data writing completion).

The data code received is returned to the eight rightmost bits. →
The set value is returned. →

Word number	15 to 8	7 to 0
n+2	XX	FD
n+3	0000	

3-1-4 Reading Parameters

To read a parameter from the Inverter, transmit data using the following two steps.

1. Transmit a corresponding base register.
2. Transmit the read data code of the parameter and receive the parameter value.

At each step, check that the output data code and input data code coincide with each other before going to the next step.

■ Parameter Reading Procedure

1. Base Register Setting
   a) Registers for parameters are classified into groups according to the function. Before setting a parameter, it is necessary to set the base register of the group to which the parameter belongs.
   b) The base register can be set by writing the data code FE and the base register value to words n and n+1 respectively.
   c) When the Inverter receives the data code FE, the same data code will be returned to word n+2.
   d) Check that the output data code and input data code coincide with each other.
2. Parameter Setting
   a) Set the read data code of the parameter in word n.
   b) When the Inverter receives the read data code, the Inverter will return the same data code and reading data to words n+2 and n+3.
   c) Check that the output data code and input data code coincide with each other.
3. End

Note 1. If the parameter to be read belongs to the base register that has been set, there will be no need to set the base register again.

Note 2. The base register value will be set to 00 when the Inverter is turned ON. Therefore, a parameter can be read with no further base register setting if the base register of the parameter is 00.

Example of Output Frequency: The data 60.0 Hz is read from U1-02.

Constant	Name	Setting unit	Base register	Data code		Register number
				Reading	Writing	
U1-02	Frequency Reference	0.01 Hz	00	21	---	0021

1. Set 00 in the base register.

Word number	15 to 8	7 to 0	
n	XX	FE	← Set the write data code in the eight rightmost bits.
n+1	0000		← Set the base register number 0000.

2. Response from Inverter.

The data code received is returned to the eight rightmost bits. →
The set value is returned. →

Word number	15 to 8	7 to 0
n+2	XX	FE
n+3	0000	

3. Output Frequency: Read data from U1-02.

Word number	15 to 8	7 to 0
n	XX	21
n+1	XXXX	

← Set the write data code in the eight rightmost bits.

4. Response from Inverter.

The data code received is returned to the eight rightmost bits. →
The set value is returned. →

Word number	15 to 8	7 to 0
n+2	XX	21
n+3	1770	

5. Hexadecimal Data Conversion
1770 Hex → 6,000 x 0.01 = 60.00 Hz

3-2 Data Codes and Base Registers

The registers of the Inverter in communication with the PC are classified into groups according to the function and write and read data codes are set in each group independently.
Before writing data to or reading data from the Inverter in communication, it is necessary to select the group with settings in the base register according to the data and the specified data code must be used.
The following provides information on the data codes and the base register of the Inverter.

3-2-1 Outline of Data Codes

Data codes are used for writing data to or reading data from the registers of the Inverter in communication.
Data codes are classified into the following two main groups.

- Data codes not affected by settings in the base register.
- Data codes that select registers to write or read data according to settings in the base register.

The following table provides brief information on data codes.

Data code			Description	Influence of base register
Reading data	0	0	Read data codes for each register	Registers are selected according to settings in the base register.
	to			
	6	3		
	to		Not used	The data codes are not affected by settings in the base register.
	6	5	Frequency reference	
	6	6	Frequency reference (substitute)	
	to		Not used	
	6	9	Data link status	
	to		Not used	
	7	E	Base register	
	to		Not used	
Writing data	8	0	Write data codes for each register	Registers are selected according to settings in the base register.
	to			
	E	3		
	to		Not used	The data codes are not affected by settings in the base register.
	E	5	Frequency reference	
	E	6	Frequency reference (substitute)	
	to		Not used	
	F	D	Enter command (written to EEPROM)	
	F	E	Base register	
	to		Not used	

Note 1. The MSB of a data code indicates data writing or reading.

Bit No.	07	06 to 00
Description	0: Read 1: Write	A code indicating the register.

Note 2. The frequency reference and frequency reference (substitute) are written to the same register. The previous frequency reference data in the register is overwritten by new frequency reference data. Two data codes are prepared for data handling.

3-2-2 Outline of Base Register

The registers of the Inverter are classified into groups according to the function.
Before writing data to or reading data from a register, it is necessary to set in the base register the group to which the register belongs.
The base register keeps the data unless the data is overwritten. Therefore, there is no need to write the data of the same group again until a new group must be selected.

Base Register Data Codes

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
---	Basic Register	---	7E	FE	1	00 to 09	00	Yes	Yes	Yes	Yes	Yes

Note The base register is a dedicated register used for SYSMAC BUS communications, and the data setting of the base register is not possible with the Digital Operator. Be sure to set the base register through communications.

Base Register Settings

Base register setting	Data code		Meaning
	Reading	Writing	
00	00 to 0F	80 to 8F	Command
	10 to 1F	90 to 9F	Status
	20 to 3F	A0 to BF	Monitor
	40 5F	C0 to DF	User constants (Constants set in A2-01 through A2-32 by the user).
01	00 to 63	80 to E3	Environment setting constants: AX-XX
02	00 to 63	80 to E3	Application constants: BX-XX
03	00 to 63	80 to E3	Tuning constants: CX-XX
04	00 to 63	80 to E3	Reference constants: DX-XX
05	00 to 63	80 to E3	Motor constants: EX-XX
06	00 to 63	80 to E3	Options constant: FX-XX
07	00 to 63	80 to E3	Remote terminal function constants: HX-XX
08	00 to 63	80 to E3	Protective function constants: LX-XX
09	00 to 63	80 to E3	Operator constants: OX-XX
XX	64 to 7F	E4 to FF	Data codes not affected by settings in the base register.

3-2-3 Enter Command

The Enter command instructs the Inverter in SYSMAC BUS communications to use data received from the PC as operation data. The transmission of the Enter command is not required by any frequency reference, base register, or command group of base register number 00. Be sure to transmit the Enter command, however, for any data that requires the Enter command. If more than one data item is written, the Enter command can be transmitted once at the end of the transmission of all data items.

Enter Command Data Codes

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
---	Enter Command (Written to EEPROM)	---	---	FD	---	0000	---	Yes	Yes	Yes	Yes	Yes

Note 1. Be sure to set the writing data 0000 for the transmission of the Enter command.

Note 2. The Enter command can be transmitted while the Inverter is running. An error, however, will result if the set data is a type of data that must not be transmitted while the Inverter is running.

Note 3. When the Enter command is transmitted, the 3G3FV will write data to the EEPROM. Since the number of writing operations is limited to 100,000 times, it is recommended that the number of Enter command transmissions be minimized.

3-2-4 Frequency Reference in SYSMAC BUS Communications

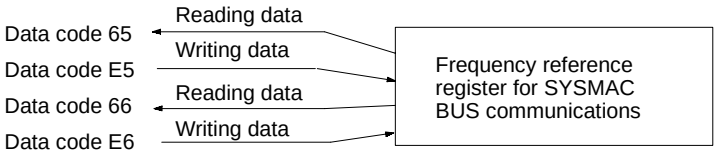
A frequency reference is used with the PC in SYSMAC BUS communications to set the output frequency of the Inverter. The frequency reference will be available only if B1-01 is set to 3.

Frequency Reference Data Codes

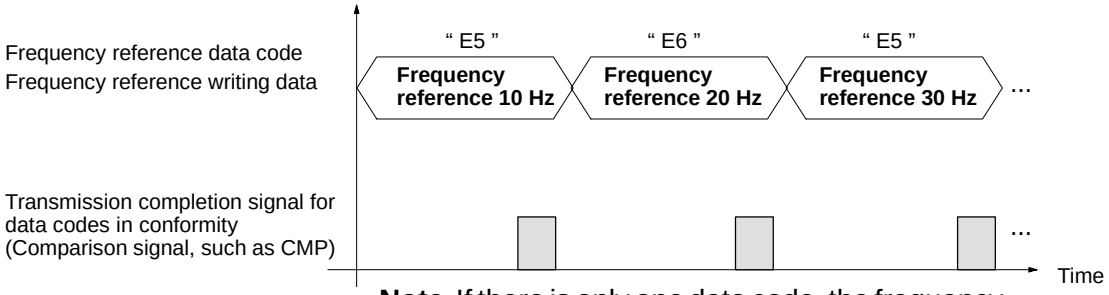
Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
---	Frequency Reference	---	65	E5	0.01 Hz (see note)	0.00 to max. frequency	0.00	Yes	Yes	Yes	Yes	Yes
---	Frequency Reference (Sub)	---	66	E6			0.00	Yes	Yes	Yes	Yes	Yes

Note The setting unit of the frequency reference can be changed in o1-03. The default value is 0.01 Hz.

- A frequency reference and frequency reference (substitute) are written to a single register and there is no difference in function between the frequency reference and frequency reference (substitute).



A single register has two data codes to handle frequency references. There will be no need to use the two data codes if the frequency references are not handled.



Note If there is only one data code, the frequency references can be handled only once.

- A frequency reference and frequency reference (substitute) are dedicated registers for communications use. They cannot be set through the Digital Operator or analog input terminal unless changes in settings in B1-01 are made.
- The Enter command is not required for the data code E5 or E6 used for writing frequency references. The Inverter takes these codes and data as operation data right after they are written.

Frequency References for Multi-speed Operations

The dedicated register of frequency references and frequency references (substitute) will be treated as frequency reference 1 if the Inverter is in multi-speed operation. Frequency references 2 through 8 (i.e., d1-02 through d1-08) of the Inverter in multi-speed operation are valid and work like those used by the Inverter in single-speed operation. The data in frequency reference 1 (i.e., d1-01) will be ignored if the Inverter is in multi-speed operation.

Frequency Reference Setting from Digital Operator (with B1-01 set to 0)

Even if B1-01 is set to 0 in the Inverter controlled by the Digital Operator, the frequency reference control of the Inverter will be possible by setting frequency reference 1 (i.e., d1-01) to appropriate data through SYSMAC BUS communications. The transmission of the Enter command is required to write data in frequency reference 1 (i.e., d1-01).

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
d1-01	Frequency Reference 1	04	00	80	0.01 Hz (see note)	0.00 to max. frequency	6.00	Yes	Yes	Yes	Yes	Yes

Note 1. The setting unit of frequency references can be changed in o1-03. The default value is 0.01 Hz.

Note 2. When frequently changing the frequency reference, it is recommended that the E5 frequency reference or E6 frequency reference (sub) be used. If “di-01”is changed, an Enter command will need to be transmitted. Since the Enter command is written to the EEPROM each time, repeated transmission of the Enter command will cause the EEPROM to reach its writing limit of 100,000 times.

3-2-5 Inverter Monitoring

The Inverter has registers for a variety of monitor items, such as the Inverter’s SYSMAC BUS communications, I/O status, I/O data, and details of errors. Monitor them whenever required according to the application.

● Data Link Status Monitor

The data link status monitor is used for monitoring the condition of the SYSMAC BUS communications between the Inverter and PC, and also displays communications errors.

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data					V/f control	V/f with PG	Open loop vector	Flux vector
---	Data Link Status	---	69	---	---	---	---	Yes	Yes	Yes	Yes	Yes

Note The data link status is a dedicated monitor used for monitoring communications, which is not available to the Digital Operator except for displaying communications errors.

Data Link Status in Details

Bit No.	Name	Display	Description
0	During data write processing	BUSY	Turns ON by attempting to write the next data when the previous data, such as a constant, has not been processed yet.
1	Write Mode Error	WRITE ERR	Turns ON by attempting to write data when the Inverter cannot accept the data due to the following: • Undervoltage is detected on the main circuit. • EEPROM failure has resulted with CPF03 detected (initialization possible). • The data is a write-prohibited constant. • The data is a constant that cannot be written while the Inverter is running.
2	Data Code Error	DADR ERR	Turns ON if an unregistered data code for data writing or reading is received.
3	Setting Range Error A	DATA ERR	Turns ON if writing data is received outside of the setting range.
4	Setting Range Error B	OPE ERR	Turns ON if writing data causing one of the operational errors OPE01 through OPE11 (adjustment error) is received (see note).
5	EEPROM Write Error	EEP ERR	Turns ON if the EEPROM of the Inverter has an fault with CPF03 resulting.
6	Enter Command Not Received	ENTFLAG	Turns ON if the Enter command is not received within 5 s after data is written.
7 to 15	Not Used	---	The data 0 is output.

Note For OPE01 through OPE11, refer to *Chapter 8 Maintenance Operations* of the *SYSDRIVE 3G3FV User's Manual (I516)*.

• Data Monitors: U1-□□

The data of the data monitor U1-□□ of the Inverter in SYSMAC BUS communications can be read. This monitor can be checked with the Digital Operator. Refer to the *SYSDRIVE 3G3FV User's Manual (I516)* for details.

Constant	Name	Base register	Data code		Unit	Data reading during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
U1-01	Frequency Reference	00	20	---	0.01 Hz (set in o1-03)	Yes	Yes	Yes	Yes	Yes
U1-02	Output Frequency		21	---	0.01 Hz (set in o1-03)	Yes	Yes	Yes	Yes	Yes
U1-03	Output Current		22	---	2000 hexadecimal (8192 decimal) Rated output current of Inverter	Yes	Yes	Yes	Yes	Yes
U1-04	Control Method		23	---	1 (set in A1-02)	Yes	Yes	Yes	Yes	Yes
U1-05	Motor Speed		24	---	0.01 Hz (set in o1-03)	Yes	No	Yes	Yes	Yes
U1-06	Output Voltage		25	---	0.1 V	Yes	Yes	Yes	Yes	Yes
U1-07	Main Circuit DC Voltage		26	---	1 V	Yes	Yes	Yes	Yes	Yes
U1-08	Output Power		27	---	0.1 kW	Yes	Yes	Yes	Yes	Yes

Constant	Name	Base register	Data code		Unit	Data reading during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
U1-09	Torque Reference	00	28	---	0.1% (100%: Motor rated torque)	Yes	No	No	Yes	Yes
U1-10	Input Terminal Status		29	---	See note 2	Yes	Yes	Yes	Yes	Yes
U1-11	Output Terminal Status		2A	---	See note 3	Yes	Yes	Yes	Yes	Yes
U1-12	Internal control status		2B	---	See note 4	Yes	Yes	Yes	Yes	Yes
U1-13	Elapsed Time		2C	---	1 hour	Yes	Yes	Yes	Yes	Yes
U1-14	FLASH ID Software No.		2D	---	1	Yes	Yes	Yes	Yes	Yes
U1-15	Terminal 13 Level		2E	---	0.1% (100%: 10-V input)	Yes	Yes	Yes	Yes	Yes
U1-16	Terminal 14 Level		2F	---	0.1% (100%: 20-mA input)	Yes	Yes	Yes	Yes	Yes
U1-17	Terminal 16 Level		30	---	0.1% (100%: 10-V input)	Yes	Yes	Yes	Yes	Yes
U1-18	Motor Secondary Current		31	---	0.1% (100%: Motor rated current)	Yes	No	No	Yes	Yes
U1-19	Motor excitation current		32	---	0.1% (100%: Motor rated current)	Yes	No	No	Yes	Yes
U1-20	Output Frequency After a Soft Start		33	---	0.01 Hz (set in o1-03)	Yes	Yes	Yes	Yes	Yes
U1-21	Input to speed control loop		34	---	0.01% (100%: Maximum frequency)	Yes	No	Yes	No	Yes
U1-22	Output from Speed Control Loop		35	---	0.1% (100%: Motor rated current)	Yes	No	Yes	No	Yes
U1-23	Speed Deviation		36	---	0.01% (100%: Maximum frequency)	Yes	No	Yes	No	Yes
U1-24	PID Feedback		37	---	0.01% (100%: Maximum frequency)	Yes	Yes	Yes	Yes	Yes
U1-25	Command Value from 3G3VF-PDI16H2		38	---	Each corresponding bit displayed as it is.	Yes	Yes	Yes	Yes	Yes
U1-26	Voltage Reference for Secondary Current		39	---	0.1 V	Yes	No	No	Yes	Yes
U1-27	Voltage Reference for Excitation Current		3A	---	0.1 V	Yes	No	No	Yes	Yes
U1-28	CPU ID		3B	---	1	Yes	Yes	Yes	Yes	Yes

Note 1. The transmission of the Enter command is not required to read the monitor data of the Inverter.

Note 2. I/O Terminal Status Monitor: U1-10

Bit No.	Content
0	FWD RUN/STOP (1: Input)
1	REV RUN/STOP (1: Input)
2	Multi-function input 1 (1: Input)
3	Multi-function input 2 (1: Input)
4	Multi-function input 3 (1: Input)
5	Multi-function input 4 (1: Input)
6	Multi-function input 5 (1: Input)
7	Multi-function input 6 (1: Input)
8 to 15	Not used

Note 3. Output Terminal Status Monitor: U1-11

Bit No.	Content
0	1: Terminal 9 and 10 short
1	1: Terminal 25 and 27 short
2	1: Terminal 26 and 27 short
3	Not used
4	
5	
6	
7	1: Terminal 18 and 20 short
8 to 15	Not used

Note 4. Operating Status Monitor: U1-12

Bit No.	Content
0	1: During RUN
1	1: Zero speed
2	FWD/REV RUN (ON: REV)
3	1: During fault reset input
4	1: Frequency agree 1
5	1: Operation ready
6	1: Minor fault
7	1: Fault
8 to 15	Not used

● Status Monitors

A variety of status monitors are available to the Inverter in SYSMAC BUS communications, which make it possible to monitor the operation status of the Inverter, the status of the Digital Operator, and operation errors.

Constant	Name	Base register	Data code		Unit	Data reading during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
---	Inverter Status	00	10	---	Each bit allocation	Yes	Yes	Yes	Yes	Yes
---	Operator Status		11	---		Yes	Yes	Yes	Yes	Yes
---	Operator Error		12	---	OPE number	Yes	Yes	Yes	Yes	Yes
---	Fault 1		14	---	Each bit allocation	Yes	Yes	Yes	Yes	Yes
---	Fault 2		15	---		Yes	Yes	Yes	Yes	Yes
---	Fault 3		16	---		Yes	Yes	Yes	Yes	Yes
---	CPF Error 1		17	---		Yes	Yes	Yes	Yes	Yes
---	CPF Error 2		18	---		Yes	Yes	Yes	Yes	Yes
---	Minor Fault 1		19	---		Yes	Yes	Yes	Yes	Yes
---	Minor Fault 2		1A	---		Yes	Yes	Yes	Yes	Yes

Inverter Status

Bit No.	Content
0	During RUN
1	Zero speed
2	FWD/REV RUN (ON: REV)
3	During fault reset input
4	Frequency agree 1
5	Operation ready
6	Minor fault
7	Fault
8 to 15	Not used

Operator Status

Bit No.	Content
0	1: Operation error
1	1: EEPROM error
2	1: Program mode
3	00: Operator connecting 11: Operator disconnecting
4	
5	Not used
6	
7	
8 to 15	

Fault 1

Bit No.	Display	Content
0	PUF	Fuse open
1	UV1	Undervoltage (main)
2	UV2	Undervoltage (CTL)
3	UV3	Undervoltage (MC)
4	SC	Short-circuit
5	GF	Ground fault
6	OC	Overcurrent
7	OV	Overvoltage
8	OH	Overheat
9	OH1	Overheat 1
10	OL1	Motor overload
11	OL2	Inverter overload
12	OL3	Overtorque detection 1
13	OL4	Overtorque detection 2
14	RR	Braking transistor
15	RH	Braking resistor

Fault 2

Bit No.	Display	Content
0	EF3	External fault (3)
1	EF4	External fault (4)
2	EF5	External fault (5)
3	EF6	External fault (6)
4	EF7	External fault (7)
5	EF8	External fault (8)
6	---	Not used
7	OS	Overspeed
8	DEV	Speed deviation
9	PGO	PG is disconnected
10	PF	Input phase loss
11	LF	Output phase loss
12	---	Not used
13	OPR	OPE disconnected
14	ERR	EEPROM error
15	---	Not used

Fault 3

Bit No.	Display	Content
0	---	Not used
1	---	
2	E-15	SYSMAC BUS communications error
3	E-10	SYSMAC BUS card fault
4	---	Not used
5	---	
6	---	
7	---	
8	---	
9	---	
10	---	
11	---	
12	---	
13	---	
14	---	
15	---	

CPF Error 1

Bit No.	Display	Content
0	---	Not used
1	---	
2	CPF02	Baseblock circuit error
3	CPF03	EEPROM error
4	CPF04	Internal A/D error
5	CPF05	External A/D error
6	CPF06	Option connect error
7	---	Not used

CPF Error 2

Bit No.	Display	Content
0	CPF20	Optional Card A/D error
1	---	Not used
2	---	
3	---	
4	---	
5	---	
6	---	
7	---	

Minor Fault 1

Bit No.	Display	Content
0	UV	Undervoltage (main)
1	OV	Overvoltage
2	OH	Overheat
3	OH2	External overheat 2
4	OL3	Overtorque detection 1
5	OL4	Overtorque detection 2
6	EF	---
7	BB	---
8	EF3	External fault (3)
9	EF4	External fault (4)
10	EF5	External fault (5)
11	EF6	External fault (6)
12	EF7	External fault (7)
13	EF8	External fault (8)
14	---	Not used
15	OS	Overspeed

Minor Fault 2

Bit No.	Display	Content
0	DEV	Speed deviation
1	PGO	PG is disconnected
2	---	Not used
3	---	
4	---	
5	---	
6	---	
7	---	
8	---	
9	---	
10	---	
11	---	
12	---	
13	---	
14	---	
15	---	

3-2-6 Settings in Multi-function Output and Multi-function Analog Output Data

Controlling the status of the multi-function output and multi-function analog output of the Inverter in SYSMAC BUS communications is possible provided that 0F is set in H2-01 through H2-03 for multi-function output settings and 1F is set in H4-01 and H4-04 for multi-function analog output settings.

Constant	Name	Base register	Data code		Setting method	Changes during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
---	Multi-function Analog Output 1	00	07	87	±11 V = ±2D6 hexadecimal (±726 decimal) (see note 1, 3)	Yes	Yes	Yes	Yes	Yes
---	Multi-function Analog Output 1		08	88	±11 V = ±2D6 hexadecimal (±726 decimal) (see note 2, 3)	Yes	Yes	Yes	Yes	Yes
---	Multi-function Output		09	89	Allocated to each bit. (see note 3)	Yes	Yes	Yes	Yes	Yes

Note 1. These settings will be valid only if 1F is set in H4-01 for monitoring multi-function analog output 1 through terminal 21.

Note 2. These settings will be valid only if 1F is set in H4-04 for monitoring multi-function analog output 2 through terminal 23.

Note 3. For outputting negative values, set the H4-07 to “1”. Set the setting value to the complement of 2.

Note 4. Settings are made with multi-function output.

Bit No.	Content	
0	Multi-function contact output: Terminals 9 and 10 (1: ON)	Valid if H2-01 is set to 0F.
1	Multi-function output 1: Terminal 25 (1: ON)	Valid if H2-02 is set to 0F.
2	Multi-function output 2: Terminal 26 (1: ON)	Valid if H2-03 is set to 0F.
3 to 15	Not used	

3-2-7 User Constants and Settings

The Inverter incorporates a user constant function, which makes it possible to simplify constant settings. A maximum of 32 user constants can be selected and allocated to base register 00.
All these constants are allocated to base register 00, thus eliminating the necessity for setting the base register for each operation independently.

User Constants

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
A2-01	Setting the User Constant 1	01	06	86	1 Hex	0100 to 050D	Not set	No	Yes	Yes	Yes	Yes
A2-02	Setting the User Constant 1		07	87				No	Yes	Yes	Yes	Yes
A2-03	Setting the User Constant 1		08	88				No	Yes	Yes	Yes	Yes
A2-04	Setting the User Constant 1		09	89				No	Yes	Yes	Yes	Yes
A2-05	Setting the User Constant 1		0A	8A				No	Yes	Yes	Yes	Yes
A2-06	Setting the User Constant 1		0B	8B				No	Yes	Yes	Yes	Yes
A2-07	Setting the User Constant 1		0C	8C				No	Yes	Yes	Yes	Yes
A2-08	Setting the User Constant 1		0D	8D				No	Yes	Yes	Yes	Yes
A2-09	Setting the User Constant 1		E0	8E				No	Yes	Yes	Yes	Yes
A2-10	Setting the User Constant 1		0F	8F				No	Yes	Yes	Yes	Yes
A2-11	Setting the User Constant 1		10	90				No	Yes	Yes	Yes	Yes
to			See note	See note				No	Yes	Yes	Yes	Yes
A2-31	Setting the User Constant 1		24	A4				No	Yes	Yes	Yes	Yes
A2-32	Setting the User Constant 1		25	A5				No	Yes	Yes	Yes	Yes

Note Write data and read data codes are allocated in hexadecimal in numerical order according to the constant number.

- A2-01 through A2-32 are set to register numbers used for user constants. Refer to page 3-25 for the register number of each user constant.

Write Data and Read Data Codes for User Constants

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing					V/f control	V/f with PG	Open loop vector	Flux vector
---	User Constant 1	00	40	C0	The same as the constants set.							
---	User Constant 2		41	C1								
---	User Constant 3		42	C2								
---	User Constant 4		43	C3								
---	User Constant 5		44	C4								
---	User Constant 6		45	C5								
---	User Constant 7		46	C6								
---	User Constant 8		47	C7								
---	User Constant 9		48	C8								
---	User Constant 10		49	C9								
---	User Constant 11		4A	CA								
to			See note	See note								
---	User Constant 31		5E	DE								
---	User Constant 32		5F	DF								

Note Write data and read data codes are set in hexadecimal and numerical order according to the constant number.

3-2-8 Constants

Writing constants to and reading constants from the Inverter through SYSMAC BUS communications is possible.

- After setting the base register, write constants to or read constants from the Inverter by using the corresponding data codes.
- After the constants have been written, be sure to transmit the Enter command, otherwise an ENT-FLAG error will result. If more than one data item is written, the Enter command can be transmitted once at the end of the transmission of all the data items.
- There are constants that cannot be written while the Inverter is in operation. Before writing constants to the Inverter in operation, refer to the list on page 3-25 and make sure that the constants can be written to the Inverter during operation. Do not attempt to write improper constants to the Inverter during operation, otherwise a WRITE ERR will result.
- There are constants that can be set subject to the A1-02 settings for control method selection. Refer to the list on page 3-25 for such constants.
- Set the parameter setting value as a hexadecimal value in units of 1. If the setting value is negative, set to the complement of 2 (reverse the bit and add 1.)

Note To initialize the Inverter, write the data of initialization (i.e., base register: 01, data code: 83, and data: 08AC) and transmit the Enter command. If the Enter command is written after transmitting other data, other data transmission will become invalid by initialization.

● Constants for Initialize Mode

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
A1-00	Display Language	01	00	80	0100	1	0, 1	1	Yes	Yes	Yes	Yes	Yes
A1-01	Access Level		01	81	0101	1	0 to 4	2	Yes	Yes	Yes	Yes	Yes
A1-02	Select Control Method		02	82	0102	1	0 to 3	2	No	Yes	Yes	Yes	Yes
A1-03	Initialize		03	83	0103	1	0 to 3330	0	No	Yes	Yes	Yes	Yes
A1-04	Password		04	84	0104	1	0 to 9999	0	No	Yes	Yes	Yes	Yes
A1-05	Setting the Password		05	85	0105	1	0 to 9999	0	No	Yes	Yes	Yes	Yes

● Constants for Program Mode

No need to change if the setting value is a hexadecimal value.

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
b1-01	Frequency Reference Selection	02	00	80	0180	1	0 to 3	1	No	Yes	Yes	Yes	Yes
b1-02	Run Source Selection		01	81	0181	1	0 to 3	1	No	Yes	Yes	Yes	Yes
b1-03	Stopping Method Selection		02	82	0182	1	0 to 3	0	No	Yes	Yes	Yes	Yes
b1-04	Disabling Reverse Operation		03	83	0183	1	0, 1	0	No	Yes	Yes	Yes	Yes
b1-05	Operation Selection for Minimum Frequency (E1-09 or less)		04	84	0184	1	0 to 3	0	No	No	No	No	Yes
b1-06	Setting Control Input Responsiveness		05	85	0185	1	0, 1	1	No	Yes	Yes	Yes	Yes
b1-07	Operation Selection After Switching to Remote Mode		06	86	0186	1	0, 1	0	No	Yes	Yes	Yes	Yes
b2-01	Excitation level (DC injection starting frequency)		07	87	0187	0.1	0.0 to 10.0	0.5	No	Yes	Yes	Yes	Yes
b2-02	DC injection braking current		08	88	0188	1	0 to 100	50	No	Yes	Yes	Yes	No
b2-03	DC injection braking time at start.		09	89	0189	0.01	0.00 to 10.00	0.00	No	Yes	Yes	Yes	Yes
b2-04	DC injection braking time at stop.		0A	8A	018A	0.01	0.00 to 10.00	0.50	No	Yes	Yes	Yes	Yes
b3-01	Speed search selection at start		0E	8E	018E	1	0, 1	0 (see note)	No	Yes	Yes	Yes	Yes
b3-02	Speed search operation current		0F	8F	018F	1	0 to 200	150	No	Yes	No	Yes	No

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
b3-03	Speed search deceleration time	02	10	90	0190	0.1	0.0 to 10.0	2.0	No	Yes	No	Yes	No
b4-01	Timer function ON-delay time		12	92	0192	0.1	0.0 to 300.0	0.0	No	Yes	Yes	Yes	Yes
b4-02	Timer function OFF-delay time		13	93	0193	0.1	0.0 to 300.0	0.0	No	Yes	Yes	Yes	Yes
b5-01	PID control selection		14	94	0194	1	0 to 2	0	No	Yes	Yes	Yes	Yes
b5-02	Proportional gain (P)		15	95	0195	0.01	0.00 to 10.00	1.00	No	Yes	Yes	Yes	Yes
b5-03	Integral time (I)		16	96	0196	0.1	0.0 to 360.0	1.0	No	Yes	Yes	Yes	Yes
b5-04	Integral limit (I)		17	97	0197	0.1	0.0 to 100.0	100.0	No	Yes	Yes	Yes	Yes
b5-05	Differential time (D)		18	98	0198	0.01	0.00 to 10.00	0.00	No	Yes	Yes	Yes	Yes
b5-06	PID limit		19	99	0199	0.1	0.0 to 100.0	100.0	No	Yes	Yes	Yes	Yes
b5-07	PID offset adjustment		1A	9A	019A	0.1	−100.0 to 100.0	0.0	No	Yes	Yes	Yes	Yes
b5-08	PID primary delay time constant		1B	9B	019B	0.01	0.00 to 10.00	0.00	No	Yes	Yes	Yes	Yes
b6-01	Dwell frequency at start		1C	9C	019C	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
b6-02	Dwell time at start		1D	9D	019D	0.1	0.0 to 10.0	0.0	No	Yes	Yes	Yes	Yes
b6-03	Dwell frequency at stop		1E	9E	019E	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
b6-04	Dwell time at stop		1F	9F	019F	0.1	0.0 to 10.0	0.0	No	Yes	Yes	Yes	Yes
b7-01	Droop control gain		20	A0	01A0	0.1	0.0 to 100.0	0.0	No	No	No	No	Yes
b7-02	Droop control delay time		21	A1	01A1	0.01	0.00 to 1.00	0.00	No	No	No	No	Yes
b8-01	Energy-saving gain		22	A2	01A2	1	0 to 100	80	No	Yes	Yes	No	No
b8-02	Energy-saving frequency		23	A3	01A3	0.1	0.0 to 400.0	0.0	No	Yes	Yes	No	No
b9-01	Zero-servo gain		24	A4	01A4	1	0 to 100	5	No	No	No	No	Yes
b9-02	Zero-servo completion width		25	A5	01A5	1	0 to 16383	10	No	No	No	No	Yes

Note When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default setting will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
C1-01	Acceleration time 1	03	00	80	0200	0.1 (see note 1)	0.00 to 6000.0 (see note 1)	10.0	Yes	Yes	Yes	Yes	Yes
C1-02	Deceleration time 1		01	81	0201			10.0	Yes	Yes	Yes	Yes	Yes
C1-03	Acceleration time 2		02	82	0202			10.0	Yes	Yes	Yes	Yes	Yes
C1-04	Deceleration time 2		03	83	0203			10.0	Yes	Yes	Yes	Yes	Yes
C1-05	Acceleration time 3		04	84	0204			10.0	No	Yes	Yes	Yes	Yes
C1-06	Deceleration time 3		05	85	0205			10.0	No	Yes	Yes	Yes	Yes
C1-07	Acceleration time 4		06	86	0206			10.0	No	Yes	Yes	Yes	Yes
C1-08	Deceleration time 4		07	87	0207			10.0	No	Yes	Yes	Yes	Yes
C1-09	Emergency stop time		08	88	0208			10.0	Yes	Yes	Yes	Yes	Yes
C1-10	Acceleration/deceleration time units		09	89	0209	1	0, 1	1	No	Yes	Yes	Yes	Yes
C1-11	Acceleration/deceleration switching frequency		0A	8A	020A	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
C2-01	S-curve characteristic time at acceleration start.		0B	8B	020B	0.01	0.00 to 2.50	0.20	No	Yes	Yes	Yes	Yes
C2-02	S-curve characteristic time at acceleration end.		0C	8C	020C	0.01	0.00 to 2.50	0.20	No	Yes	Yes	Yes	Yes
C2-03	S-curve characteristic time at deceleration start.		0D	8D	020D	0.01	0.00 to 2.50	0.20	No	Yes	Yes	Yes	Yes
C2-04	S-curve characteristic time at deceleration end.		0E	8E	020E	0.01	0.00 to 2.50	0.00	No	Yes	Yes	Yes	Yes
C3-01	Slip compensation gain.		0F	8F	020F	0.1	0.0 to 2.5	1.0 (see note 2)	Yes	Yes	No	Yes	Yes
C3-02	Slip compensation primary delay time.		10	90	0210	1	0 to 10000	200 (see note 2)	No	Yes	No	Yes	No
C3-03	Slip compensation limit.		11	91	0211	1	0 to 250	200	No	Yes	No	Yes	No
C3-04	Slip compensation during regeneration.		12	92	0212	1	0, 1	0	No	Yes	Yes	Yes	No
C3-05	Flux Calculation Method		42	C2	0242	1	0, 1	0	No	No	No	Yes	No

Note 1. The setting range and setting unit for acceleration/deceleration times will differ according to the setting for C1-10 (the unit for acceleration/deceleration time).

Note 2. When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default settings will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
C4-01	Torque compensation gain.	03	13	93	0213	0.01	0.00 to 2.50	1.00	Yes	Yes	Yes	Yes	No
C4-02	Torque compensation delay time.		14	94	0214	1	0 to 10000	20 (see note 1)	No	Yes	Yes	Yes	No
C5-01	ASR Proportional (P) gain 1		15	95	0215	0.01	0.00 to 300.00	20.0 (see note 2)	Yes	No	Yes	No	Yes
C5-02	ASR Integral (I) time 1		16	96	0216	0.001	0.000 to 10.000	0.500 (see note 2)	Yes	No	Yes	No	Yes
C5-03	ASR Proportional Gain (P) 2		17	97	0217	0.01	0.00 to 300.00	20.0 (see note 2)	Yes	No	Yes	No	Yes
C5-04	ASR Integral (I) time 2		18	98	0218	0.001	0.000 to 10.000	0.500 (see note 2)	Yes	No	Yes	No	Yes
C5-05	ASR Limit		19	99	0219	0.1	0.0 to 20.0	5.0	No	No	Yes	No	No
C5-06	ASR Primary delay time		1A	9A	021A	0.001	0.000 to 0.500	0.004	No	No	No	No	Yes
C5-07	ASR Switching frequency		1B	9B	021B	0.1	0.0 to 400.0	0.0	No	No	No	No	Yes
C5-08	ASR Integral (I) Limit		41	C1	0241	1	0 to 400	400	No	No	No	No	Yes
C6-01	Carrier frequency upper limit.		1C	9C	021C	0.1	2.0 to 15.0 (see note 3)	15.0 (see note 3)	No	Yes	Yes	Yes	Yes
C6-02	Carrier frequency lower limit.		1D	9D	021D	0.1	0.4 to 15.0	15.0 (see note 3)	No	Yes	Yes	No	No
C6-03	Carrier frequency proportional gain.		1E	9E	021E	1	0 to 99	0	No	Yes	Yes	No	No
C7-01	Hunting prevention selection		1F	9F	021F	1	0, 1	1	No	Yes	Yes	No	No
C7-02	Hunting prevention gain		20	A0	0220	0.01	0.00 to 2.50	1.00	No	Yes	Yes	No	No
C8-08	AFR Gain		2A	AA	022A	0.01	0.00 to 10.00	1.00	No	No	No	Yes	No
C8-30	Carrier Frequency Selection During Auto-tuning		40	C0	0240	1	0, 1	0	No	No	No	Yes	Yes

Note 1. When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default settings will be displayed.)

Note 2. When the control mode is changed, the Inverter will revert to default settings. (The flux vector control default settings will be displayed.)

Note 3. The setting range and the default setting of the Inverter will differ depending on its capacity and control mode. (The value for the 200-V-class 0.4 kW Inverter in open loop vector control mode will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
d1-01	Frequency reference 1	04	00	80	0280	0.01 (see note)	0.00 to max. frequency (see note)	6.00	Yes	Yes	Yes	Yes	Yes
d1-02	Frequency reference 2		01	81	0281			0.00	Yes	Yes	Yes	Yes	Yes
d1-03	Frequency reference 3		02	82	0282			0.00	Yes	Yes	Yes	Yes	Yes
d1-04	Frequency reference 4		03	83	0283			0.00	Yes	Yes	Yes	Yes	Yes
d1-05	Frequency reference 5		04	84	0284			0.00	Yes	Yes	Yes	Yes	Yes
d1-06	Frequency reference 6		05	85	0285			0.00	Yes	Yes	Yes	Yes	Yes
d1-07	Frequency reference 7		06	86	0286			0.00	Yes	Yes	Yes	Yes	Yes
d1-08	Frequency reference 8		07	87	0287			0.00	Yes	Yes	Yes	Yes	Yes
d1-09	Jog frequency reference		08	88	0288			6.00	Yes	Yes	Yes	Yes	Yes
d2-01	Reference frequency upper limit		09	89	0289	0.1	0.0 to 110.0	100.0	No	Yes	Yes	Yes	Yes
d2-02	Reference frequency lower limit		0A	8A	028A	0.1	0.0 to 109.0	0.0	No	Yes	Yes	Yes	Yes
d3-01	Jump frequency 1		0B	8B	028B	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
d3-02	Jump frequency 2		0C	8C	028C	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
d3-03	Jump frequency 3		0D	8D	028D	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
d3-04	Jump frequency width		0E	8E	028E	0.1	0.0 to 20.0	1.0	No	Yes	Yes	Yes	Yes
d4-01	Reference frequency hold function selection		0F	8F	028F	1	0, 1	0	No	Yes	Yes	Yes	Yes
d4-02	Trim control level		10	90	0290	1	0 to 100	25	No	Yes	Yes	Yes	Yes
d5-01	Torque control selection		11	91	0291	1	0, 1	0	No	No	No	No	Yes
d5-02	Torque reference delay time		12	92	0292	1	0 to 1000	0	No	No	No	No	Yes
d5-03	Speed limit selection		13	93	0293	1	1, 2	1	No	No	No	No	Yes
d5-04	Speed limit		14	94	0294	1	−120 to +120	0	No	No	No	No	Yes
d5-05	Speed limit bias		15	95	0295	1	0 to 120	10	No	No	No	No	Yes
d5-06	Speed/torque control switching timer.		16	96	0296	1	0 to 1000	0	No	No	No	No	Yes

Note The setting unit and setting range of the frequency reference can be changed using O1-03 (frequency reference setting and display units). Refer to the default setting of O1-03.

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
E1-01	Input voltage setting	05	00	80	0300	1	155 to 255 (see note 1)	200 (see note 1)	No	Yes	Yes	Yes	Yes
E1-02	Motor selection		01	81	0301	1	0, 1	0	No	Yes	Yes	Yes	Yes
E1-03	V/f pattern selection		02	82	0302	Hexadecimal	0 to F	F	No	Yes	Yes	No	No
E1-04	Maximum frequency (FMAX)		03	83	0303	0.1	50.0 to 400.0	60.0	No	Yes	Yes	Yes	Yes
E1-05	Maximum voltage (VMAX)		04	84	0304	0.1	0.0 to 255.0 (see note 1)	200.0 (see note 1)	No	Yes	Yes	Yes	Yes
E1-06	Maximum voltage frequency (FA)		05	85	0305	0.1	0.0 to 400.0	60.0	No	Yes	Yes	Yes	Yes
E1-07	Intermediate frequency (FB)		06	86	0306	0.1	0.0 to 400.0	3.0 (see note 2)	No	Yes	Yes	Yes	No
E1-08	Intermediate voltage (VC)		07	87	0307	0.1	0.0 to 255.0 (see note 1)	11.0 (see note 1, 2)	No	Yes	Yes	Yes	No
E1-09	Minimum frequency (FMIN)		08	88	0308	0.1	0.0 to 400.0	0.5 (see note 2)	No	Yes	Yes	Yes	Yes
E1-10	Minimum voltage (VMIN)		09	89	0309	0.1	0.0 to 255.0 (see note 1)	2.0 (see note 1, 2)	No	Yes	Yes	Yes	No
E1-11	Mid. Output Frequency B		0A	8A	030A	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
E1-12	Mid. Output Frequency Voltage B		0B	8B	030B	0.1	0.0 to 255.0 (see note 1)	0.0	No	Yes	Yes	Yes	Yes
E1-13	Base Voltage		0C	8C	030C	0.1	0.0 to 255.0 (see note 1)	200.0 (see note 1)	No	Yes	Yes	Yes	Yes

Note 1. These are values for a 200-V-class Inverter. Values for the 400-V-class Inverter are double.

Note 2. When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default settings will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
E2-01	Motor rated current	05	0E	8E	030E	0.01 (see note 1)	0.32 to 6.40 (see note 2)	1.90 (see note 3)	No	Yes	Yes	Yes	Yes
E2-02	Motor rated slip		0F	8F	030F	0.01	0.00 to 20.00	2.90 (see note 3)	No	Yes	Yes	Yes	Yes
E2-03	Motor no-load current		10	90	0310	0.01 (see note 1)	0.32 to 6.40 (see note 2)	1.20 (see note 3)	No	Yes	Yes	Yes	Yes
E2-04	Number of motor poles		11	91	0311	1	2 to 48	4	No	No	Yes	No	Yes
E2-05	Motor phase-to-phase resistance		12	92	0312	0.001	0.000 to 65.000	9.842 (see note 3)	No	Yes	Yes	Yes	Yes
E2-06	Motor leakage inductance		13	93	0313	0.1	0.0 to 30.0	18.2 (see note 3)	No	No	No	Yes	Yes
E2-07	Motor iron-core saturation coefficient 1		14	94	0314	0.01	0.00 to 0.50	0.50	No	No	No	Yes	Yes
E2-08	Motor iron-core saturation coefficient 2		15	95	0315	0.01	0.00 to 0.75	0.75	No	No	No	Yes	Yes
E2-09	Mechanical loss		16	96	0316	0.1	0.0 to 10.0	0.0	No	No	No	No	Yes

Note 1. Units of 0.01 A are used for a capacity of 7.5 kW or below and units of 0.1 A are used for a capacity of 11 kW or over.

Note 2. The setting range is 10% to 200% of the Inverter's rated output current. The values for a 200-V-class 0.4 kW Inverter will be displayed.

Note 3. The default setting depends upon the type of Inverter. The value for a 200-V-class 0.4 kW Inverter will be displayed.

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting (see note 4)			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
E3-01	Select control method of motor 2	05	17	97	0317	1	0, 2	2	No	Yes	Yes	Yes	Yes
E4-01	Motor 2 maximum frequency		18	98	0318	0.1	40.0 to 400.0	60.0	No	Yes	No	Yes	No
E4-02	Motor 2 maximum voltage		19	99	0319	0.1	0.0 to 255.0 (see note 1)	200.0 (see note 1)	No	Yes	No	Yes	No
E4-03	Motor 2 maximum voltage frequency		1A	9A	031A	0.1	0.0 to 400.0	60.0	No	Yes	No	Yes	No
E4-04	Motor 2 intermediate frequency		1B	9B	031B	0.1	0.0 to 400.0	3.0 (see note 2)	No	Yes	No	Yes	No
E4-05	Motor 2 intermediate voltage		1C	9C	031C	0.1	0.0 to 255.0 (see note 1)	11.0 (see note 1, 2)	No	Yes	No	Yes	No
E4-06	Motor 2 minimum frequency		1D	9D	031D	0.1	0.0 to 400.0	0.5 (see note 2)	No	Yes	No	Yes	No
E4-07	Motor 2 minimum voltage		1E	9E	031E	0.1	0.0 to 255.0 (see note 1)	2.0 (see note 1, 2)	No	Yes	No	Yes	No
E5-01	Motor 2 rated current		1F	9F	031F	0.01 (see note 5)	0.32 to 6.40 (see note 6)	1.90 (see note 3)	No	Yes	No	Yes	No
E5-02	Motor 2 rated slip		20	A0	0320	0.01	0.00 to 20.00	2.90 (see note 3)	No	Yes	No	Yes	No
E5-03	Motor 2 no-load current		21	A1	0321	0.01 (see note 5)	0.32 to 6.40 (see note 6)	1.20 (see note 3)	No	Yes	No	Yes	No
E5-04	Motor 2 number of motor poles		22	A2	0322	1	2 to 48	4	No	Yes	No	Yes	No
E5-05	Motor 2 phase-to-phase resistance		23	A3	0323	0.001	0.000 to 65.000	9.842 (see note 3)	No	Yes	No	Yes	No
E5-06	Motor 2 leakage inductance		24	A4	0324	0.1	0.0 to 30.0	18.2 (see note 3)	No	Yes	No	Yes	No

Note 1. These are values for a 200-V-class Inverter. Values for the 400-V-class Inverter are double.

Note 2. When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default settings will be displayed.)

Note 3. The default setting depends upon the type of Inverter. The value for a 200-V-class 0.4 kW Inverter will be displayed.

Note 4. Settings for E4-01 to E5-06 depend on the control mode settings for E3-01.

Note 5. Units of 0.01 A are used for a capacity of 7.5 kW or below and units of 0.1 A are used for a capacity of 11 kW or over.

Note 6. The setting range is 10% to 200% of the Inverter's rated output current. The values for a 200-V-class 0.4 kW Inverter will be displayed.

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
F1-01	Number of PG pulses	06	00	80	0380	1	0 to 60000	1000	No	No	Yes	No	Yes
F1-02	PG disconnection stopping method (PGO)		01	81	0381	1	0 to 3	1	No	No	Yes	No	Yes
F1-03	PG overspeed stopping method		02	82	0382	1	0 to 3	1	No	No	Yes	No	Yes
F1-04	PG speed deviation stopping method		03	83	0383	1	0 to 3	3	No	No	Yes	No	Yes
F1-05	PG rotation setting		04	84	0384	1	0, 1	0	No	No	Yes	No	Yes
F1-06	PG output ratio		05	85	0385	1	1 to 132	1	No	No	Yes	No	Yes
F1-07	Selecting integral control during accel/decel.		06	86	0386	1	0, 1	0	No	No	Yes	No	No
F1-08	Overspeed (OS) detection level.		07	87	0387	1	0 to 120	115	No	No	Yes	No	Yes
F1-09	Overspeed (OS) detection time		08	88	0388	0.1	0.0 to 2.0	0.0 (see note)	No	No	Yes	No	Yes
F1-10	PG speed deviation detection level (DEV)		09	89	0389	1	0 to 50	10	No	No	Yes	No	Yes
F1-11	PG speed deviation detection time (DEV)		0A	8A	038A	0.1	0.0 to 10.0	0.5	No	No	Yes	No	Yes
F1-12	Number of PG gear teeth 1		0B	8B	038B	1	0 to 1000	0	No	No	Yes	No	No
F1-13	Number of PG gear teeth 2		0C	8C	038C	1	0 to 1000	0	No	No	Yes	No	No
F1-14	PG Disconnection Detection Time		17	97	0397	0.1	0.0 to 10.0	2.0	No	No	Yes	No	Yes
F2-01	Analog Reference Card selection		0D	8D	038D	1	0, 1	0	No	Yes	Yes	Yes	Yes
F3-01	Digital Reference Card input selection		0E	8E	038E	1	0 to 7	0	No	Yes	Yes	Yes	Yes
F4-01	Channel 1 output monitor selection		0F	8F	038F	1	1 to 31	2	No	Yes	Yes	Yes	Yes
F4-02	Channel 1 gain		10	90	0390	0.01	0.00 to 2.50	1.00	Yes	Yes	Yes	Yes	Yes
F4-03	Channel 2 output monitor selection		11	91	0391	1	1 to 31	3	No	Yes	Yes	Yes	Yes
F4-04	Channel 2 gain		12	92	0392	0.01	0.00 to 2.50	0.50	Yes	Yes	Yes	Yes	Yes
F5-01	Not used		13	93	0393	1	---	0	---	---	---	---	---
F5-02	Not used		14	94	0394	1	---	1	---	---	---	---	---

Note When the control mode is changed, the Inverter will revert to default settings. (The flux vector control default settings will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
F6-01	Not used	06	15	95	0395	1	---	0	---	---	---	---	---
F7-01	Output pulse multiple selection		16	96	0396	1	0 to 4	1	No	Yes	Yes	Yes	Yes
F8-01	Not used		18	98	0398	1	0 to 3	1	No	Yes	Yes	Yes	Yes
F9-01	Not used		19	99	0399	1	---	0	---	---	---	---	---
F9-02	Not used		1A	9A	039A	1	---	0	---	---	---	---	---
F9-03	Not used		1B	9B	039B	1	---	1	---	---	---	---	---
F9-04	Not used		1C	9C	039C	1	---	0	---	---	---	---	---
H1-01	Multi-function input 1: Terminal 3 selection	07	00	80	0400	Hexadecimal	0 to 77	24	No	Yes	Yes	Yes	Yes
H1-02	Multi-function input 2: Terminal 4 selection		01	81	0401	Hexadecimal	0 to 77	14	No	Yes	Yes	Yes	Yes
H1-03	Multi-function input 3: Terminal 5 selection		02	82	0402	Hexadecimal	0 to 77	3 (0) (see note)	No	Yes	Yes	Yes	Yes
H1-04	Multi-function input 4: Terminal 6 selection		03	83	0403	Hexadecimal	0 to 77	4 (3) (see note)	No	Yes	Yes	Yes	Yes
H1-05	Multi-function input 5: Terminal 7 selection		04	84	0404	Hexadecimal	0 to 77	6 (4) (see note)	No	Yes	Yes	Yes	Yes
H1-06	Multi-function input 6: Terminal 8 selection		05	85	0405	Hexadecimal	0 to 77	8 (6) (see note)	No	Yes	Yes	Yes	Yes
H2-01	Multi-function contact output: terminal 9 to 10.		06	86	0406	Hexadecimal	0 to 37	0	No	Yes	Yes	Yes	Yes
H2-02	Multi-function output 1: terminal 25.		07	87	0407	Hexadecimal	0 to 37	1	No	Yes	Yes	Yes	Yes
H2-03	Multi-function output 2: terminal 26.		08	88	0408	Hexadecimal	0 to 37	2	No	Yes	Yes	Yes	Yes
H3-01	Signal selection: terminal 13 (Voltage)		09	89	0409	1	0, 1	0	No	Yes	Yes	Yes	Yes
H3-02	Gain: terminal 13		0A	8A	040A	0.1	0.0 to 1000.0	100.0	Yes	Yes	Yes	Yes	Yes
H3-03	Bias: terminal 13		0B	8B	040B	0.1	−100.0 to +100.0	0.0	Yes	Yes	Yes	Yes	Yes
H3-04	Multi-function analog input signal selection: terminal 16		0C	8C	040C	1	0, 1	0	No	Yes	Yes	Yes	Yes

Note The values in parentheses indicate initial values when initialized in 3-wire sequence.

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
H3-05	Selection: Terminal 16	07	0D	8D	040D	Hexadecimal	0 to 1F	1F	No	Yes	Yes	Yes	Yes
H3-06	Gain: terminal 16		0E	8E	040E	0.1	0.0 to 1000.0	100.0	Yes	Yes	Yes	Yes	Yes
H3-07	Bias: terminal 16		0F	8F	040F	0.1	−100.0 to +100.0	0.0	Yes	Yes	Yes	Yes	Yes
H3-08	Signal selection: terminal 14		10	90	0410	1	0 to 2	2	No	Yes	Yes	Yes	Yes
H3-09	Selection: Terminal 14		11	91	0411	Hexadecimal	1 to 1F	1F	No	Yes	Yes	Yes	Yes
H3-10	Gain: Terminal 14		12	92	0412	0.1	0.0 to 1000.0	100.0	Yes	Yes	Yes	Yes	Yes
H3-11	Bias: Terminal 14		13	93	0413	0.1	−100.0 to +100.0	0.0	Yes	Yes	Yes	Yes	Yes
H3-12	Analog input filter time constant		14	94	0414	0.01	0.00 to 2.00	0.00	No	Yes	Yes	Yes	Yes
H4-01	Multi-function analog output 1 selection: terminal 21		15	95	0415	1	1 to 31	2	No	Yes	Yes	Yes	Yes
H4-02	Gain terminal 21		16	96	0416	0.01	0.00 to 2.50	1.00	Yes	Yes	Yes	Yes	Yes
H4-03	Bias terminal 21		17	97	0417	0.1	−10.0 to +10.0	0.0	Yes	Yes	Yes	Yes	Yes
H4-04	Multi-function analog output 2 selection: terminal 23		18	98	0418	1	1 to 31	3	No	Yes	Yes	Yes	Yes
H4-05	Gain terminal 23		19	99	0419	0.01	0.00 to 2.50	0.50	Yes	Yes	Yes	Yes	Yes
H4-06	Bias terminal 23		1A	9A	041A	0.1	−10.0 to +10.0	0.0	Yes	Yes	Yes	Yes	Yes
H4-07	Analog output signal level selection		1B	9B	041B	1	0, 1	0	No	Yes	Yes	Yes	Yes
H5-01	Not used		1C	9C	041C	1	---	1F	---	---	---	---	---
H5-02	Not used		1D	9D	041D	1	---	3	---	---	---	---	---
H5-03	Not used		1E	9E	041E	1	---	0	---	---	---	---	---
H5-04	Not used		1F	9F	041F	1	---	3	---	---	---	---	---
H5-05	Not used		20	A0	0420	1	---	1	---	---	---	---	---
L1-01	Motor protection selection	08	00	80	0480	1	0, 1	1	No	Yes	Yes	Yes	Yes
L1-02	Motor protection time constant		01	81	0481	0.1	0.1 to 5.0	1.0	No	Yes	Yes	Yes	Yes

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
L2-01	Momentary power loss selection	08	02	82	0482	1	0 to 2	0	No	Yes	Yes	Yes	Yes
L2-02	Momentary power loss ridethru		03	83	0483	0.1	0.0 to 2.0	0.7 (see note 1)	No	Yes	Yes	Yes	Yes
L2-03	Minimum baseblock time (BB)		04	84	0484	0.1	0.0 to 5.0	0.5 (see note 1)	No	Yes	Yes	Yes	Yes
L2-04	Voltage restart time		05	85	0485	0.1	0.0 to 2.0	0.3	No	Yes	Yes	Yes	Yes
L2-05	Under voltage detection level (UV)		06	86	0486	1	150 to 210 (see note 2)	190 (see note 2)	No	Yes	Yes	Yes	Yes
L2-06	Not used		07	87	0487	0.1	---	0.0	---	---	---	---	---
L3-01	Stall prevention during acceleration		08	88	0488	1	0 to 2	1	No	Yes	Yes	Yes	No
L3-02	Stall prevention level during acceleration		09	89	0489	1	0 to 200	150	No	Yes	Yes	Yes	No
L3-03	Stall prevention level during acceleration		0A	8A	048A	1	0 to 100	100 (see note 3)	No	Yes	Yes	Yes	No
L3-04	Stall prevention during deceleration		0B	8B	048B	1	0 to 2	1	No	Yes	Yes	Yes	Yes
L3-05	Stall prevention during run		0C	8C	048C	1	0 to 2	1	No	Yes	Yes	No	No
L3-06	Stall prevention level during run		0D	8D	048D	10	30 to 200	160	No	Yes	Yes	No	No
L4-01	Frequency detection level		10	90	0490	0.1	0.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
L4-02	Frequency detection width		11	91	0491	0.1	0.0 to 20.0	2.0	No	Yes	Yes	Yes	Yes
L4-03	Frequency detection level (+/–)		12	92	0492	0.1	–400.0 to 400.0	0.0	No	Yes	Yes	Yes	Yes
L4-04	Frequency detection width (+/–)		13	93	0493	0.1	0.0 to 20.0	2.0	No	Yes	Yes	Yes	Yes
L4-05	Operation when frequency reference is lost		14	94	0494	1	0, 1	0	No	Yes	Yes	Yes	Yes
L5-01	Number of auto restart attempts		15	95	0495	1	0 to 10	0	No	Yes	Yes	Yes	Yes
L5-02	Auto restart operation selection		16	96	0496	1	0, 1	0	No	Yes	Yes	Yes	Yes

Note 1. The default setting depends upon the type of Inverter. The value for a 200-V-class 0.4 kW Inverter will be displayed.

Note 2. These are values for a 200-V-class Inverter. Values for 400-V-class Inverter are double.

Note 3. When the control mode is changed, the Inverter will revert to default settings. (The open loop vector control default settings will be displayed.)

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
L6-01	Torque detection selection 1	08	18	98	0498	1	0 to 4	0	No	Yes	Yes	Yes	Yes
L6-02	Torque detection level1		19	99	0499	1	0 to 300	150	No	Yes	Yes	Yes	Yes
L6-03	Torque detection time 1		1A	9A	049A	0.1	0.0 to 10.0	0.1	No	Yes	Yes	Yes	Yes
L6-04	Torque detection selection 2		1B	9B	049B	1	0 to 4	0	No	Yes	Yes	Yes	Yes
L6-05	Torque detection level 2		1C	9C	049C	1	0 to 300	150	No	Yes	Yes	Yes	Yes
L6-06	Torque detection time 2		1D	9D	049D	0.1	0.0 to 10.0	0.1	No	Yes	Yes	Yes	Yes
L7-01	Forward torque limit		1E	9E	049E	1	0 to 300	200	No	No	No	Yes	Yes
L7-02	Reverse torque limit		1F	9F	049F	1	0 to 300	200	No	No	No	Yes	Yes
L7-03	Forward regenerative torque limit		20	A0	04A0	1	0 to 300	200	No	No	No	Yes	Yes
L7-04	Reverse regenerative torque limit		21	A1	04A1	1	0 to 300	200	No	No	No	Yes	Yes
L8-01	DB resistor protection		24	A4	04A4	1	0, 1	0	No	Yes	Yes	Yes	Yes
L8-02	Inverter overheat detection pre-alarm level		25	A5	04A5	1	50 to 110	95	No	Yes	Yes	Yes	Yes
L8-03	Operation after Inverter overheat pre-alarm		26	A6	04A6	1	0 to 3	3	No	Yes	Yes	Yes	Yes
L8-05	Input open-phase protection selection		28	A8	04A8	1	0, 1	0	No	Yes	Yes	Yes	Yes
L8-07	Output open-phase protection selection		2A	AA	04AA	1	0, 1	0	No	Yes	Yes	Yes	Yes

Constant	Name	Base register	Data code		Register number	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data						V/f control	V/f with PG	Open loop vector	Flux vector
O1-01	Monitor selection	09	00	80	0500	1	4 to 28	6	Yes	Yes	Yes	Yes	Yes
O1-02	Monitor selection after power-on		01	81	0501	1	1 to 4	1	Yes	Yes	Yes	Yes	Yes
O1-03	Frequency reference setting and display units		02	82	0502	1	0 to 39999	0	No	Yes	Yes	Yes	Yes
O1-04	V/f pattern setting units		03	83	0503	1	0, 1	0	No	No	No	No	Yes
O1-05	Not used		04	84	0504	1	---	0	---	---	---	---	---
O2-01	Local/Remote Key		05	85	0505	1	0, 1	1	No	Yes	Yes	Yes	Yes
O2-02	Stop Key		06	86	0506	1	0, 1	1	No	Yes	Yes	Yes	Yes
O2-03	User constant initial values		07	87	0507	1	0 to 2	0	No	Yes	Yes	Yes	Yes
O2-04	Inverter capacity selection		08	88	0508	Hexadecimal	0 to FF (see note)	0 (see note)	No	Yes	Yes	Yes	Yes
O2-05	Frequency reference setting method		09	89	0509	1	0, 1	0	No	Yes	Yes	Yes	Yes
O2-06	Operation selection when Digital Operator is disconnected		0A	8A	050A	1	0, 1	0	No	Yes	Yes	Yes	Yes
O2-07	Cumulative operation time setting		0B	8B	050B	1	0 to 65535	0	No	Yes	Yes	Yes	Yes
O2-08	Cumulative operation time selection		0C	8C	050C	1	0, 1	0	No	Yes	Yes	Yes	Yes
O2-09	Factory use		0D	8D	050D	1	---	0	---	---	---	---	---

Note The default setting and setting range depend upon the type of Inverter. The values and ranges for a 200-V-class 0.4 kW Inverter will be displayed.

3-3 Errors in Communications

■ CALL Message

After the Inverter is turned ON, the Inverter waits for a data code to be transmitted in order to check the readiness of the transmission line and host control equipment. The Inverter continues to display the message “CALL” and the user will not be able to control the Inverter if no data code is transmitted. On receipt of a data code other than “00”, the Inverter automatically cancels the CALL status and the frequency reference is displayed.
Write a program making it possible for a data code other than “00” to be transmitted whenever the Inverter is turned ON.

Note Due to the above reason, transmit a data code regardless of whether the application requires only the operation of bits with no data code transmission.

■ Data Setting Errors

A data setting error will be detected if no data is written properly from the PC due to a failure in the data code, data to be written, or Inverter in SYSMAC BUS communications.
If a data setting error results, the contents of the error will be indicated as a data link status in the reading data to be returned to the PC with the data code FF.

● Data Transmission and Response between PC and Inverter with Data Setting Error

Data Not Written from PC to Inverter

I/O	Word	Bit	
		15 to 8	7 to 0
Output: PC to Inverter	n	Run command	**Data code**
	n+1	**Write data**	
Input: Inverter to PC	n+2	Inverter status	Data code
	n+3	Read data	

Response from Inverter to PC

I/O	Word	Bit				
		15	12	11 to 8	7 to 0	
Output: PC to Inverter	n	Run command			Data code	
	n+1	Write data				
Input: Inverter to PC	n+2		**ON**		**F**	**F**
	n+3	**Data link status**				

● Reading Data Link Status

When an error occurs, information on data setting error and data link status will be attached to the data to be read. The information can be read anytime by using the following data code.

Data Code

Constant	Name	Base register	Data code		Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading data	Writing data					V/f control	V/f with PG	Open loop vector	Flux vector
---	Data Link Status	---	69	---	---	---	---	Yes	Yes	Yes	Yes	Yes

Note The data link status is a dedicated monitor used for monitoring communications, and is not available to the Digital Operator except for displaying errors.

● Contents of Data Setting Errors/Data Link Status and Troubleshooting

If communications are handled with data codes, the program will be interrupted when a data setting error results due to the nonconformity of the data codes.
In such a case, check the data link status and remedy the data setting error.

Bit No.	Name	Display	Cause	Countermeasures
0	During data write processing	BUSY	Turns ON by attempting to write the next data when the previous data, such as a constant, has not been processed yet.	Use the Timer to control the timing of data transmission.
1	Write mode error	WRITE ERR	Turns ON by attempting to write data when the Inverter cannot accept the data due to the following: • Undervoltage is detected on the main circuit. • EEPROM failure has resulted with CPF03 detected (initialization possible). • The data is a write-prohibited constant. • The data is a constant that cannot be written while the Inverter is operating.	Correct the program to eliminate the occurrence of the causes.
2	Data code error	DADR ERR	Turns ON if an unregistered data code for data writing or reading is received.	Correct the data code.
3	Setting range error A	DATA ERR	Turns ON if writing data is received outside of the setting range.	Correct the data so that it will be within the setting range.
4	Setting range error B	OPE ERR	Turns ON if writing data causing one of the operational errors OPE01 through OPE11 (adjustment error) is received.	Check the operational error and correct the data according to the *SYSDRIVE 3G3FV User's Manual (I516).*
5	EEPROM write error	EEP ERR	Turns ON if the EEPROM of the Inverter has a fault with CPF03 resulting.	Turn the Inverter on and off for initialization. If the same error results again after initializing the Inverter, replace the Inverter.
6	Enter command not received	ENTFLAG	Turns ON if the Enter command is not received within 5 s after data is written.	Correct the program so that the Enter command can be transmitted.
7 to 15	Not used	---	The data 0 is output.	---

■ SYSMAC BUS Transmission Path Errors

If the SYSMAC BUS transmission path has an error, the Inverter will detect the following.

Errors and Countermeasures

Name	Display	Cause	Countermeasures
SYSMAC BUS Communication Error	E-15	Turns ON if no communications are possible due to the following: • The transmission path is disconnected, short-circuited, or incorrectly wired. • The hardware of the host equipment has failed.	Check and repair the transmission path or host equipment.
SYSMAC BUS Card Fault	E-10	Turns ON if the Interface Card has an error and is not connected to the CPU of the Inverter.	Turn the Inverter on and off. If the error is not restored then, replace the Interface Card.
Option Connection Error	CPF06	Turns ON if the connectors of the Inverter control circuit and the Interface Card are not connected properly.	Reconnect the connectors.

Note The connectors of the Inverter Interface Card and control circuit will not engage properly if they are not coupled securely. Visually check the connection when connecting.

Inverter during Transmission Errors

To ensure the safety operation of the system, be sure to check the operating condition of the Inverter when a transmission error has resulted.

Constant	Name	Base register	Data code		Register No.	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing						V/f control	V/f with PG	Open loop vector	Flux vector
F8-01	E-15 Detected Selection	06	18	98	0398	1	0 to 3	1	No	Yes	Yes	Yes	Yes

Make one of the following settings according to the application.

Set value	Operation	Inverter status	Error output
0	C1-02 deceleration stop	Error status	ON
1	Coast to stop	Error status	ON
2	C1-09 deceleration stop	Error status	ON
3	Continue operation (see note)	Warning status	OFF

Note When set to “Continue operation,” the Inverter itself will continue to operate. Therefore, provide other means such as a limit switch or emergency switch to secure safety.

■ Inverter Faults and Minor Faults

The faults and minor faults of the Inverter can be checked through SYSMAC BUS communications. Take the necessary countermeasures according to *Section 8 Maintenance Operations* of the *SYSDRIVE 3G3FV User's Manual (I516)* after checking them.

● Fault Outputs and Details

Bit 11 in word n+3 has fault output.

I/O	Word	Bit			
		15	11	10 to 8	7 to 0
Input: Inverter to PC	n+2		**ON**		Data code
	n+3	Reading data			

Check the contents of faults from the following data codes. These data codes can also be displayed and checked with the Digital Operator.

Constant	Name	Base register	Data code		Setting unit	Changes during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
---	Fault 1	00	14	---	Allocated to each bit	Yes	Yes	Yes	Yes	Yes
---	Fault 2		15	---		Yes	Yes	Yes	Yes	Yes
---	Fault 3		16	---		Yes	Yes	Yes	Yes	Yes

● Minor Fault Outputs and Details

Set 10 in H2-01 to H2-03 for multi-function output. If a minor fault results, the corresponding multi-function output will turn ON.

Minor Fault Output Settings

Constant	Name	Base register	Data code		Register No.	Setting unit	Setting range	Default setting	Changes during operation	Control mode setting			
			Reading	Writing						V/f control	V/f with PG	Open loop vector	Flux vector
H2-01	Multi-function Contact Output	07	06	86	0406	1	0 to 37	0	No	Yes	Yes	Yes	Yes
H2-02	Multi-function Output 1		07	87	0407	1	0 to 37	1	No	Yes	Yes	Yes	Yes
H2-03	Multi-function Output 2		08	88	0408	1	0 to 37	2	No	Yes	Yes	Yes	Yes

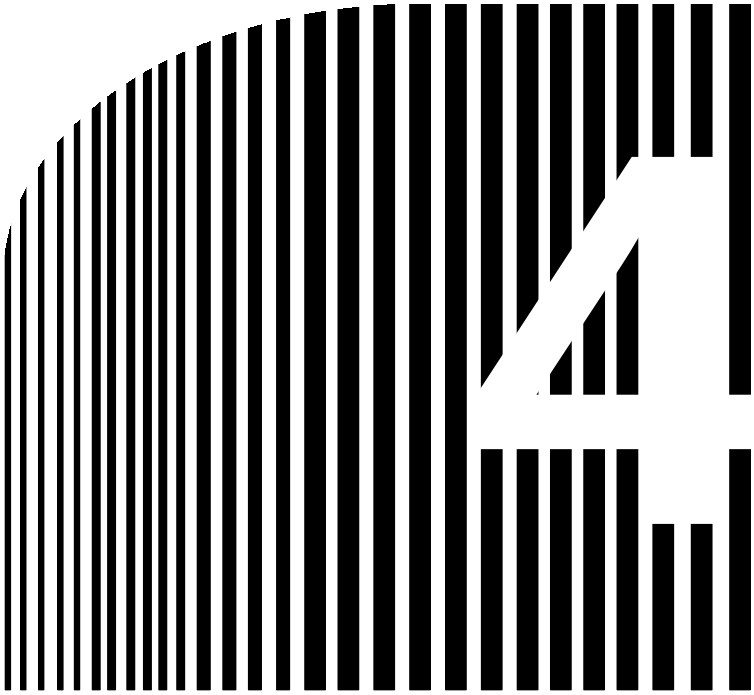
Check the contents of minor faults from the following data codes. These data codes can also be displayed and checked with the Digital Operator.

Constant	Name	Base register	Data code		Setting unit	Changes during operation	Control mode setting			
			Reading	Writing			V/f control	V/f with PG	Open loop vector	Flux vector
---	Minor Fault 1	---	19	---	---	Yes	Yes	Yes	Yes	Yes
---	Minor Fault 2		1A	---		Yes	Yes	Yes	Yes	Yes

■ Memory Data Backup

The SYSMAC BUS 3G3FV uses an EEPROM for backing up data. When parameters are changed or when the power is turned OFF, data will be written to the EEPROM.

- The maximum number of data write operations to the EEPROM is approximately 100,000 times.
- During SYSMAC BUS communications, every Enter command will be written to the EEPROM whenever it is transmitted. It is recommended that transmission of the Enter command be minimized.
- Data settings such as frequency references that do not require any Enter command are not written to the EEPROM. When the power is turned ON, these data settings will be reset to “0.”



Chapter 4

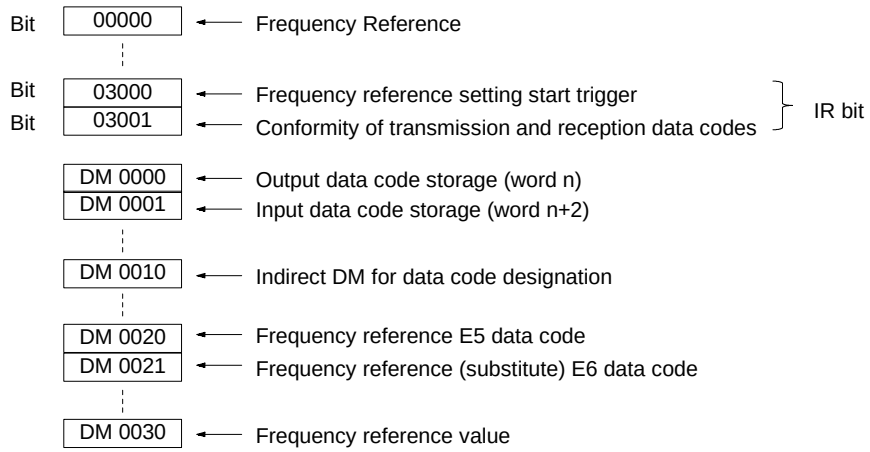
• Communications Program •

This section provides information on example programs for the SYSMAC Programmable Controller (PC) controlling the SYSDRIVE 3G3FV-series Inverter mounted with the Interface Card.
Each function of the program is explained individually. When using the program for actual applications, however, be sure to prepare interlocks so that the functions will not cause errors due to improper, duplicated use.
Also be sure to set all input bits, IR bits, and data memory areas so that they will not cause errors due to improper, duplicated use.

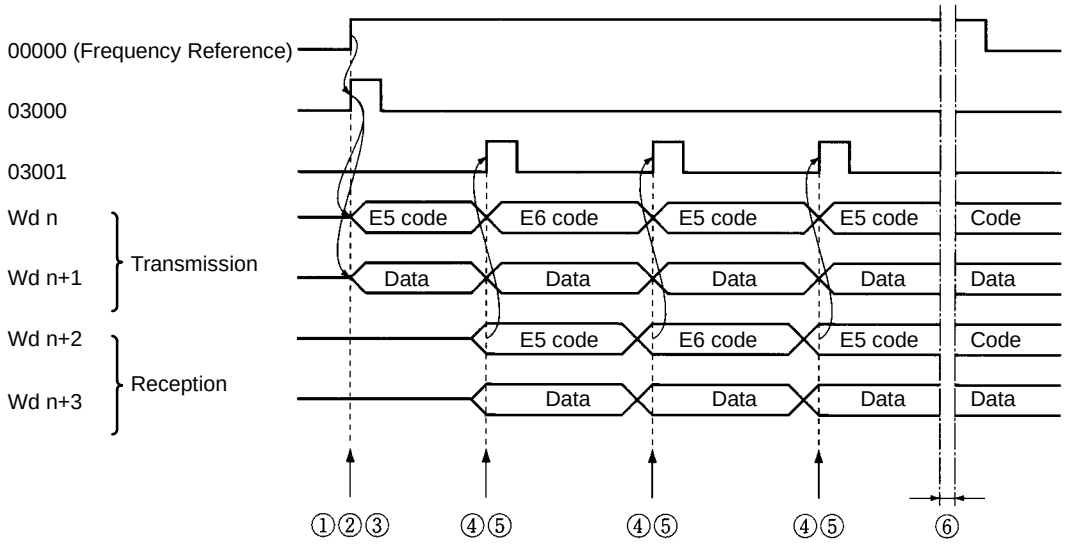
4-1 Frequency Reference Settings

The following information is used for writing the frequency reference set in the DM area of the PC to the Inverter repeatedly while the Frequency Reference Bit 00000 is ON. In this example, the frequency reference set in DM 0030 is handled and set. The operation is monitored by transmitting the frequency reference with data code E5 and frequency reference (substitute) with data code E6 and checking the input data codes returned from the Inverter.

■ Allocation



■ Timing Chart



■ Operation

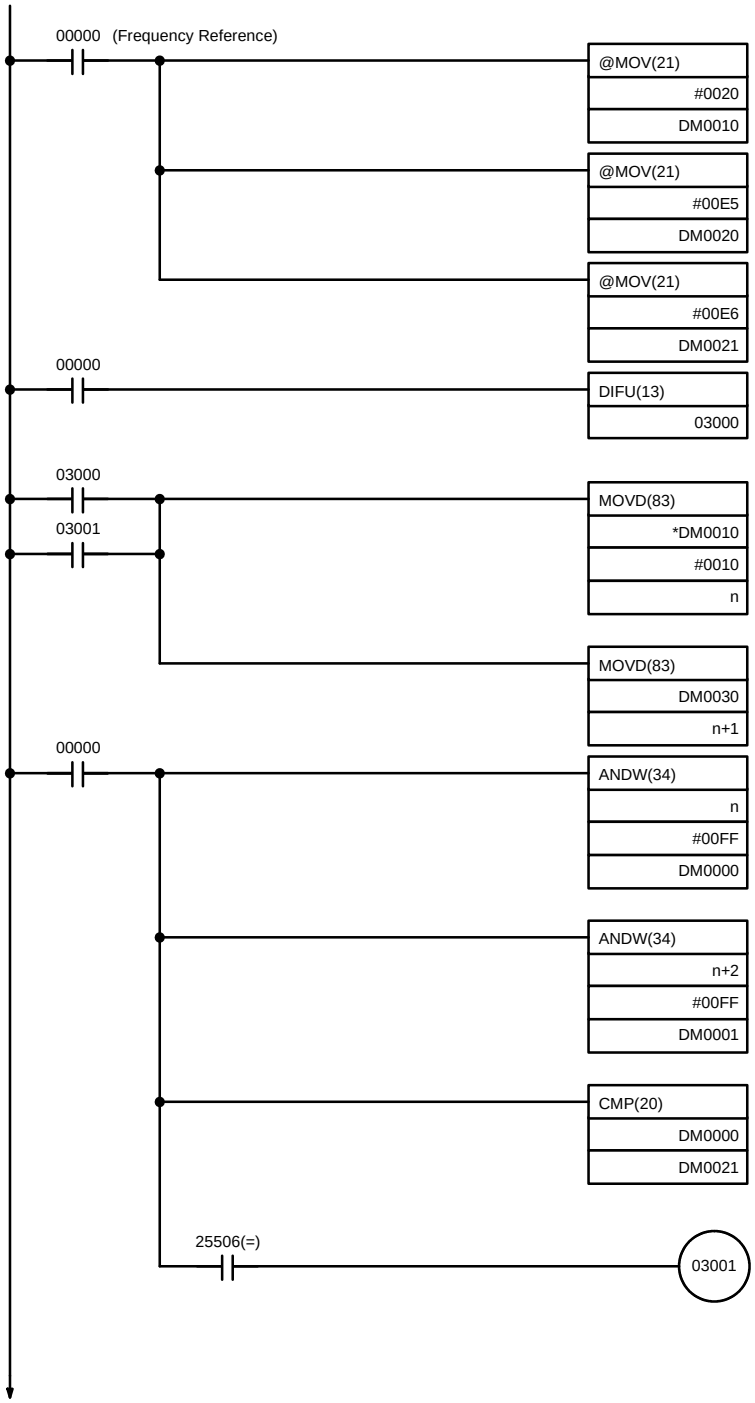
1. When the Frequency Reference Bit is turned ON, the following default values will be set in the DM.
   DM 0010: #0020
   DM 0020: #00E5
   DM 0021: #00E6
   E5 is the data code for writing the frequency reference and E6 is the data code for writing the frequency reference (substitute).
2. The two rightmost bits of the contents of the indirect DM set in DM 0010 (i.e., the value 00E5 set in DM 0020) are transferred to the two rightmost bits of word n.

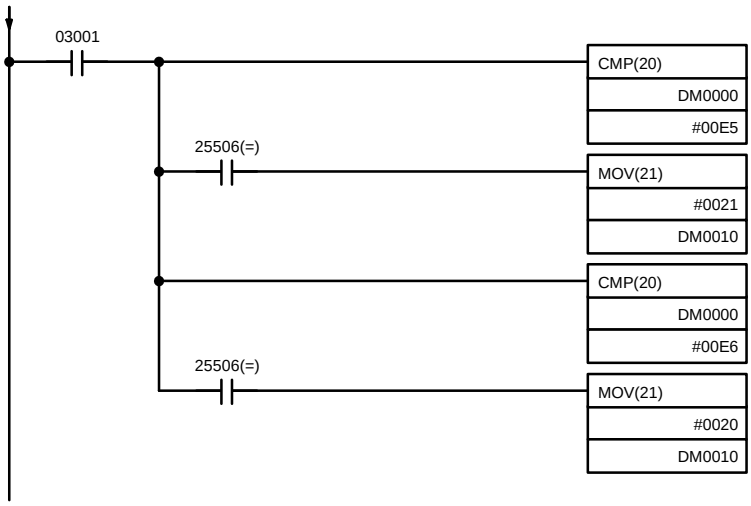
   The output data code is set.

   Simultaneously, the frequency reference data in DM 0030 is transferred to word n+1.

   The writing data is set.
3. The two leftmost bits of word n are masked and only the two rightmost bits of the output data code are stored in DM 0000. Similarly, the two leftmost bits of the data returned from the Inverter to word n+2 are masked and only the two rightmost bits of the input data code are stored in DM 0001. This is always performed.
4. The output data code in DM 0000 and the input data code in DM 0001 are compared. Bit 03001 will be turned ON if they coincide.
5. When bit 03001 is turned ON, the processing method will be switched over according to the output data code in DM 0000 as described below.
   - DM 0000 = #00E5
     DM 0010 is set to #0021 (preparation for frequency reference (substitute) transmission)
   - DM 0000 = #00E6
     DM 0010 is set to #0020 (preparation for frequency reference transmission)
6. Repeat steps 2 through 5 until the Frequency Reference Bit is turned OFF.

■ Ladder Program

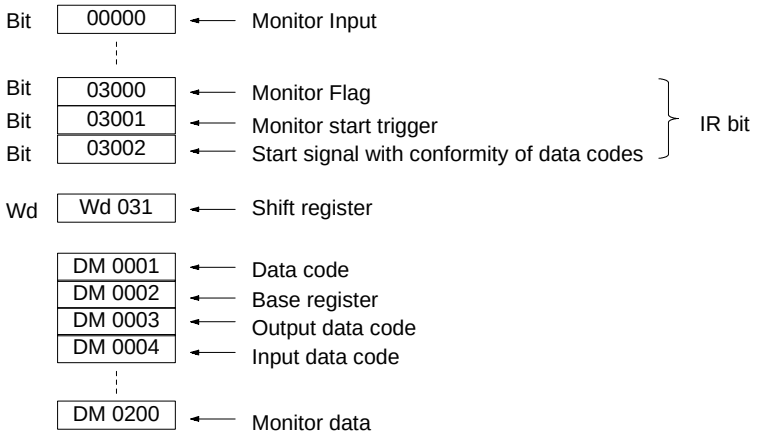



03001
CMP(20)
DM0000
#00E5
25506(=)
MOV(21)
#0021
DM0010
CMP(20)
DM0000
#00E6
25506(=)
MOV(21)
#0020
DM0010

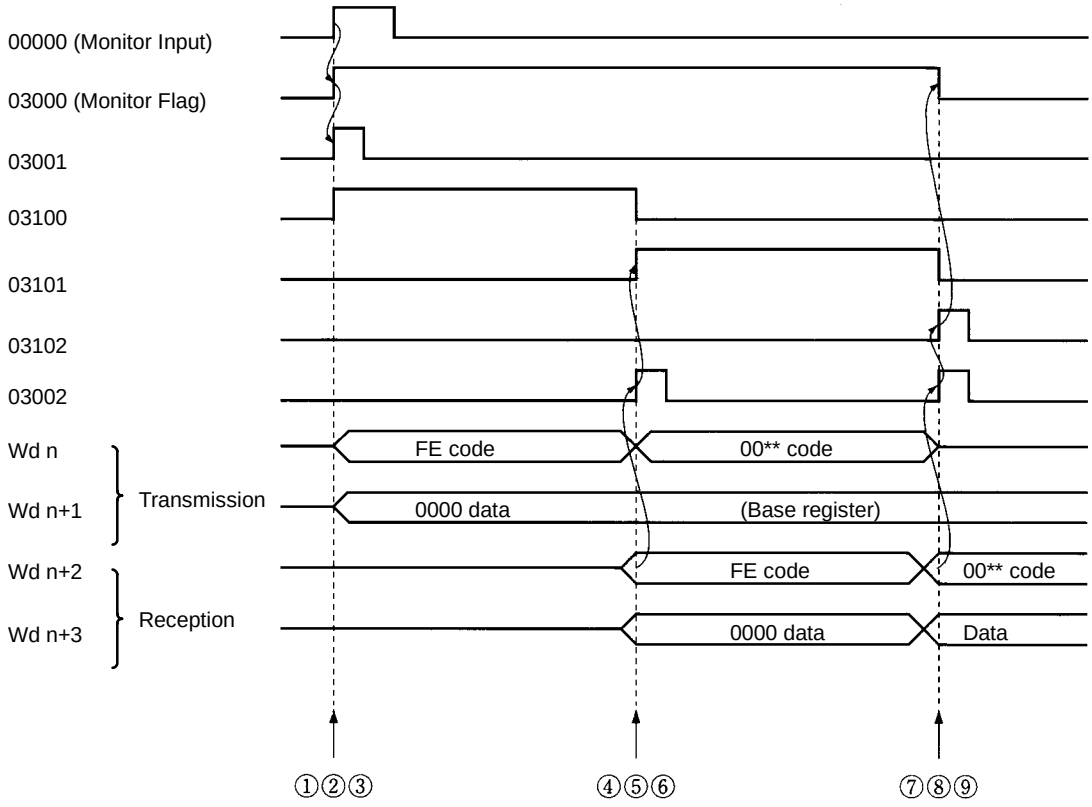
4-2 Inverter Monitor

The following information is used for reading a single item of monitor data only once from the Inverter when the Monitor Input Bit is ON. To read the item, transmit the write data code FE and base register 00 first. Then transmit the read data code corresponding to the item. In this example, the item is stored in DM 0200.

■ Allocation



■ Timing Chart

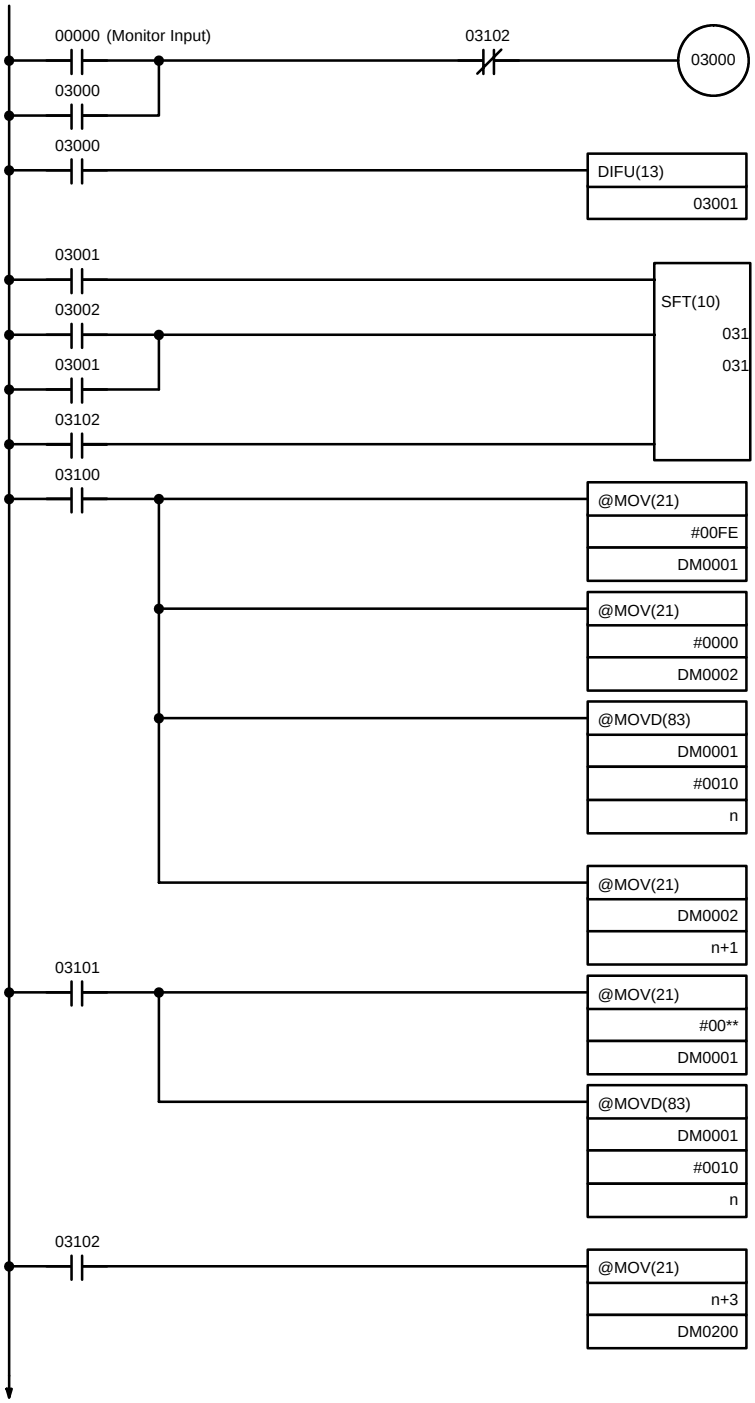


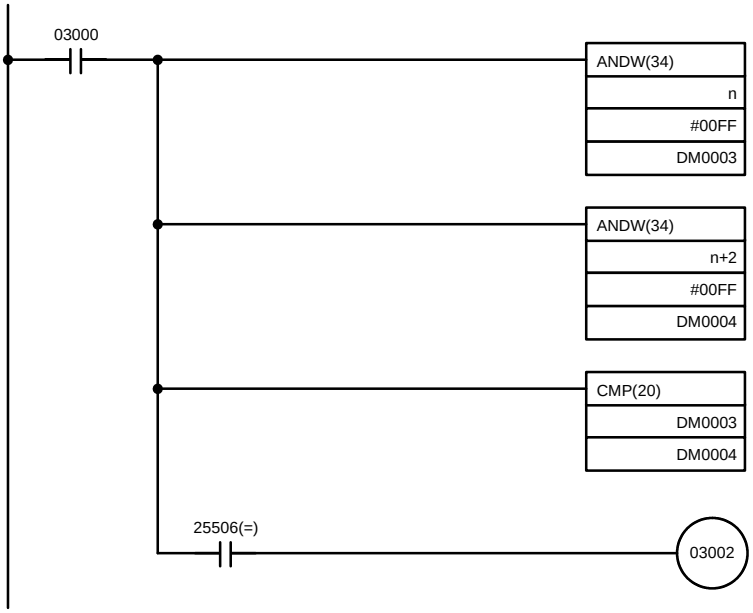
■ Operation

1. When the Monitor Input Bit is turned ON, the status of Monitor Flag 03000 will be held and Differentiation Bit 03001 will be turned ON. Then the shift register in word 031 will be turned ON to execute the instructions in sequence.
2. First, bit 03100 is turned ON. Then the following default values are set in the DM area.
   DM 0001: #00FE
   DM 0002: #0000
   The two rightmost bits of DM 0001 are transferred to the two rightmost bits of word n and the data in DM 0002 is transferred to word n+1.

   The write data code FE and base register 00 are transmitted to the Inverter.
3. The two leftmost bits of word n are masked and only the two rightmost bits of the output data code are stored in DM 0003. Similarly, the two leftmost bits of the data returned from the Inverter to word n+2 are masked and only the two rightmost bits of the input data code are stored in DM 0004.
4. The output data code in DM 0003 and the input data code in DM 0004 are compared. Bit 03002 will be turned ON if they coincide.
5. When bit 03002 is turned ON, Shift Register Bit 03100 will be turned OFF and bit 03101 will be turned ON.
6. When bit 03101 is turned ON, the following will be set in the DM area.
   DM 0001 = #00**
   Set ** to the corresponding data code (00 through 3B).
   For example, set DM 0001 to #0022 for reading the output current.
   The two rightmost bits of DM 0001 are transferred to the two rightmost bits of word n.
7. Like the operations in steps 3 and 4, the output data code and the input data code are compared. If they coincide, bit 03002 will be turned ON.
8. When bit 03002 is turned ON, Shift Register Bit 03101 will be turned OFF and bit 03102 will be turned ON.
9. When bit 03102 is turned ON, the monitor data returned from the Inverter to word n+3 will be stored in DM 0200 and the shift register will be cleared. Simultaneously, bit 03000 that has been on hold will be reset.

■ Ladder Program

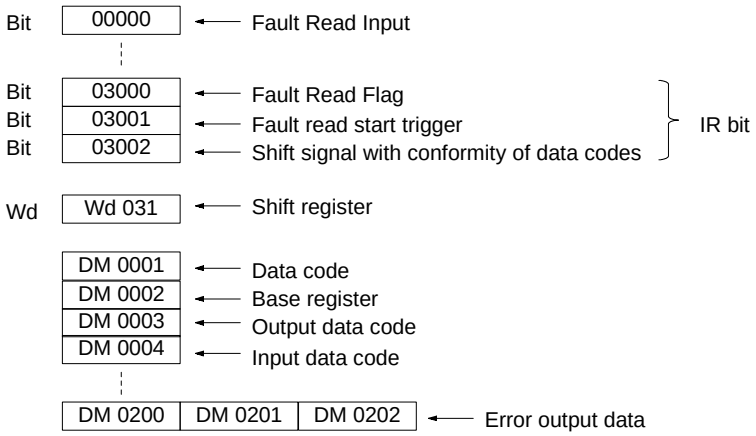



03000
ANDW(34)
n
#00FF
DM0003
ANDW(34)
n+2
#00FF
DM0004
CMP(20)
DM0003
DM0004
25506(=)
03002

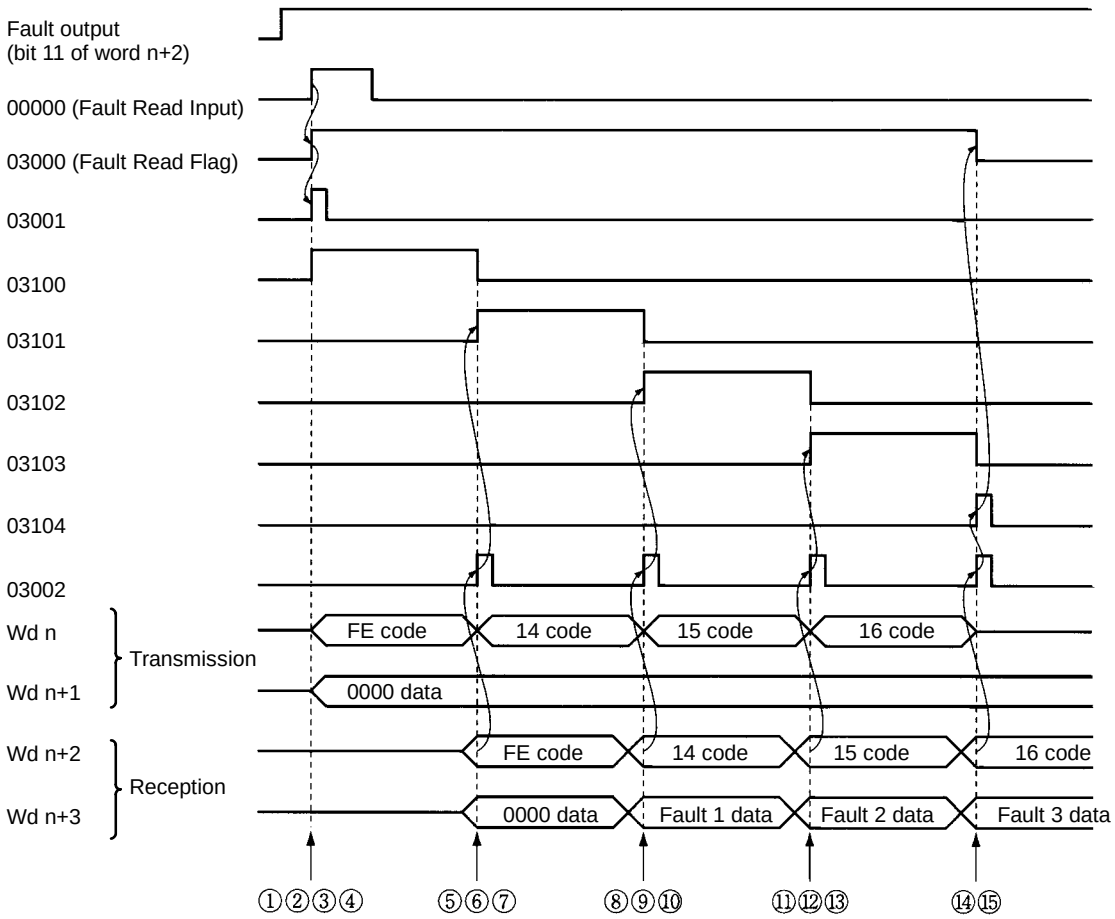
4-3 Inverter Fault Processing

If the Inverter has a fault, bit 11 of word n+2 for the Inverter fault output via SYSMAC BUS communications will be turned ON. If the fault output is turned ON, turn OFF the Run command of the Inverter with bits 8 and 9 of word n, and interrupt the operation of the host controller.
The following is used for reading the contents of the fault after performing the above. In this example, faults 1, 2, and 3 are stored in DM 0202, DM 0201, and DM 0200 respectively. After checking the contents of the faults, take countermeasures according to information provided in the *SYSDRIVE 3G3FV User's Manual (I516)*.

■ Allocation



■ Timing Chart



■ Operation

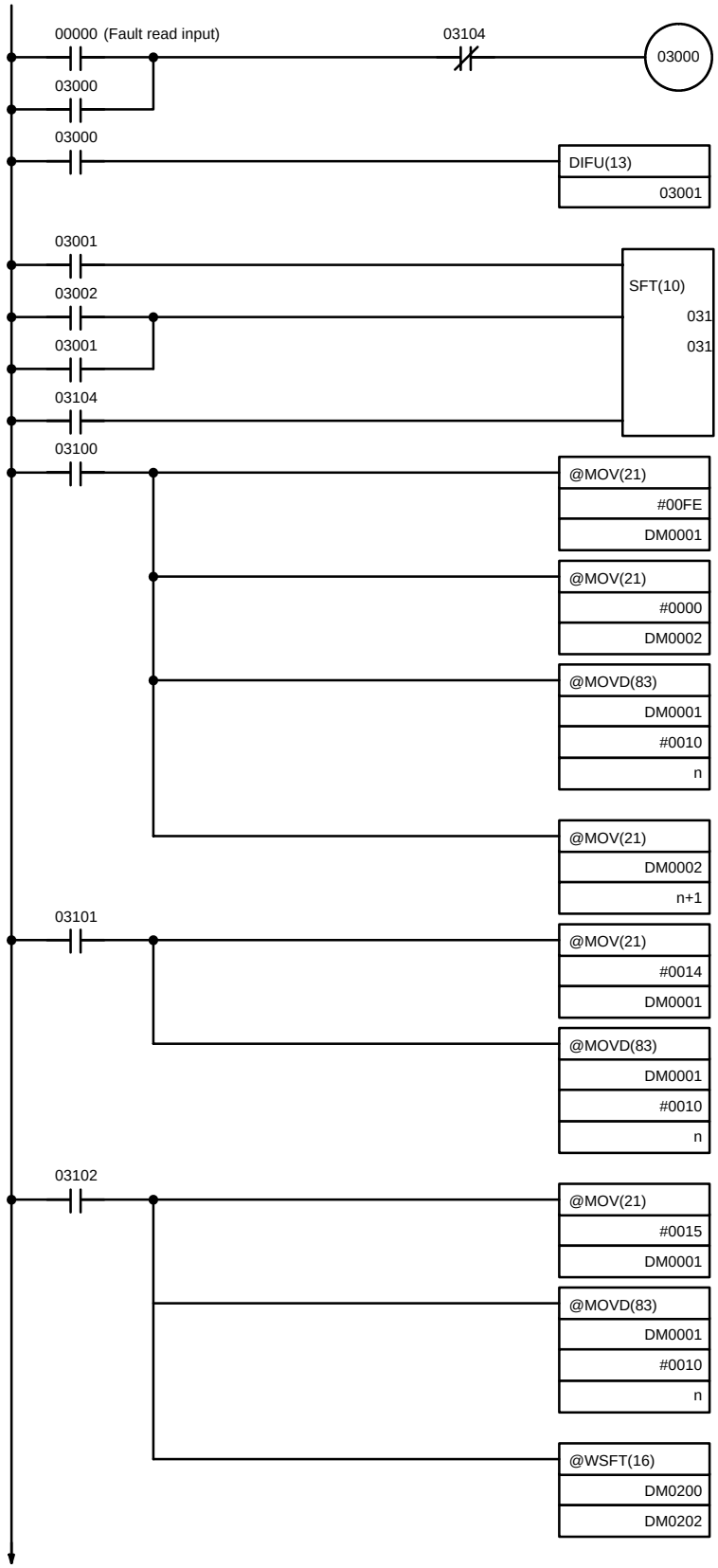
1. When the Inverter has a fault, bit 11 of word n+2 for fault output will be turned ON.
2. If data is being exchanged, the Fault Read Input Bit will be turned ON after the data exchange completes. When Fault Read Input Bit is turned ON, the status of the Fault Read Flag 03000 will be held and Differentiation Bit 03001 will be turned ON. Then the shift register in word 031 will be turned ON to execute the instructions in sequence.
3. First, bit 03100 is turned ON. Then the following default values are set in the DM area.
   DM 0001: #00FE
   DM 0002: #0000
   The two rightmost bits of DM 0001 are transferred to the two rightmost bits of word n and the data in DM 0002 is transferred to word n+1.

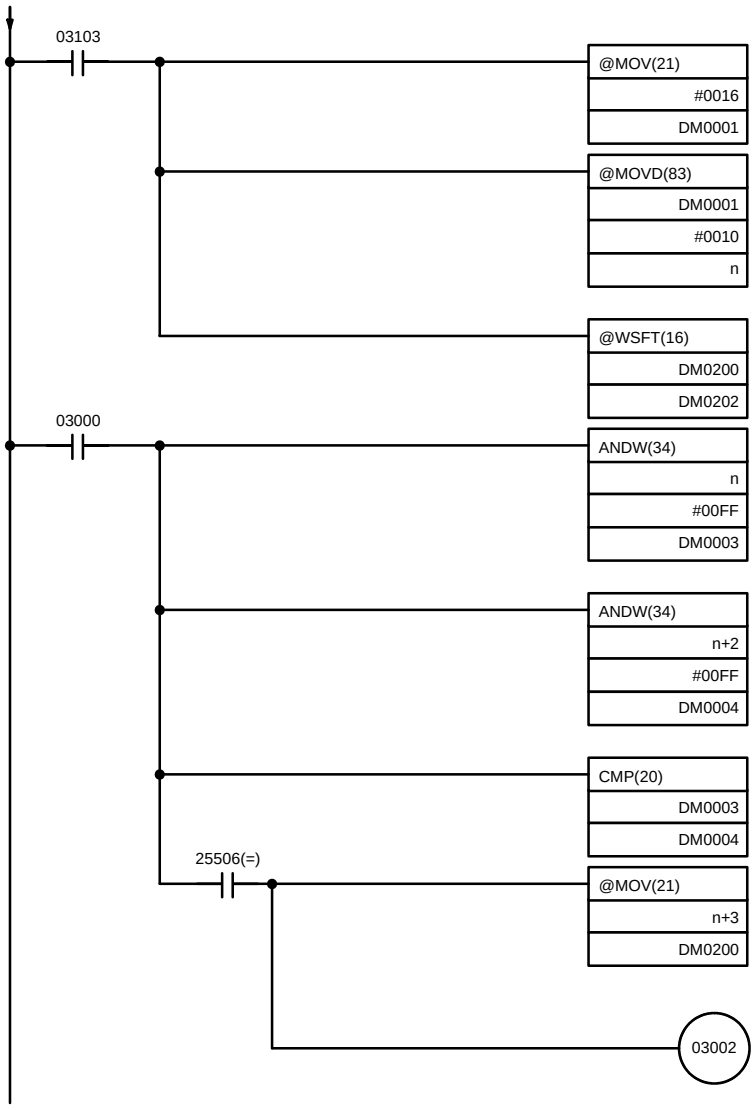
   The write data code FE and base register 00 are transmitted to the Inverter.
4. The two leftmost bits of word n are masked and only the two rightmost bits of the output data code are stored in DM 0003. Similarly, the two leftmost bits of the data returned from the Inverter to word n+2 are masked and only the two rightmost bits of the input data code are stored in DM 0004.
5. The output data code in DM 0003 and the input data code in DM 0004 are compared. Bit 03002 will be turned ON if they coincide.

6. When bit 03002 is turned ON, Shift Register Bit 03100 will be turned OFF and bit 03101 will be turned ON.
7. When bit 03101 is turned ON, the data code 0014 will be set in DM 0001 to read fault 1. Then the two rightmost bits of DM 0001 will be transferred to word n.
8. Like the operations in steps 4 and 5, the output data code and the input data code are compared. If they coincide, fault 1 will have been returned to word n+3. This data is stored in DM 0200. Simultaneously, bit 03002 will be turned ON.
9. When bit 03002 is turned ON, Shift Register Bit 03101 will be turned OFF and bit 03102 will be turned ON.
10. When bit 03102 is turned ON, the data code 0015 will be set in DM 0001 to read fault 2. Then the two rightmost bits of DM 0001 will be transferred to word n. Simultaneously, the contents of DM 0200 will be shifted to DM 0201.
11. Like the operations in steps 4 and 5, the output data code and the input data code are compared. If they coincide, fault 2 will have been returned to word n+3. This data is stored in DM 0200. Simultaneously, bit 03002 is turned ON.
12. When bit 03002 is turned ON, Shift Register Bit 03102 will be turned OFF and bit 03103 will be turned ON.
13. When bit 03103 is turned ON, the data code 0016 will be set in DM 0001 to read fault 3. Then the two rightmost bits of DM 0001 will be transferred to word n. Simultaneously, the contents of DM 0201 will be shifted to DM 0202 and the contents of DM 0200 will be shifted to DM 0201.
14. Like the operations in steps 4 and 5, the output data code and the input data code are compared. If they coincide, fault 3 will have been returned to word n+3. This data is stored in DM 0200. Simultaneously, bit 03002 is turned ON.
15. When bit 03002 is turned ON, the shift register will be reset and bit 03000 that has been on hold will be reset.

Note From the above operations, fault 1 is stored in DM 0202, fault 2 is stored in DM 0201, and fault 3 is stored in DM 0200.
If a fault should result, remedy the fault according to content of the fault and transmit the Fault Reset Signal. The Inverter or motor may be damaged if the Fault Reset Signal Is transmitted without remedying the fault.

■ Ladder Program




03103
@MOV(21)
#0016
DM0001
@MOVD(83)
DM0001
#0010
n
@WSFT(16)
DM0200
DM0202
03000
ANDW(34)
n
#00FF
DM0003
ANDW(34)
n+2
#00FF
DM0004
CMP(20)
DM0003
DM0004
25506(=)
@MOV(21)
n+3
DM0200
03002

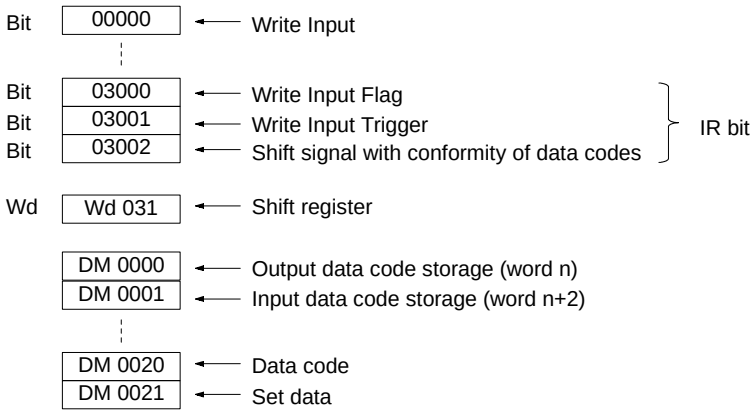
4-4 Writing Constants

The following information is used for writing constants to the Inverter by transmitting the corresponding data in the following three steps.

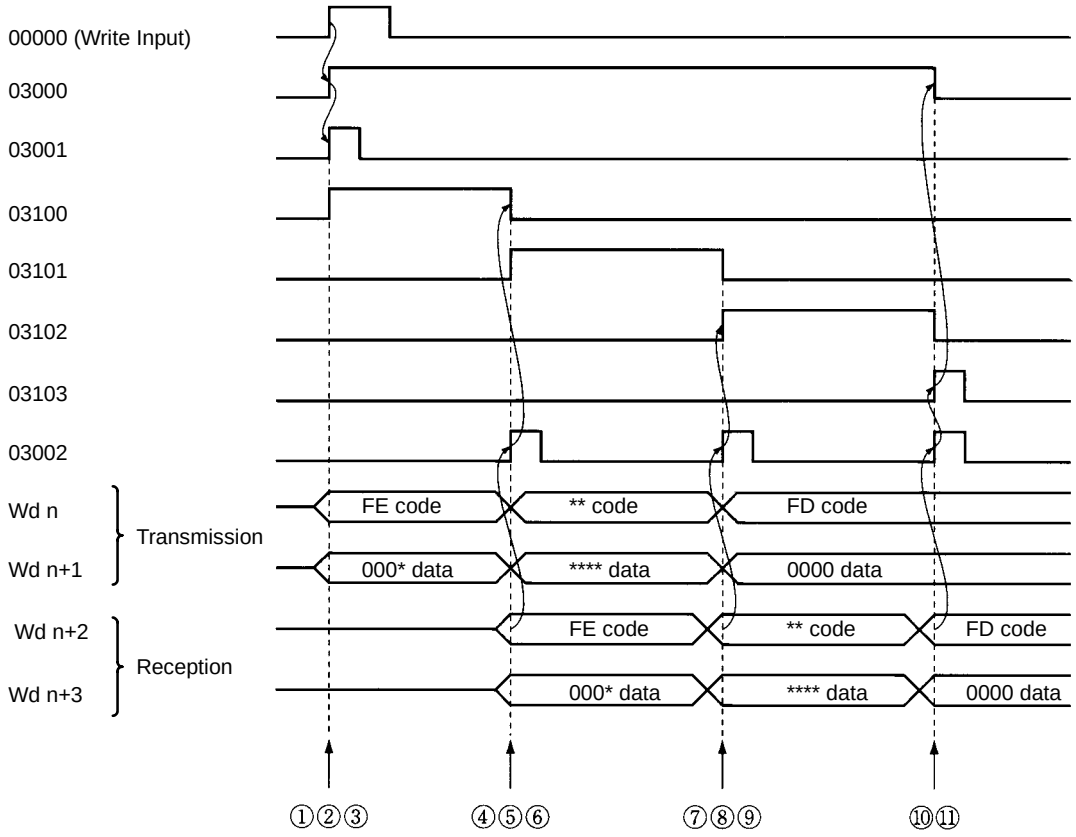
1. Transmit the base register of the constant to be written.
2. Transmit the write data code of the constant and the write data.
3. Transmit the Enter command.

If the previous base register can be used as is, there will be no need to transmit the base register.

■ Allocation



■ Timing Chart



■ Operation

1. When the Write Input Bit is turned ON, the status of the Write Input Flag 03000 will be held and Differentiation Bit 03001 will be turned ON. Then the shift register in word 031 will be turned ON to execute the instructions in sequence.
2. First, bit 03100 is turned ON. Then the following default values are set in the DM area.
   DM 0020: #00FE
   DM 0021: #000*
   Set * to the base register of the corresponding group that includes the constant.
   For example, set DM 0021 to #0003 for writing C1-01 (i.e., acceleration time 1).
   The two rightmost bits of DM 0020 are transferred to the two rightmost bits of word n and the contents of DM 0021 are transferred to word n+1.

   The write data code FE and base register 0∗ are transmitted to the Inverter.
3. The two leftmost bits of word n are masked and only the two rightmost bits of the output data code are stored in DM 0000. Similarly, the two leftmost bits of the data returned from the Inverter to word n+2 are masked and only the two rightmost bits of the input data code are stored in DM 0001.
4. The output data code in DM 0000 and the input data code in DM 0001 are compared. Bit 03002 will turned ON if they coincide.
5. When bit 03002 is ON, Shift Register Bit 03100 will be turned OFF and bit 03101 will be turned ON.

6. When bit 03101 is turned ON, the data code 00** will be set in DM 0020 for writing the constant. Then the two rightmost bits of DM 0020 will be transferred to word n.
   Set ** to the write data code of the corresponding constant.
   For example, set DM 0020 to #0080 for writing C1-01 (i.e., acceleration time 1).
   Simultaneously, set the value to be written to DM 0021 and the value is transferred to word n+1.

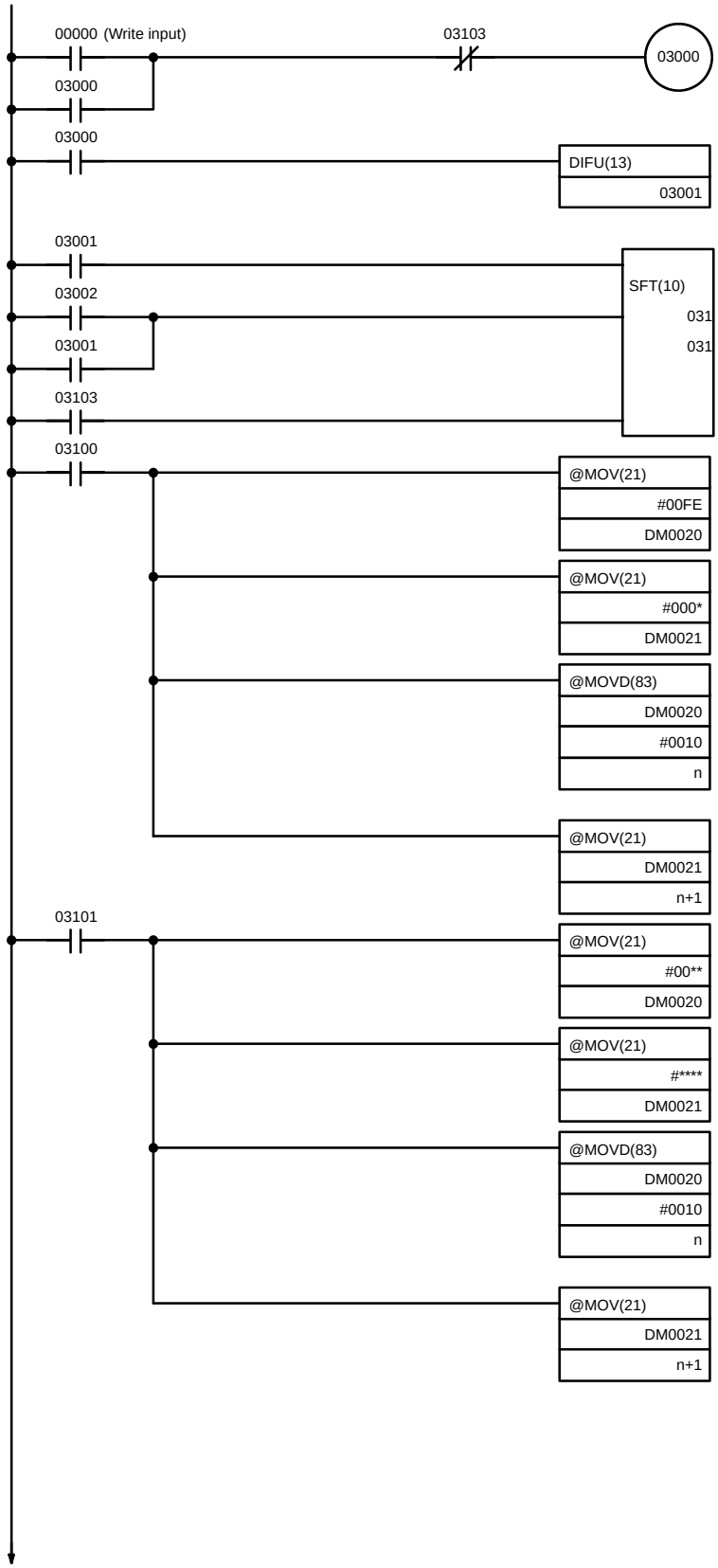
   The write data code and set value are transmitted to the Inverter.
7. Like the operations in steps 3 and 4, the output data code and the input data code are compared. If they coincide, bit 03002 will be turned ON.
8. When bit 03002 is turned ON, Shift Register Bit 03101 will be turned OFF and bit 03102 will be turned ON.
9. When bit 03102 is turned ON, the data code 00FD will be set in DM 0020. Then the two rightmost bits of DM 0020 will be transferred to word n. Simultaneously, DM 0021 will be set to #0000 and this value will be transferred to word n+1.

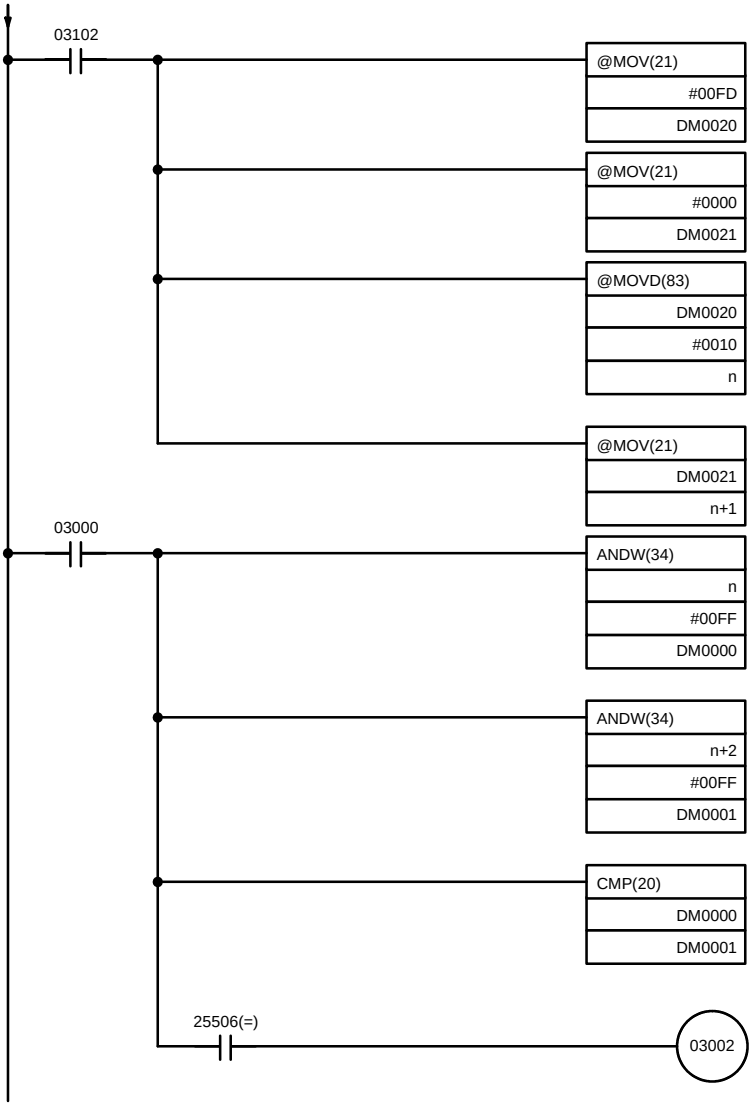
   The Enter command is transmitted.
10. Like the operations in steps 3 and 4, the output data code and the input data code are compared. If they coincide, bit 03002 will be turned ON.
11. When bit 03002 is turned ON, Shift Register Bit 03102 will be turned OFF and bit 03103 will be turned ON. This will reset the shift register and bit 03000 that has been on hold will be reset.

Note 1. If more than one constant is written, the Enter command can be transmitted once at the end of the transmission of all the constants. An ENTFLAG error will result if the Inverter does not receive the Enter command within five seconds after receiving the last data item. The Inverter uses constants that have been received for operation purposes after the reception of the Enter command.

Note 2. Be sure to set 0000 as write data when transmitting the Enter command.

■ Ladder Program




03102
@MOV(21)
#00FD
DM0020
@MOV(21)
#0000
DM0021
@MOVD(83)
DM0020
#0010
n
@MOV(21)
DM0021
n+1
03000
ANDW(34)
n
#00FF
DM0000
ANDW(34)
n+2
#00FF
DM0001
CMP(20)
DM0000
DM0001
25506(=)
03002

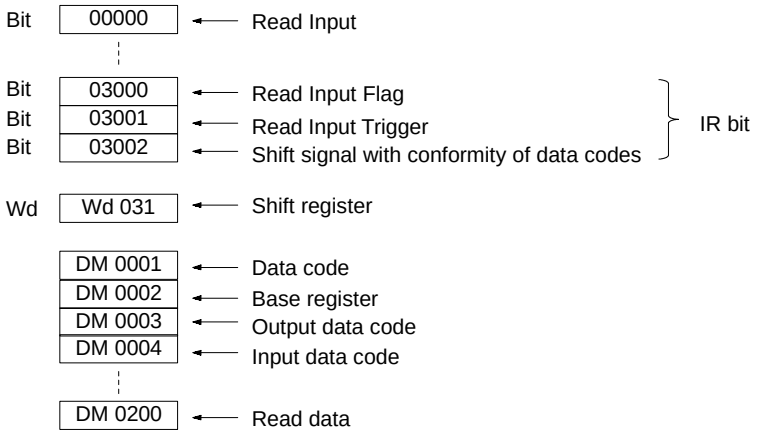
4-5 Reading Constants

The following information is used for reading constants from the Inverter by transmitting the corresponding data in the following two steps.

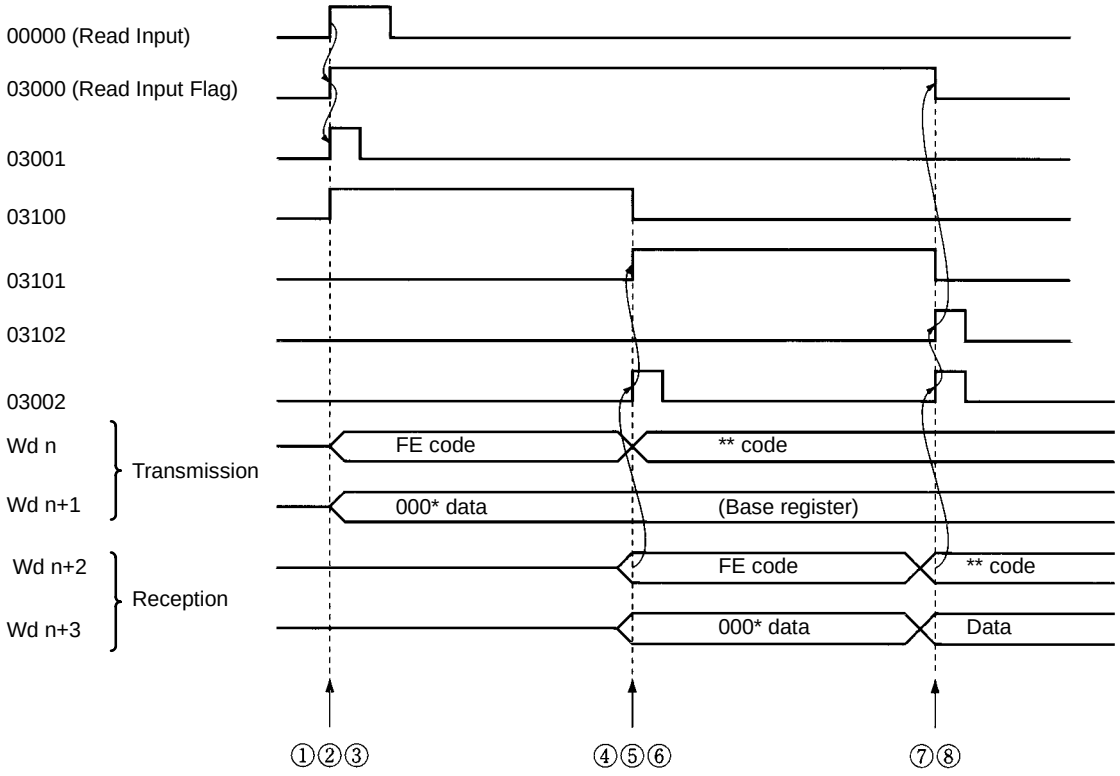
1. Transmit the base register of the constant to be read.
2. Transmit the read data code of the constant and receive the command value.

In this program example, the constant read is stored in DM 0200.

■ Allocation



■ Timing Chart



■ Operation

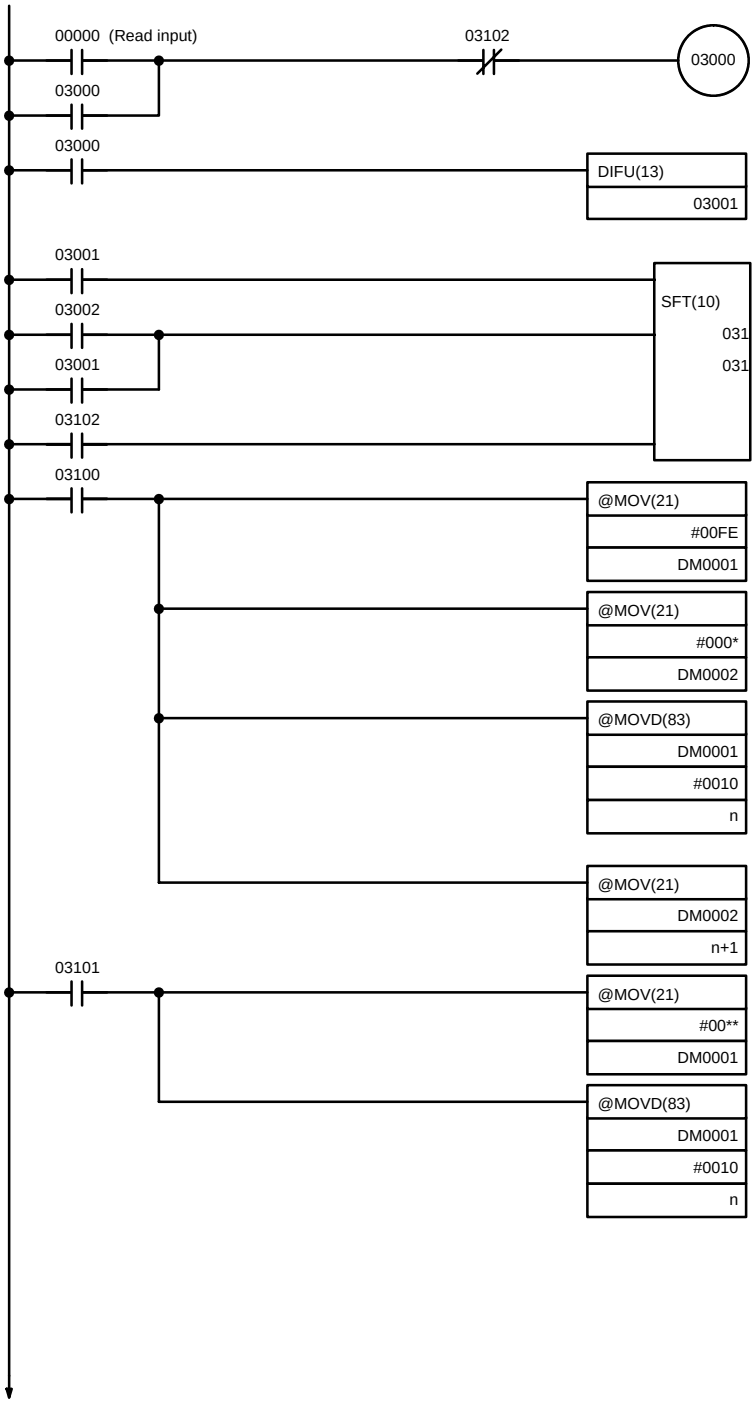
1. When the Read Input Bit is turned ON, the status of Read Input Flag 03000 will be held and Differentiation Bit 03001 will be turned ON. Then the shift register in word 031 will be turned ON to execute the instructions in sequence.
2. First, bit 03100 is turned ON. Then the following default values are set in the DM area.
   DM 0001: #00FE
   DM 0002: #000*
   Set * to the base register of the corresponding group that includes the constant.
   For example, set DM 0002 to #0003 for reading C1-01 (i.e., acceleration time 1).
   The two rightmost bits of DM 0001 are transferred to the two rightmost bits of word n and the contents of DM 0002 are transferred to word n+1.

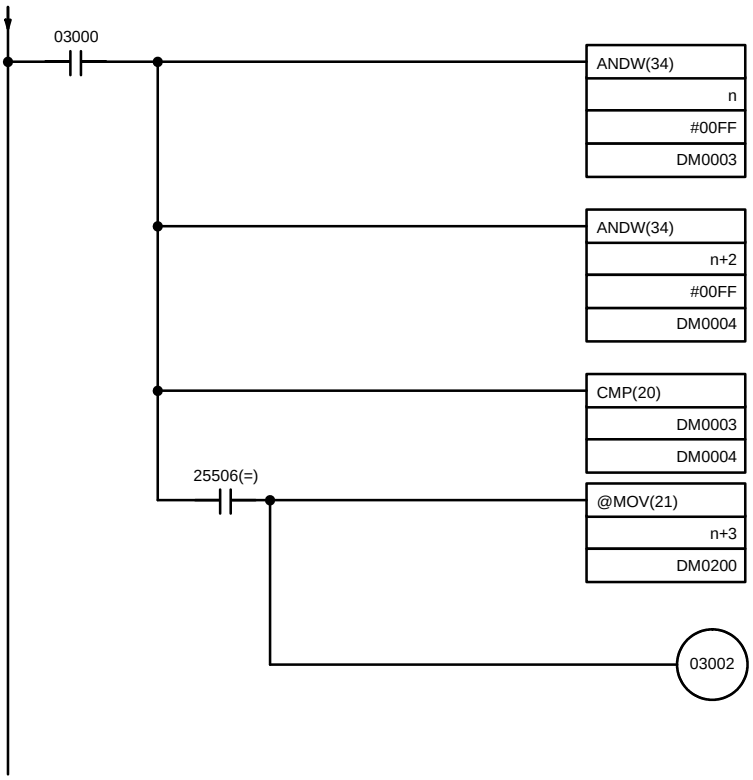
   The write data code FE and base register 0* are transmitted to the Inverter.
3. The two leftmost bits of word n are masked and only the two rightmost bits of the output data code are stored in DM 0003. Similarly, the two leftmost bits of the data returned from the Inverter to word n+2 are masked and only the two rightmost bits of the input data code are stored in DM 0004.
4. The output data code in DM 0003 and the input data code in DM 0004 are compared. Bit 03002 will be turned ON if they coincide.
5. When bit 03002 is turned ON, Shift Register Bit 03100 will be turned OFF and bit 03101 will be turned ON.

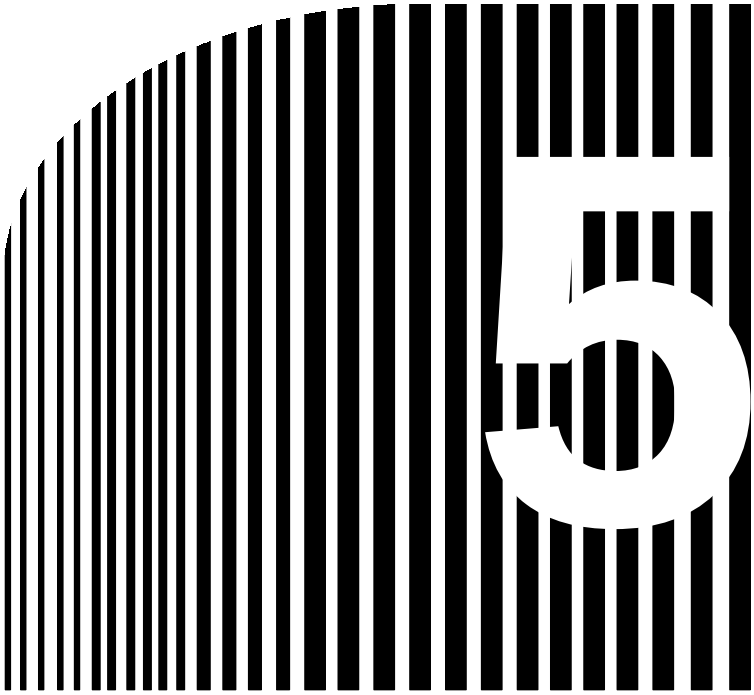
6. When bit 03101 is turned ON, the data code 00** will be set in DM 0001 for reading the constant. Then the two rightmost bits of DM 0001 will be transferred to word n.
   Set ** to the read data code of the corresponding constant.
   For example, set DM 0001 to #0000 for reading C1-01 (i.e., acceleration time 1).

   The read data code is transmitted to the Inverter.
7. Like the operations in steps 3 and 4, the output data code and the input data code are compared. If they coincide, the constant value will have been returned to word n+3. Then store this value in DM 0200. Simultaneously, bit 03002 is turned ON.
8. When bit 03002 is turned ON, Shift Register Bit 03101 is turned OFF and bit 03102 is turned ON. This resets the shift register and bit 03000 that has been on hold is reset.

■ Ladder Program



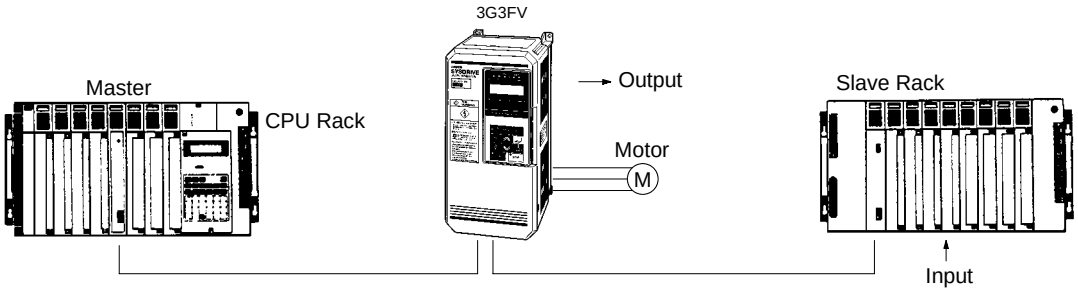

03000
ANDW(34)
n
#00FF
DM0003
ANDW(34)
n+2
#00FF
DM0004
CMP(20)
DM0003
DM0004
25506(=)
@MOV(21)
n+3
DM0200
03002



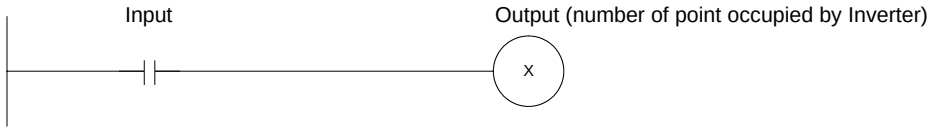
Chapter 5

• Transmission Delay Time •

5-1 Configuration Example



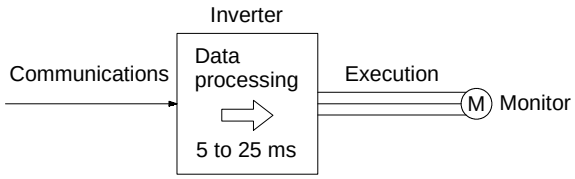
Circuit Example



Transmission time to the Inverter is the same for contact output by Inverter commands or data code transfer by MOV(21). The calculation of the response time from the time the input turns ON at the Slave to the time the Inverter output changes is shown in the following sections.

5-2 Inverter Internal Processing Time

The time required for the Inverter to process data after it has been sent via SYSMAC BUS is as follows,
Minimum response time: 5 ms
Maximum response time: 25 ms



5-3 Response Time for Wired SYSMAC BUS System

CPU Rack	Minimum response time	Maximum response time
C1000H/C2000H	Input ON response time + (cycle time x 2) + (T_{RT} or T_{TT}) + Inverter output minimum response time (5 ms)	Input ON response time + (cycle time x 3) + (T_{RM} x 2) + (T_{RT} or T_{TT}) + Inverter output maximum response time (25 ms)
C500	Input ON response time + cycle time + 2 ms + Inverter output minimum response time (5 ms)	Input ON response time + (cycle time x 2) + (T_{RM} x 2) + Inverter output maximum response time (25 ms)
C200H/HS C200HX/HG/HE	Input ON response time + (cycle time x 3) + Inverter output minimum response time (5 ms) (Given that the remote transmission time is less than the scan time.)	Input ON response time + (cycle time x 4) + Inverter output maximum response time (25 ms) (Given that the remote transmission time is less than the scan time.)
CVM1/CV500/ CV1000/CV2000 (Asynchronous processing)	Input ON response time + 5N + T_{RM} + Inverter output minimum response time (5 ms) (N: Number of Masters on SYSMAC BUS)	Input ON response time + (cycle time + 10N) + (T_{RM} x 2) + (T_{RT} or T_{TT}) + Inverter output maximum response time (25 ms) (N: Number of Masters on SYSMAC BUS)
CVM1/CV500/ CV1000/CV2000 (Synchronous processing)	Input ON response time + cycle time + (T_{RT} or T_{TT}) + Inverter output minimum response time (5 ms)	Input ON response time + (cycle time x 2) + (T_{RM} x 2) + 2(T_{RT} or T_{TT}) + Inverter output maximum response time (25 ms)

T_{RM} = Total Slave transmission time per Master (communications cycle time) = $\Sigma T_{RT} + T_{TT}$
T_{RT} = Transmission time per Slave (RI) = 1.4 ms + (0.2 ms x n)
T_{TT} = Transmission time per Unit I/O Terminal = 2 ms x m
(m: Total number of words for transmission I/O)
(n: Total number of words for relevant Slave I/O)

Note The SYSDRIVE 3G3FV Inverter is a kind of Unit I/O Terminal.
Total number of words for relevant Slave I/O is four words.

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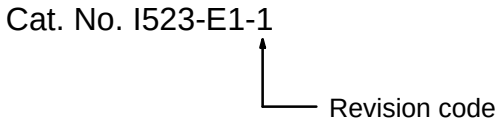
Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	July 1997	Original production