TOSHIBA INVERTER G3-Series RS-232C Manual

**HIGH PERFORMANCE TRANSISTOR INVERTER
VECTOR DRIVE SERIES**

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G3

TOSVERT-130
TRANSISTOR INVERTER

RS232C COMMUNICATIONS MANUAL

October, 1996
Part #42709-001

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Introduction

Thank you for purchasing the Toshiba TOSVERT-130 G3 High-Performance Transistor Inverter with built-in RS232C serial communications. Before using the RS232C communication features, please be sure to thoroughly read the instructions and precautions contained in this manual. In addition, please make sure that this instruction manual is delivered to the end user of the inverter unit, and keep this instruction manual in a safe place for future reference or inverter inspection.

This instruction manual describes the communication specifications, wiring, protocol, functions and usage methods for the RS232C communications interface.

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Usage Precautions

Usage Precautions

- Do not touch charged parts such as the terminal block while the inverter's CHARGE lamp is lit. A charge will still be present in the inverter unit's internal electrolytic capacitors, and therefore touching these areas may result in an electrical shock. Always turn all inverter input power supplies OFF, and wait at least 5 minutes after the CHARGE lamp has gone out before connecting the communications cable or motor wiring.

- To avoid the possibility of electric shock due to leakage currents, always ground the inverter unit's E/GND terminal and the motor.

- When making wiring connections, make certain that no clippings or wiring leads that could cause device failure fall into the inverter or onto electronic components.

- Route the communications cable separate from the inverter input/output power wiring.

- The inverter's EEPROM has a life span of 10,000 write cycles. Do not write to the same EEPROM address (bank 1) more than 10,000 times.

- When the inverter's control power supply is turned on, the inverter performs initialization functions for approximately 1 second, during which communications capabilities are disabled. Communications capabilities will also be disabled for approximately 1 second after momentary control power supply outages or inverter resets.

- Do not make any connections to the +5v pin (pin #5) on the inverter's RS232C port (CN4) - this pin is the power source for the optional parameter writer unit. If connections are made to this pin, the inverter may cease to function properly or the inverter unit may be damaged.

- Do not plug in or remove the RS232C communications cable into the inverter's CN4 communications port while power is applied to the inverter. If the cable is plugged in or removed while power is applied, the inverter's main control board may be damaged.

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1. Wiring Connections

The built-in RS232C serial communications port (CN4) is located on the lower half of the main control board. The connector is a modular 6-pin phone-jack type (part number TM3P-66P, made by Hirose Electric). A typical connection configuration between a G3 inverter and a standard personal computer with a 9-pin RS232C serial port is shown in Figure 1. Because communication interfaces and signal-control programming methods vary, however, this configuration may need to be modified on a case-by-case basis for non-standard interfaces.
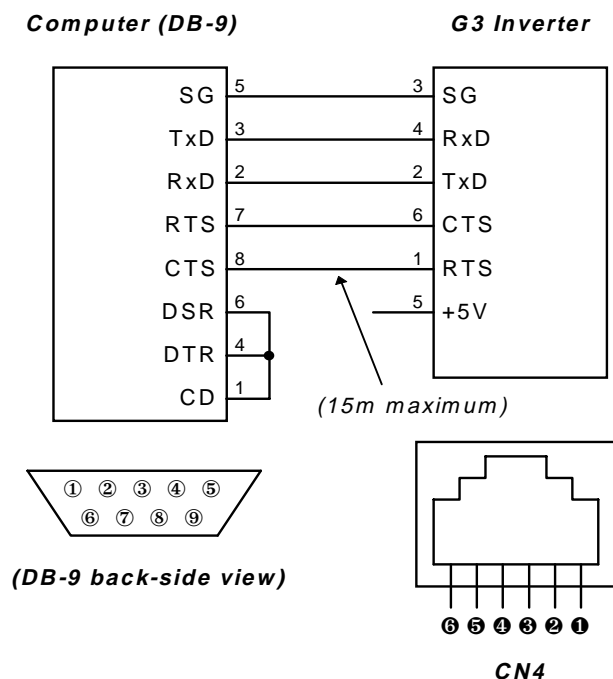
Computer (DB-9)   **G3 Inverter**

Computer (DB-9)	pin		pin	G3 Inverter
SG	5		3	SG
TxD	3		4	RxD
RxD	2		2	TxD
RTS	7		6	CTS
CTS	8		1	RTS
DSR	6		5	+5V
DTR	4			
CD	1			

(15m maximum)

(DB-9 back-side view)

① ② ③ ④ ⑤
⑥ ⑦ ⑧ ⑨

CN4

❻ ❺ ❹ ❸ ❷ ❶

Figure 1. Typical Connection Configuration

G3 Inverter RS232C Serial Port (CN4) Pin Definitions

Pin #	Name	Function
1	RTS	request to send (output)
2	TxD	transmit data (output)
3	SG	signal ground / common return
4	RxD	receive data (input)
5	+5V	power supply for parameter writer unit **(NOTE)**
6	CTS	clear to send (input)

(NOTE): Do not make any connections to the +5V pin (pin #5) - this pin is to be used <u>only</u> as the power source for the optional parameter writer unit. If connections are made to this pin, the inverter may cease to function properly or the inverter unit may be damaged. Also, to avoid damaging the inverter's main control board, do not plug in or remove the RS232C communications cable while power is applied to the inverter.

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2. Overview

The inclusion of RS232C serial communications as standard on the TOSVERT-130 G3 high-performance transistor inverter provides a wide spectrum of inverter control, status and parameter setting capabilities when connected to a computer (host). A program can be written on the host computer that controls communication from the computer to an inverter, processing and analysis of the inverter's response, and formatted display of the response data. In the same way, this type of program can allow a complete set of inverter parameter data to be read and saved onto a storage disk, and then edited or uploaded to other inverter units. Some example RS232C functions and the internal access locations associated with them are as follows:

- Monitor functions (output frequency, load current, input voltage, etc.)
    - ❋ read from RAM (word/bit [1])
    - ❋ read from EEPROM (word/bit [1])
    - ❋ read from internal ROM (word/bit [1])
    - ❋ read from external ROM (word/bit [1])
    - ❋ read from the option bus (word/bit [1]) [2]

- Command functions (RUN / STOP, JOG, etc.)
    - ❋ read from / write to RAM (word/bit [1])
    - ❋ simultaneously write to both EEPROM and RAM [2] (word/bit [1])
    - ❋ read from EEPROM (word/bit [1])

- Parameter functions (parameter data setting reading / writing)
    - ❋ read from / write to RAM (word/bit [1])
    - ❋ read from / write to EEPROM (word/bit [1])
    - ❋ simultaneously write to both EEPROM and RAM [3] (word/bit [1])

- Additional functions
    - ❋ communications timer function can detect broken cables, etc.
    - ❋ address increment function can automatically increment the address after reads/writes.

Notes

[1]: Individual bit read/writes can be performed by setting the data mask. When the data mask is used, bits that are masked off are read as "0", and are not changed when written to (refer to the mask setting command in section 5.1.)

[2]: When reading from the option bus with a TOSLINE-F10, TOSLINE-S20, DeviceNet or RIO communications option board installed, the option board's dual-port RAM is accessed. When reading from the option bus with an RS485 communications option board installed, the option board's USART serial controller is accessed.

[3]: When writing to EEPROM addresses 03C0H ~ 04FEH (excluding 04D8H ~ 04F7H), both the EEPROM and RAM are written. When writing to all other addresses, only the EEPROM is written.

★ Throughout this document, the term "bit" will refer to the smallest computer data element, and will be represented as either a "0" or "1". Similarly, 8 bits will be referred to as a byte, and 16 bits (2 bytes) will be called a word.

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3. Host Computer ↔ Inverter Data Exchange Process

(1) The inverter waits for a request from the host computer to establish a computer link.

(2) The inverters ignore all characters received before a "(" character. If multiple "(" characters are received, only the last one received is valid, and all others are discarded.

<div align="center">

Ex: HOST COMPUTER → INVERTER   INVERTER → HOST COMPUTER
`W%3R(A03C0)`   `(A03C0)`

</div>

(3) When an inverter number is included after the "(" character, only when that number corresponds to the inverter's number will the transmission be valid. If the number does not correspond, the inverter will disregard the transmission without sending any response, and will wait for the next "(" character.

(4) When an inverter number is not included after the "(" character, the transmission is regarded as valid, and the inverter will accept the command.

(5) Only when a carriage return code (0DH) is received will the transmission be considered terminated. If the transmitted message exceeds the maximum number of characters allowed (14), a communications error (error code 0001) is generated.

(6) If the inverter's communications timer is set, and if a transmission is not received within the set time, a communications error will be generated and the inverter will trip (LCD display will show "`COMMUNICATION ERROR (PRESS CLEAR)`"). (Standard shipment setting for the communications timer is "OFF" (0), so if the timer is to be used, the timer time must be set. For more information on setting the communications timer, refer to section 6.2 Timer Function).

(7) If the message does not correspond to the format described in section 4. Communications Format, a communications error will be generated.

(8) After the received command is processed, a response is sent back to the host computer. Typical response times (inverter processing time only - not including communication time) with `COMMUNICATION SELECTION` in `GROUP:COMMUNICATION SETTING PARAMETERS` set to `0` (standard shipment setting) are on the order of 3.9ms to 5.9ms. Data write commands, however, may take upwards of 9.7ms to 11.7ms under the same conditions. In addition, if `COMMUNICATION SELECTION` in `GROUP:COMMUNICATION SETTING PARAMETERS` is set from `1 ~ 3` (RS485, TOSLINE-F10, TOSLINE-S20, DeviceNet or RIO boards installed), the time ranges for these operations may be lengthened by up to a factor of 3 times those given above.

NOTE: When the inverter's control power supply is turned on, the inverter performs initialization functions for approximately 1 second, during which communications capabilities are disabled. Communications capabilities will also be disabled for approximately 1 second after momentary control power supply outages or inverter resets.

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4. Communications Format

All data is represented in hexadecimal format, and inverter status data is not included in the response data (except for the addition of the "#" character when the inverter is tripped.) All transmitted characters conform to the 7-bit (or 8-bit) ASCII (ANSI) standards (refer to section 8.5 ASCII Character Codes.)

- If monitoring the inverter status is desired, refer to the status monitor portion of section 8.4 Communications Data Tables.

4.1 Data Transmissions From Host Computer To Inverter

1	2	3	4	5	6	7	8	9	10	11	12	13	14
"(" (28H)	INVNO		CMD	DATA				"+" (2BH)	"&" (26H)	SUM		")" (29H)	CR (0DH)
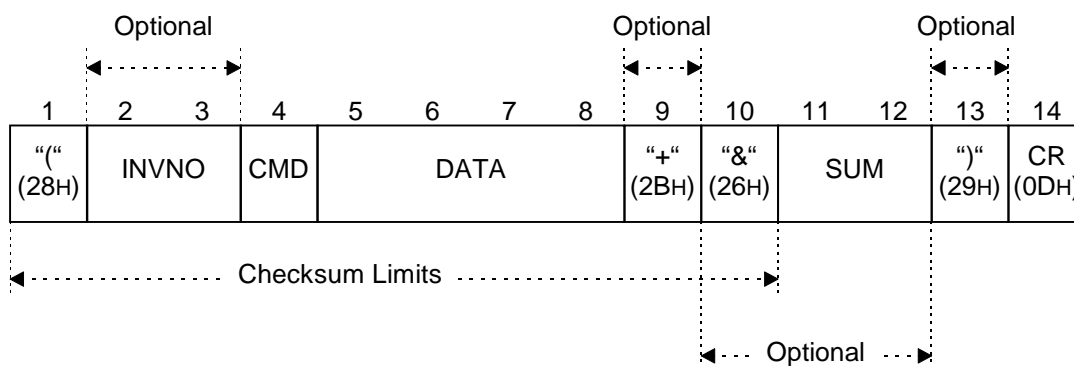
1. "("   (1 character) Header code

2. INVNO   (2 characters) Inverter number (optional): 00 (30H, 30H) ~ 99 (39H, 39H) [base 10]. Only when this number and the inverter number set via the inverter control panel match will the command be recognized. If this number does not match the inverter number, or if this number is only 1 character long, the command will not be recognized and no response will be sent.
Note: Because the panel setting is in base 10, the transmitted number must also be in base 10.

3. CMD   (1 character) Command (refer to section 5.1 Command Summaries) [base 16].

4. DATA   (0 ~ 4 characters) Data (refer to section 5.1 Command Summaries) [base 16].

5. "+"   (1 character) Address increment code (optional). Only valid during R/W commands. After the R/W command is performed, the inverter's address data is automatically incremented by 1 word (address data + 2). (Because the address data is changed, the mask data returns to its initialization value of FFFFH).

- If there is no "+" character or if an error occurs, the address and mask data remain unchanged.

6. "&"   (1 character) Checksum indicator code (optional). Do not include checksum data when this character is not used.

7. SUM   (2 characters) Checksum (optional). ASCII-coded, least-significant 2-digit value (4 bits/digit) of the sum total addition of the ASCII code values from the header code to the checksum indicator code. Do not include a checksum indicator code when the checksum data is not included.

8. ")"   (1 character) Termination code (optional).

9. CR   (1 character) Carriage return code.

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4.2 Data Responses From Inverter To Host Computer

[Normal Condition]

When an inverter number is transmitted, and that number does not match the inverter's set number, the inverter does not transmit a response to the host computer.
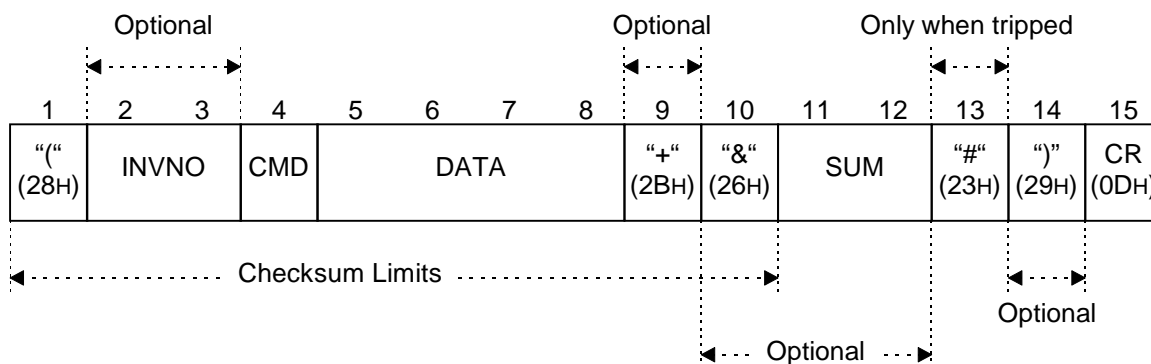

1. **"("** (1 character) Header code

2. **INVNO** (2 characters) Inverter number: 00 (30H, 30H) ~ 99 (39H, 39H) [base 10]. If the transmitted number does not match the inverter number, or if the transmitted number is only 1 character long, the command will not be recognized and no response will be sent.

3. **CMD** (1 character) Command. The received command is returned.

4. **DATA** (4 characters) Data. Except for the "R" and "W" commands, the received data is returned (for the "R" command, the read data is returned, and for the "W" command, the data after writing is returned.) If the received data was less than 4 characters in length, the returned data is extended to 4 characters (Ex: (B0) → (B0000)).

5. **"+"** (1 character) Address increment code. Returned only when initially received. (Only valid during R/W commands. After the R/W command is performed, the inverter's address data is automatically incremented by 1 word (address data + 2), and the mask data is returned to its initialization value of FFFFH.)

6. **"&"** (1 character) Checksum indicator code. Returned only when initially received.

7. **SUM** (2 characters) Checksum. ASCII-coded, least-significant 2-digit value (4 bits/digit) of the sum total addition of the ASCII code values from the header code to the checksum indicator code (returned only when a checksum indicator code was initially received).

8. **"#"** (1 character) Inverter tripped code. Only returned when the inverter is tripped.

9. **")"** (1 character) Termination code (returned only when initially received).

10. **CR** (1 character) Carriage return code.

<< Note >> When a reset command is received, the inverter may reset during the response process, resulting in an incomplete response.

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[Error Condition]

When any of the errors described below occur while a command is being processed, the communications error code (N), the error number (refer to section 8.2 Communication Errors), and checksum data (if initially received), are returned to the host computer. No response will be sent to the host computer when an inverter number was included in the original transmission but it does not match the inverter's set number, when a format error occurs, or when the correct inverter number was transmitted but a checksum error occurs, as this could cause bus contention.

	Optional										Only when tripped		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
"(" (28H)	INVNO		"N" (4EH)	DATA				"&" (26H)	SUM		"#" (23H)	")" (29H)	CR (0DH)

Checksum Limits ←⋯⋯⋯⋯→

Optional
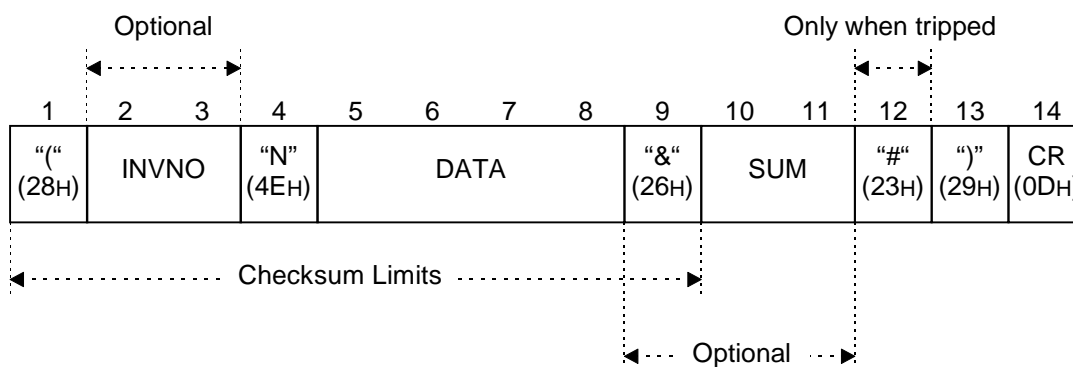
"("   (1 character) Error code.

DATA   (4 characters) Data (0000 ~ 0004).
          0000 ... cannot execute (communication was correct, but cannot execute command. Typical causes: attempt to write a parameter that cannot be written while the inverter is running (MAXIMUM OUTPUT FREQUENCY, VOLTS PER HERTZ PATTERN, etc.), EEPROM error).
          0001 ... data error (data setting value outside of adjustment range, data exceeded 4 characters, etc.)
          0002 ... address error (address data outside of adjustment range when a "W" command was sent, etc.)
          0003 ... command error (invalid command).
          0004 ... checksum error (checksum data incorrect).

")"   (1 character) Termination code. Returned even when not initially received.

Examples:

(N0000&5C) ....cannot execute (attempt to change MAXIMUM OUTPUT FREQUENCY while the inverter was running, etc.)

(N0001&5D) ....data error (attempt to set a preset speed higher than the UPPER LIMIT FREQUENCY setting, etc.)

(N0002&5E) ....address outside limits (a "W" command was sent with the address data set to a write-protected area (RAM: address set to less than 3C0H or higher than 516H, EEPROM: less than 3C0H or higher than 59EH), etc.)

(N0003&5F) ....command error (command other than A, B, M, R, W, or T sent, etc.)

(N0004&60) ....checksum error (checksum data incorrect)

no response ....inverter number error, format error (parity error, overrun error, framing error), checksum error when an inverter number was transmitted, etc.

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5. Transmission Commands

1) **A** (41H):   address setting command
2) **R** (52H):   read command (word read)
3) **W** (57H):   write command (word write)
4) **M** (4DH):   mask setting command
5) **B** (42H):   bank setting command
6) **T** (54H):   communications confirmation (test) command

- Once set, the address, bank, and mask setting data do not change until they are set to different values, except for the following conditions:

  $\Rightarrow$ whenever the address data is changed, the mask data returns to its initialization value of FFFFH.

  $\Rightarrow$ whenever the address increment function is used in conjunction with the "R" or "W" commands, the address data is automatically incremented by 1 word (2 bytes), and the mask data therefore returns to its initialization value of FFFFH.

Initial Values

When power is first applied to the inverter unit, or after a reset or trip clear, etc., the following data values are initialized:

    Address data = 0510H..... (RS232C frequency command setting address)
    Bank data   = 0000H..... (RAM)
    Mask data   = FFFFH.... (all bits can be written to)

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5.1 Command Summaries

[A] Address setting command

Sets the address to be used when reading or writing (refer to the "Address" columns of the communications data tables in section 8.4.)

Address Settings (address data limits: 0000H ~ FFFFH)

Bank	R/W	Read	Write
Bank = 0 (RAM)	R/W	0100H ~ 077EH	03C0H ~ 0516H [1]
Bank = 1 (EEPROM)	R/W	0000H ~ 7FFEH	03C0H ~ 059EH [1] [2]
Bank = 2 (Internal ROM)	R	8000H ~ FFFEH	×
Bank = 3 (External ROM)	R	0000H ~ FFFEH	×
Bank = 4 (Option bus)	R	0000H ~ 1FFEH	×

[1]: The following RAM and EEPROM locations cannot be written to:
04D8H ~ 04F7H, 0500H ~ 0507H (RAM only), 04FAH bits 4 and 5, 04FBH bit 7, 050AH bits 4 and 5 (RAM only), 050BH bit 7 (RAM only), 0512H bits 4 and 5 (RAM only), 0513H bit 7 (RAM only).

Bit position example: (Address 04FAH)
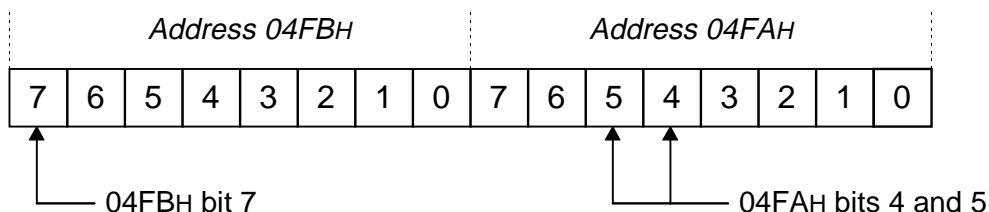
[2]: When addresses 03C0H ~ 04FEH (excluding 04D8H ~ 04F7H) are written to, both RAM and EEPROM contents are changed. Writing to all other addresses changes only the EEPROM contents.

- Once set, the address data does not change until it is set to a different value, except when the address increment function is used in conjunction with the "R" or "W" commands, in which case the address data is automatically post-incremented by 1 word (2 bytes). On power-up or after a reset, etc., the address data is initialized to 0510H (RS232C frequency command).

___ *Caution* ___

The address data should only be set to a maximum of 1 byte less than the bank's upper limit. For example, the read limits of RAM (bank 0) are from 0100H ~ 077FH, so if you would like to read from address 077FH, set the address to 077EH and then retrieve the data from the upper byte of the response word. If the address were set to 077FH and a read were performed, an attempt would be made to access address 0780H, which is above the maximum address limit.

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[B] Bank setting command

Sets the type of memory to be accessed (refer to the "Bank" columns of the communications data tables in section 8.4.)

Bank Settings (bank data limits: 0000H ~ 0004H):

    0000 ......RAM
    0001 ......EEPROM
    0002 ......Internal ROM (read-only)
    0003 ......External / Option ROM (read-only)
    0004 ......Option bus (read-only)
         └──────── Optional (only the lowest digit is required)

• Once set, the bank data does not change until it is set to a different value. On power-up or after a reset, etc., the bank data is initialized to 0000H (RAM).

[M] Mask setting command

Allows the access of only the data required during read/write operations. During data writes, data checking is performed to ensure that the data is being set within adjustment limits, but only that portion of the data that is within the limits of the mask setting is checked (refer to the "Mask" columns of the communications data tables in section 8.4.) Mask data limits = 0000H ~ FFFFH.

When writing data, set the mask bits to binary "1" for those bits that you would like to change, and set the mask bits to binary "0" for those bits that you do not want to change. When reading data, set the mask bits to binary "1" for those bits that you would like to read, and set the mask bits to binary "0" for those bits that you do not want to read. At read time, all data bits for which the corresponding mask bits are "0" will be read as "0".

• Once set, the mask data does not change until it is set to a different value or until the address data changes. When the address data changes (including when the address-increment function is used in conjunction with the R/W commands), the mask data is automatically set to its initialization value of FFFFH, which allows all bits to be read/written. Upon inverter power-up or after a reset, etc., the mask data is initialized to FFFFH.

Ex: To set the Command • frequency mode selection to "RS232C commands valid" (refer to page 34):

HOST COMPUTER → INVERTER   INVERTER → HOST COMPUTER
        (B0)   (B0000) . . . . . set bank to RAM
        (A515)   (A0515) . . . . . set selection address
        (M3)   (M0003) . . . . . mask = $(0000\ 0000\ 0000\ 0011)_2$
        (W1)   (W××××) . . . . . data depends on other bits

	Address 0516H							Address 0515H							
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Due to the mask, only these bits can be changed
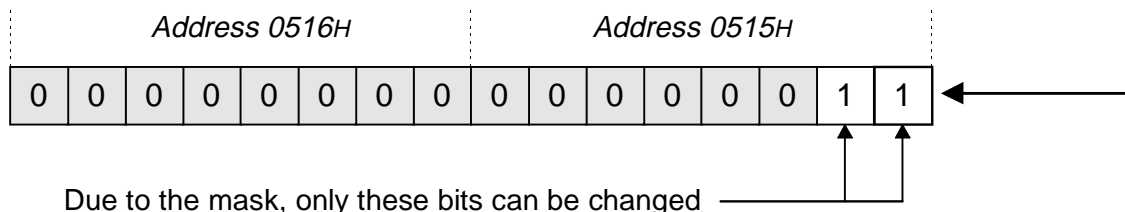
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[W] Data write command

Writes data to the set address in the set bank. When writing to EEPROM addresses 03C0H ~ 04FEH (excluding 04D8H ~ 04F7H), both RAM and EEPROM contents are changed (for data setting limits, refer to the "Adjustment Range" columns of the communications data tables in section 8.4).

- The data response received after sending a "W" command is the actual data at the address after writing (word length). This feature combines the write command with the function of the read command (see Example #1 below.)

- The write command can only be used with RAM (bank 0) and EEPROM (bank 1).

- Address increment function: if a "+" character is included in the "W" command immediately following the data, the address is automatically post-incremented by 1 word (2 bytes), and the mask data returns to its initialization value of FFFFH. This feature can be used to write large blocks of data with a minimum number of commands.

<< Note >>

When a data write is performed, only that portion of the data that is within the mask limits is checked by the data checking routine (see Example #2 on page 14). If the data being written is outside of the adjustment limits associated with that address, an error is generated, and the data is not written. Please be sure to correctly set the mask before performing a data write. If the mask is not correctly set, the data cannot be correctly checked, which may result in data corruption or unpredictable inverter operation (data checking is not performed on certain parameters: refer to the communications data tables in section 8.4 for further information).

___ *Caution* ___

The EEPROM has a lifespan of 10,000 write cycles per address. Do not write to the same EEPROM (bank 1) address more than 10,000 times.

Example #1: Writing RS232C commands (refer to page 34).

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	set bank to RAM
(A512)	(A0512)	RS232C command address
(R)	(R0009)	acc/dec #2, reverse, running
(M4)	(M0004)	mask forward/reverse selection
(W4)	(W000D)	forward (acc/dec #2, running)
(R)	(R0004)	forward [*1] (verify data)

[*1]: If only whether the inverter is running in forward or reverse is to be determined, the read command could be sent immediately after the mask command. Note that the data contained in the response to the write command is the complete, unmasked data at that address.

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<u>Example #2</u>: Setting the frequency display resolution parameter (refer to FREQUENCY DISPLAY RESOLUTION in GROUP:UTILITY PARAMETERS in section 8.4).

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	..... set bank to RAM
(A45D)	(A045D)	..... frequency display resolution address
(R)	(R3111)	
(M3)	(M0003)	
(W6)	(W3112)	

- Mask overlaid on data prior to write

	Address 045EH								*Address 045DH*						
0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	1

- Write data

	Address 045EH								*Address 045DH*						
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

- Data after write

	Address 045EH								*Address 045DH*						
0	0	1	1	0	0	0	1	0	0	0	1	0	0	1	0
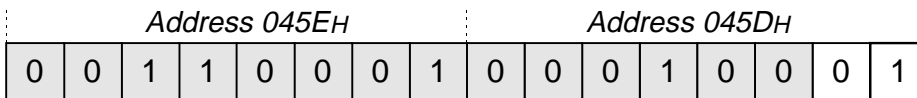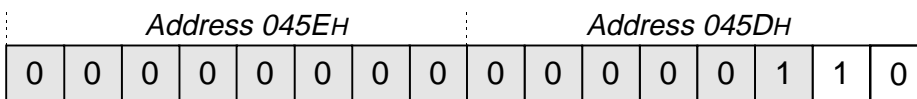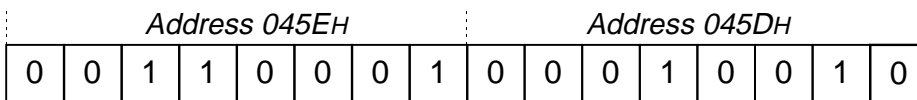
- The adjustment range for the frequency display resolution parameter is 0 ~ 2, but because data checking is only performed on that portion of the data contained in the mask, the written data is viewed as 2. This is within the adjustment range and, therefore, no error occurs. The end result is that the frequency display resolution parameter setting is changed to 2 (0.01Hz).

[R] Data read command

Reads the data at the set address in the set bank. No data argument is required for this command: any included data is ignored.

- The data contained at the set address is returned as the data argument to the host computer. If the mask data is FFFFH, the returned data word is the complete data at the address. If the mask data is anything other than FFFFH, those bits set to 0 in the mask will be returned as 0's.

- Address increment function: if a "+" character is included in the "R" command, the address is automatically post-incremented by 1 word (2 bytes), and the mask data returns to its initialization value of FFFFH. This feature can be used to read large blocks of data with a minimum number of commands.

[T] Test command

Transmitted data (0 ~ 9, A ~ F) is returned unchanged to the host computer. Data adjustment range: 0000H ~ FFFFH.

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6. Communication Examples

6.1 Communications Preparation

(1) Using the communications cable, connect the G3 inverter and the host computer (refer to section 1. Wiring Connections).
(2) Turn power to the inverter and host computer ON.
(3) Check that the baud rate, number of data bits, parity, etc. are all set correctly.
(4) Run a communications interface application program on the host computer.

Communication should now be possible. The examples that follow were generated with the sample MS-DOS QBasic RS232 communications program shown in Example #2 of section 7. Example Communication Programs.

(Note) If using the sample program directly, verify that the inverter's communication parameters (in `GROUP:COMMUNICATION SETTING PARAMETERS`) are set as follows (standard factory settings):
`RS232 BAUD RATE`............. 2 (9600 baud)
`NUMBER OF DATA BITS`..... 0 (7 bits)
`PARITY SETTING`............... 0 (even parity)

Example: Switching to RS232 command and frequency mode (refer to page 34):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER
(B0)	(B0000) .... set bank to RAM
(A515)	(A0515) .... set selection address
(M3)	(M0003) .... mask applicable bits
(W3)	(W××××) .... "RS232C command & frequency valid"

* Note that because the RS232C command/frequency mode selection has priority, the setting of `COMMAND MODE SELECTION` and `FREQUENCY MODE SELECTION` in `GROUP:UTILITY PARAMETERS` will have no effect on the actual command/frequency status after the above example program is executed. Even if the command/frequency mode is not set to RS232C input, other functions such as parameter setting, inverter status monitoring, etc., can still be performed via RS232C communications.

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6.2 Timer Function

When using RS232C communications with the G3 inverter, a communications timer function can be implemented. When the communications timer is used, if communication does not take place within the set time limit, the inverter will trip ("COMMUNICATION ERROR (PRESS CLEAR)" will be shown on the LCD display).

If it is desired to have the timer function active even after inverter control power is cycled OFF and ON, write the timer setting to EEPROM (bank 1). If it is desired to have the timer function disabled after inverter control power is cycled OFF and ON, write the timer setting to RAM (bank 0). The following example shows the remaining steps for setting the timer. (NOTE: Because the factory setting for the timer is 0000H, setting the STANDARD SETTING MODE SELECTION parameter in GROUP:UTILITY PARAMETERS to 3 (return to factory settings) will cause the timer setting to return to 0000H).

Ex: Setting the RS232C communications timer (setting to 15 seconds):

HOST COMPUTER → INVERTER   INVERTER → HOST COMPUTER
    (A445)   (A0445) . . . . . RS232C timer address
    (MFF)   (M00FF) . . . . . mask applicable bits
    (WF)   (W××0F) . . . . . set timer to 15 seconds
    (R)   (R××0F) . . . . . activate timer

< Timer adjustment range >

00H	: timer OFF
01H ~ 64H	: 1s ~ 100s

NOTE

- Setting the timer time alone does not activate the timer. The timer is activated by the first valid communication that occurs after the timer is set. If the timer setting is written to the EEPROM, the timer is activated by the first valid communication that occurs after the inverter is powered ON.

- If an inverter number error (number is only 1 character long, number does not match the inverter's set number), format error (parity error, overrun error, framing error), or checksum error when an inverter number was transmitted occurs immediately after the timer time is set, this is not regarded as a valid communication, and the timer will not be activated / reset.

- To turn the timer function OFF, set the timer setting to "0". The timer will then be turned OFF upon the occurrence of the next valid communication (writing "0" to the timer setting alone will not turn the timer OFF).

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6.3 Examples

- Setting the RS232C frequency command value:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A510)	(A0510)	RS232C frequency command address
(R)	(R1F40)	currently set to 80.00Hz
(W1770)	(W1770)	change to 60.00Hz

- Performing RUN/STOP commands:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A512)	(A0512)	RS232C command address
(M1)	(M0001)	mask RUN/STOP bit
(W1)	(W××××)	execute RUN command
(W0)	(W××××)	execute STOP command

- Monitoring the command mode status:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A5B8)	(A05B8)	command mode status address
(M3)	(M0003)	mask status bits
(R)	(R0003)	command mode currently = RS232C

- Switching to JOG mode:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A512)	(A0512)	RS232C command address
(M80)	(M0080)	mask JOG mode selection bit
(W80)	(W××××)	select JOG mode

- Selecting between acc/dec #1/#2 (setting acc/dec #2):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A512)	(A0512)	RS232C command address
(M8)	(M0008)	mask acc/dec #1/#2 selection bit
(W8)	(W××××)	select acc/dec #2

- Monitoring operating frequency:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A524)	(A0524)	operating frequency monitor address
(R)	(R1770)	inverter is running at 60.00Hz

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- Monitoring the cumulative run time:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A5D2)	(A05D2)	run time rollover bit address
(M8)	(M0008)	mask run time rollover bit
(R)	(R0000)	timer has not rolled over
(A5A6)	(A05A6)	cumulative run time address
(R)	(R0064)	timer is currently at 100 hours

- Executing emergency off command (inverter will trip):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A513)	(A0513)	RS232C command address
(M10)	(M0010)	mask emergency off command bit
(W10)	(W××××)	execute emergency off

❋ Because the inverter has tripped, all responses from the inverter will have the inverter tripped "#" character included until a trip clear command is performed.

- Monitoring the present trip code:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000#)	select RAM (bank 0)
(A591)	(A0591#)	present trip monitor address (refer to Table 1 on page 40)
(M7F)	(M007F#)	mask trip code bits
(R)	(R0011#)	11H = emergency off trip

- Performing reset (trip clear):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000#)	select RAM (bank 0)
(A513)	(A0513#)	RS232C command address
(M20)	(M0020#)	mask reset command bit
(W20)	no response . .	reset

❋ Note that whether or not a response to the reset command is generated is dependent upon system and reset timing. After resetting, the RAM data, address and mask data, etc., will have returned to their initialized values, and the inverter tripped "#" character will no longer be included in the inverter responses.

- Executing "return to factory settings" (STANDARD SETTING MODE SELECTION = 3) command (can only be performed when the inverter is stopped):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B0)	(B0000)	select RAM (bank 0)
(A4C2)	(A04C2)	standard setting mode address
(M00FF)	(M00FF)	mask selection bits
(W3)	(W××03)	3 = return to factory settings

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6.4 Address Increment Function Examples

Example #1: Parameter writing

- Writing MAXIMUM OUTPUT FREQUENCY, UPPER LIMIT FREQUENCY, LOWER LIMIT FREQUENCY, ACCELERATION TIME #1 and DECELERATION TIME #1 parameter settings using the address increment feature:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(B1)	(B0001)	select EEPROM (bank 1)
(A3C0)	(A03C0)	maximum frequency address
(W1F40+)	(W1F40+)	write 1F40H (80.00Hz) - address is then auto-incremented to 03C2H
(W1F40+)	(W1F40+)	write 80.00Hz to 03C2H (UPPER LIMIT FREQUENCY)
(W0+)	(W0000+)	write 0.00Hz to 03C4H (LOWER LIMIT FREQUENCY)
(W64+)	(W0064+)	write 10.0s to 03C6H (ACCELERATION TIME #1)
(W64)	(W0064)	write 10.0s to 03C8H (DECELERATION TIME #1)

❋ Note that because the data is being written to bank 1 (EEPROM) in the above example, the same data is also automatically written to bank 0 (RAM) (refer to page 13). When a data write is performed, data checking is also performed to ensure that the data is within the adjustment range specified in the data tables in section 8.4. If the address or data is out of its adjustment range, an error will be generated, and the data will not be valid (please note that data checking is not performed on those parameters in the data tables in section 8.4 whose mask and adjustment range columns are shaded.) If a "+" character is included in the "W" command immediately following the data, the address is automatically post-incremented by 1 word (2 bytes).

Example #2: Parameter reading

- Reading MAXIMUM OUTPUT FREQUENCY, UPPER LIMIT FREQUENCY, LOWER LIMIT FREQUENCY, ACCELERATION TIME #1 and DECELERATION TIME #1 parameter settings using the address increment feature (assuming continuation from Example #1 above):

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER	
(A3C0)	(A03C0)	MAXIMUM OUTPUT FREQUENCY addr.
(R+)	(R1F40+)	read 1F40H (80.00Hz) - address is then auto-incremented to 03C2H
(R+)	(R1F40+)	read 80.00Hz from 03C2H
(R+)	(R0000+)	read 0.00Hz from 03C4H
(R+)	(R0064+)	read 10.0s from 03C6H
(R)	(R0064)	read 10.0s from 03C8H

These data values would be the same whether read from bank 0 (RAM) or bank 1 (EEPROM).

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7. Example Communication Programs

<u>Example #1</u>: MS-DOS QBasic program which continuously monitors a user-input address (program written in MS-DOS QBasic Version 1.1 and executed on an IBM-compatible computer):

Program listing

```
OPEN "COM1:9600,E,7,1" FOR RANDOM AS #1    ----  9600 baud, even parity, 7 data bits
INPUT "Monitor Address (0000-FFFF):"; C$    ----  input the address to monitor
B$ = "B0"                                   ----  set RAM bank
C$ = "A" + C$                               ----  build address (A) command
MonitorLoop:
   PRINT #1, "(" + B$ + ")"                  ----  transmit data packet to inverter
   INPUT #1, D$                              ----  read inverter response
   PRINT "Received Data = "; D$              ----  display the response
   B$ = C$                                   ----  advance command (B → A → R)
   C$ = "R"                                  ----  set "R" command
GOTO MonitorLoop                            ----  loop forever ([CTRL] + [BREAK] exits)
```

Execution Example (operating frequency monitor)

```
Monitor Address (0000-FFFF):? 524          ----  operating frequency monitor address
Received Data = (B0000)
Received Data = (A0524)
Received Data = (R1770)                      ----  current operating frequency = 60.00Hz
Received Data = (R1770)
Received Data = (R1770)
      :
      :
```

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Example #2: Sample MS-DOS QBasic RS232C communications program (program written in MS-DOS QBasic Version 1.1 and executed on an IBM-compatible computer):

Program listing

```
OPEN "COM1:9600,E,7,1" FOR RANDOM AS #1   -----  9600 baud,even parity,7 data bits
CommLoop:
   INPUT "Send Data =";B$                  -----  input command to send
   PRINT #1,B$                             -----  transmit command to inverter
   INPUT #1,A$                             -----  read inverter response
   PRINT "Received Data = ";A$             -----  display inverter response
GOTO CommLoop                              -----  loop forever ([CTRL] + [BREAK] exits)
```

Execution Example

```
Send Data =? (A3C0)              -----  maximum output frequency address
Received Data = (A03C0)
Send Data =? (W1770)             -----  set maximum output frequency to 60.00Hz
Received Data = (W1770)
Send Data =?
     :
     :
```

Example #3: Sample data conversion QBasic programs (programs written in MS-DOS QBasic Version 1.1 and executed on an IBM-compatible computer):

A) Decimal to hexadecimal conversion

Program listing

```
Start:
   INPUT "Decimal Data ="; A
   INPUT "Multiplier ="; B
   C$ = HEX$(A / B)
   PRINT "Hexadecimal Data = ";C$
GOTO Start
```

Execution Example

```
Decimal Data =? 60
Multiplier =? 0.01
Hexadecimal Data = 1770
Decimal Data =? 80
Multiplier =? 0.01
Hexadecimal Data = 1F40
     :
     :
```

B) Hexadecimal to decimal conversion

Program listing

```
Start:
   INPUT "Hexadecimal Data ="; A$
   INPUT "Multiplier ="; B
   A$ = "&H" + A$
   X = VAL(A$) * B
   PRINT "Decimal Data = "; X
GOTO Start
```

Execution Example

```
Hexadecimal Data =? 1F40
Multiplier =? 0.01
Decimal Data = 80
Hexadecimal Data =? 1770
Multiplier =? 0.01
Decimal Data = 60
        :
        :
```

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Example #4:   Sample MS-DOS QBasic RS232C communications program #2 (program written in MS-DOS QBasic Version 1.1 and executed on an IBM-compatible computer):

Program listing

```
DECLARE SUB TxRx (Comd$, Data$, RXdata$, CommErr%)
DIM BRT$, PRT$, BLN$, CMD$, DAT$, rxd$, CommErr%

INPUT "Baud Rate ="; BRT$                              ----- input baud rate
INPUT "Parity ="; PRT$                                 ----- input parity
INPUT "Length ="; BLN$                                 ----- input number of data bits
OPEN "COM1:" + BRT$ + "," + PRT$ + "," + BLN$ + ",1" FOR RANDOM AS #1
                                                       ----- open communications port
CommLoop:                                              ----- main program loop
    INPUT "Command ="; CMD$                            ----- input command (A,R,W,M,B,T)
    INPUT "Data ="; DAT$                               ----- input data
    CALL TxRx(CMD$, DAT$, rxd$, CommErr%)              ----- call main Tx/Rx subroutine
    IF CommErr% = 0 THEN                               ----- OK/error check
       PRINT "Received Data = "; rxd$                  ----- display received data if OK
    ELSE                                               ----- else, indicate error
       PRINT "A Communications Error Has Occurred!"
    END IF
    PRINT                                              ----- print blank line
GOTO CommLoop                                          ----- loop ([CTRL]+[BREAK] exits)


SUB TxRx (Comd$, Data$, RXdata$, CommErr%)             ----- main Tx/Rx subroutine
    DIM TXdata$, Sum&, I%, CKsum$, Retry%, RXbuf$, StartTime&, RXchar$

    TXdata$ = "(" + Comd$ + Data$ + "&"                ----- build checksum string
    Sum& = 0                                           ----- initialize checksum data
    FOR I% = 1 TO LEN(TXdata$)
       Sum& = Sum& + ASC(MID$(TXdata$, I%, 1))         ----- calculate checksum
    NEXT I%
    CKsum$ = RIGHT$(HEX$(Sum&), 2)                     ----- convert to characters
    TXdata$ = TXdata$ + CKsum$ + ")"                   ----- build complete Tx string
    Retry% = 0                                         ----- initialize retry counter

Txloop:                                                ----- transmission loop
    IF LOC(1) <> 0 THEN RXchar$ = INPUT$(LOC(1), #1)   ----- ensure Rx buffer is empty
    PRINT #1, Txdata$                                  ----- transmit data
    PRINT "Transmitted Data = "; Txdata$               ----- display transmitted data
    RXbuf$ = ""                                        ----- initialize receive buffer
    StartTime& = TIMER                                 ----- initialize 1s timer

Rxloop:                                                ----- reception loop
    IF (TIMER - StartTime&) > 1 THEN                   ----- check for time-out (1s)
       Retry% = Retry% + 1                             ----- increment retry counter
       IF Retry% < 3 THEN GOTO Txloop                 ----- 3 Tx attempts allowed
       CommErr% = 1                                    ----- indicate time-out error
       EXIT SUB                                        ----- return to main program
```

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```
     END IF
     IF (TIMER - StartTime&) < 0 THEN StartTime& = TIMER
                                             ----- timer overflow check
     RXchar$ = ""                            ----- initialize received char
     IF LOC(1) <> 0 THEN RXchar$ = INPUT$(1, #1)   ----- if available, retrieve char

     IF RXchar$ = CHR$(13) THEN              ----- [CR] received?
        RXdata$ = RXbuf$                     ----- transfer received data
        RXbuf$ = ""                          ----- initialize receive buffer
        IF LEFT$(RXdata$, LEN("(" + Comd$)) = "(" + Comd$ THEN
                                             ----- data packet error check
           CommErr% = 0                      ----- indicate no error
           EXIT SUB                          ----- return to main program
        ELSE
          PRINT "Error - Received Data = "; Rxdata$   ----- indicate data error
          Retry% = Retry% + 1                ----- increment retry counter
          IF Retry% < 3 THEN GOTO Txloop     ----- 3 Tx attempts allowed
          CommErr% = 2                       ----- indicate data error
          EXIT SUB                           ----- return to main program
        END IF
     ELSE                                    ----- [CR] not retrieved
        RXbuf$ = RXbuf$ + RXchar$            ----- append char to data
        GOTO Rxloop                          ----- continue receiving data
     END IF

 END SUB
```

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Execution Example

```
Baud Rate =? 9600                    ------- baud rate = 9600
Parity =? E                          ------- even parity
Length =? 7                          ------- 7 data bits
Command =? A                         ------- set address data command
Data =? 3C0                          ------- maximum frequency address
Transmitted Data = (A3C0&35)         ------- transmitted data packet
Received Data = (A03C0&65)           ------- data response received OK
     :
     :
Command =? 00A                       ------- using an inverter number
Data =? 3C0
Transmitted Data = (00A3C0&95)
Received Data = (00A03C0&C5)
     :
     :
Command =? 01A                       ------- example communications error (inv. No. error)
Data =? 3C0
Transmitted Data = (01A3C0&96)
Transmitted Data = (01A3C0&96)
Transmitted Data = (01A3C0&96)       ------- 3 unsuccessful communication attempts
A Communications Error Has Occurred!
     :
     :
Command =? A                         ------- example communications error (address error)
Data =? 0
Transmitted Data = (A0&BF)
Received Data = (A0000&4F)


Command =? W                         ------- cannot write to address 0!
Data =? 0
Transmitted Data = (W0&D5)
Error - Received Data = (N0002&5E)----     N0002 = address error
Transmitted Data = (W0&D5)
Error - Received Data = (N0002&5E)
Transmitted Data = (W0&D5)
Error - Received Data = (N0002&5E)
A Communications Error Has Occurred!
     :
     :
Command =? A                         ------- address auto-increment example
Data =? 3C0                          ------- read MAXIMUM OUTPUT FREQUENCY
Transmitted Data = (A3C0&35)
Received Data = (A03C0&65)


Command =? R
Data =? +
Transmitted Data = (R+&CB)
Received Data = (R1F40+&A6)          ------- read 80.00Hz:  address is then incremented
     :                               -------          to 3C2 (UPPER LIMIT FREQUENCY)
```

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Program Comments

Main Program

Overview: Upon program startup, the communication parameters are entered and the communications port initialized. The main program loop is then initiated, where the command and data are entered. The transmit/receive subroutine is then called, and the response status displayed.

Variables: <u>Input</u> -   BRT$:   baud rate
                       PRT$:   parity (even = E, odd = O)
                       BLN$:   number of data bits (7 or 8)
                       CMD$:   command (A, B, M, R, T, W)
                       DAT$:   data (0000 ~ FFFF(+))

         <u>Output</u> - rxd$:   received data

         <u>Internal</u> - CommErr%: error code (0=no error, 1=time-out error, 2=data error)

Notes: • The communications port to use is hard-coded as COM1.

      • If an inverter number is to be used, it must be entered as 2 decimal numbers included before the command (see example in the "Execution Example" section).

      • To use the address increment feature (R/W commands <u>only</u>), append a "+" to the input data (DAT$).

Transmit/Receive Subroutine

Overview: A checksum is calculated and added to the command and data, and then the combined message is transmitted. Receive processing is performed, and the response string is returned along with an error flag (code). Time-out and data error checks are performed, and retransmissions can occur up to a set limit of 3 times.

Variables: <u>Input</u> -   Comd$:   command (A, B, M, R, T, W) (from main routine)
                       Data$:   data (0000 ~ FFFF(+)) (from main routine)

         <u>Output</u> - RXdata$:   received data (to main routine)
                       ComErr%:   error code (to main routine)

         <u>System</u> - TIMER: system timer

         <u>Internal</u> - TXdata$:   transmitted data string
                       SUM&:   checksum calculation buffer
                       I%:   checksum calculation loop counter
                       CKsum$:   converted checksum string
                       Retry%:   transmission retry counter
                       RXchar$:   received character buffer
                       RXbuf$:   received message temporary buffer
                       StartTime&: time-out start time

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Notes: • Check the data before entering it into the main routine. This subroutine performs no error checking.

• This subroutine performs no checksum verification on returned data packets.

• If transmission speed is a concern, the checksum processing may be eliminated. The TXdata$ variable would then become:

```
TXdata$ = "(" + Comd$ + Data$ + ")"
```

• If communication error (inverter "N" code response) processing is desired, the line:

```
IF LEFT$(RXdata$, LEN("(" + Comd$)) = "(" + Comd$ THEN
```

can be replaced by the line:

```
IF (LEFT$(RXdata$, LEN("(" + Comd$)) = "(" + Comd$) OR
(LEFT$(RXdata$, LEN("(" + "N")) = "(" + "N") THEN
```

RXdata$ will then be returned with the error message, and CommErr% will be set to 0 (no error).

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8. Appendix

8.1 Communications Specification

Item	Specification
Applicable Inverter	TOSHIBA TOSVERT-130 G3
Communication System	Half-duplex, 5-wire system
Connection Control System	Centralized control system [1]
Synchronization Method	Start-stop synchronization (1 stop bit)
Communication Speed	Default setting: 9600 baud 2400/4800/9600 baud selectable [2]
Communication Code	Default setting: 7-bit (ASCII), even parity 7/8 -bit, even/odd parity selectable[3]
Character Format	10-bit or 11-bit [4]
Error Detection Methods	Parity, checksum
Error Correction Method	None
Response Observation Method	None
Bit Transmission Order	LSB first
Frame Length	Variable (15 bytes maximum)
Interface	Conforms to EIA RS232 standard
Communication Distance	15m maximum
Other	Time-out function available

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NOTES:

*1: Centralized control system
The controlling equipment master (host) controls connected slave (G3) units. The master transmits data to a G3 unit, and the G3 transmits its response, according to the communication process outlined in this manual.

*2: Baud rate selection method
The RS232C baud rate is selected by setting parameter RS232 BAUD RATE in GROUP:COMMUNICATION SETTING PARAMETERS (refer to page 58). When any of the communication setting parameters are changed, the new settings will not be validated until the inverter is powered OFF and then back ON again, a reset is performed, the INDUSTRIAL APPLICATIONS parameter (in GROUP:UTILITY PARAMETERS) setting is changed, or the STANDARD SETTING MODE SELECTION parameter (in GROUP:UTILITY PARAMETERS) setting is changed. Until one of these actions is performed, the communication settings that were in effect prior to the change will still be valid.

*3: Communication Code
All character codes conform to the ASCII (ANSI) standard for 7-bit alphanumeric characters (refer to section 8.5 ASCII Character Codes). With standard settings, an even parity bit is also added. Via the following parameter settings, 8-bit data length and odd parity selections are also available:

- Bit length: NUMBER OF DATA BITS in GROUP:COMMUNICATION SETTING PARAMETERS (0 = 7 bits, 1 = 8 bits).
- Parity: PARITY SETTING in GROUP:COMMUNICATION SETTING PARAMETERS (0 = even parity, 1 = odd parity).

*4: Character Formats

1) 10-bit (7 bits + parity) (standard factory-shipped setting)

START BIT	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	PARITY BIT	STOP BIT

2) 11-bit (8 bits + parity)

START BIT	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	PARITY BIT	STOP BIT

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8.2 Communication Errors

Error Name	Error Description	Error Code
Cannot execute	communication was correct, but cannot execute command (attempt to write a parameter that cannot be written while inverter is running [*1], EEPROM error)	0000
Data error	data setting value outside of adjustment range, transmission exceeded 14 characters, character other than a <CR> received after the ")", data exceeded 4 characters, data not in the range of "0" ~ "9" or "A" ~ "F", character other than "&", ")", <CR>, or "+" (only during read/write commands) received after data, checksum data exceeded 2 characters.	0001
Address error	address data outside of adjustment range when a "W" command was sent, attempt to write data at a protected address [*2], bank setting was incorrect when a read/write was performed	0002
Command error	command was incorrect	0003
Checksum error	checksum was incorrect, character other than ")" or <CR> received after the checksum data	0004/ no response [*4]
Format error	communications format was incorrect (parity error, overrun error, framing error) [*3]	no response
Inverter number error	inverter number was incorrect, inverter number was only 1 character long	no response

[*1]: Parameters that cannot be set while the inverter is running are MAXIMUM OUTPUT FREQUENCY, BASE FREQUENCY VOLTAGE SELECT, VOLTS PER HERTZ PATTERN, STANDARD SETTING MODE SELECTION, and INDUSTRIAL APPLICATIONS.

[*2]: The following RAM and EEPROM locations cannot be written to: 04D8H ~ 04F7H, 0500H ~ 0507H (RAM only), 04FAH bits 4 and 5, 04FBH bit 7, 050AH bits 4 and 5 (RAM only), 050BH bit 7 (RAM only), 0512H bits 4 and 5 (RAM only), 0513H bit 7 (RAM only).

[*3]: Parity error:....... parity incorrect
Overrun error:... new data received before previous data could be read from buffer
Framing error:... stop bit position incorrect

[*4]: If an inverter number was sent in the transmission and a checksum error occurs, no response will be sent.

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Communication Error Priority Rankings

1. Format error
2. Inverter number error
3. Checksum error
4. Command error
5. Data error (incorrect data: data characters other than "0" ~ "9", "A" ~ "F", data length exceeds 4 characters, character other than "+" (only during a R/W command), "&", ")", or <CR> after the data, or character other than <CR> after the ")" character)
6. Address error (only R/W commands)
7. Cannot execute error (only "W" command)
8. Data error (data outside of setting limits during "W" command, attempt to write to a protected location, or bank data outside of limits during "B" command)

Response Data Matrix

Interface		RS232C	
Inverter number		**Yes**	**No**
Normal communications		❍	❍
When an error occurs	Cannot execute error	❍	❍
	Data error	❍	❍
	Address error	❍	❍
	Command error	❍	❍
	Checksum error	✕	❍
	Format error	✕	❏
	Inverter number error	✕	✕

❍ .... Response transmitted.

✕......... Response not transmitted.

❏........ Response transmitted when the "(" character is correctly received. When the "(" character is not correctly received, the data is discarded and therefore no response is transmitted.

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8.3 Memory Configuration

RAM	EEPROM	Internal ROM	External / Option ROM	Option Bus

FFFF$_H$

077F$_H$

0517$_H$

04FF$_H$

04F7$_H$
04D8$_H$

03C0$_H$

0100$_H$

0000$_H$

System Area

Comm. Command Area

User Param. #1

System Param.

User Param. #1

System Area

[Bank = 0]

7FFF$_H$

059F$_H$

System Area

User Param. #2 (pattern run)

User Param. #1

System Param.

User Param. #1

System Area

[Bank = 1]

8000$_H$

Program & Data

[Bank = 2]

Program & Data

[Bank = 3]

1FFF$_H$

Option Data

[Bank = 4]

RAM: Contains parameter settings and other data that the inverter uses for system control (parameters, commands, status, etc.) When the inverter is powered-off, this data is erased. When the inverter is powered-on, parameter data is copied from EEPROM to RAM (directly in the case of User Param. #1). Other data is initialized.

EEPROM: Contains user-set parameters and other data. This data is retained even when the inverter is powered-off.

Internal ROM: Contains control programming and internal ROM version information.

External ROM: Contains control programming and external ROM version information.

Option Bus: Allows access to data contained in installed options.

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<< Note >> Shaded areas cannot be written to (read-only). Also, do not attempt to access those areas crossed out with an "X".

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8.4 Communications Data Tables

- **Symbol Definitions**
    - (#): Depends on inverter rating.
    - (✳): Cannot be set while inverter is running (attempting to write data while the inverter is running will result in an error (N0000)).
    - (**Note**): Use caution! Because there is no data checking performed on these settings, caution must be used to not write incorrect data (the "Mask" and "Adjustment Range" sections will be shaded).

- **Usage Precautions**
    - 1: Refer to the inverter instruction manual in conjunction with this manual.
    - 2: If the mask data is not correctly set when data is written, the data check function cannot correctly check the data setting.
    - 3: All data is written in hexadecimal (base 16) format (except for "Multiplier" and "Adjustment Range" data, which is written in decimal (base 10) format).

Parameter Table Usage Method Example

GROUP:FUNDAMENTAL PARAMETERS #1

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
MAXIMUM OUTPUT FREQUENCY (✳)	0 / 1	03C0	FFFF	0BB8 ~ 9C40 (30.00 ~ 400.00)	0.01
BASE FREQUENCY #1	0 / 1	0428	FFFF	09C4 ~ 9C40 (25.00 ~ 400.00)	0.01

◊   In this example, the MAXIMUM OUTPUT FREQUENCY setting of the inverter will be changed from 80Hz to 60Hz.

HOST COMPUTER → INV.   INV. → HOST COMPUTER
        (B0)   (B0000)..............Bank
        (A3C0)   (A03C0)..............Address
        (MFFFF)   (MFFFF)..............Mask
        (W1770)   (W1770)..............Data (within adjustment range)
(Since the mask is automatically set to FFFFH whenever
 the address is set, setting it as shown here is optional.)

- **Panel display range (base 10)**
    The actual value displayed on the LCD panel will depend on the setting of FREQUENCY DISPLAY RESOLUTION in GROUP:UTILITY PARAMETERS. When 0.01Hz resolution is selected and the above example is performed, 60.00Hz will be displayed on the panel. When 0.1Hz resolution is selected, 60.0Hz will be displayed. The "Adjustment Range" column shows a maximum of 5 digits, but because the panel can only display 4 digits, the displayed value will be a rounded representation of the actual data setting value.
    (Ex: If 399.95 (9C3BH) is written to MAXIMUM OUTPUT FREQUENCY (upper limit=400.00), 400.0Hz will be displayed.)

- **Display Data / Internal Data Conversion Method**
    Internal data = [display data ÷ Multiplier], converted to hexadecimal.
    (Ex: To convert a MAXIMUM OUTPUT FREQUENCY setting of 60Hz to internal data: 60 ÷ 0.01 = 6000, converted to hexadecimal → 1770H).

- **Shaded Parameters:** Data checks are not performed on parameters that appear in the following data tables with shaded "Mask" and "Adjustment Range" sections. Use extreme caution when setting these parameters, therefore, as incorrect mask or data settings may cause unpredictable operation.

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RS232C Command / Frequency

<< RS232C commands/frequency command will only be valid when the following parameter is respectively configured for RS232C command, frequency, or both. >>

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
RS232C	Command • frequency mode selection	0	0515	0003	0000: FREQUENCY MODE SELECTION, COMMAND MODE SELECTION settings 0001: RS232C commands valid 0002: RS232C frequency valid 0003: RS232C commands and frequency valid	—	0000

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
RS232C	Frequency command	0	0510	FFFF	LL ~ UL (Note 1)	0.01	0000

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
RS232C Command	Run • stop command selection	0	0512	0001	0000: Stop command 0001: Run command	—	0000
	Forward • reverse run selection	0	0512	0004	0000: Reverse 0004: Forward	—	0004
	Acc/dec #1 / #2 selection	0	0512	0008	0000: Acc / dec #1 0008: Acc / dec #2	—	0000
	Jog mode selection	0	0512	0080	0000: Normal (acc/dec mode) 0080: Jog mode	—	0000
	Feedback control (Note 2)	0	0513	0001	0000: Feedback valid 0001: Feedback invalid	—	0000
	Compulsory DC injection braking mode	0	0513	0002	0000: No compulsory DC injection braking 0002: Compulsory DC injection below DC INJECTION START FREQUENCY	—	0000
	Fundamental parameter switching	0	0513	0004	0000: V/F #1 0004: V/F #2	—	0000
	Gate block command (coast stop command)	0	0513	0008	0000: Normal 0008: Gate block	—	0000
	Emergency off command	0	0513	0010	0000: Does nothing 0010: Emergency off	—	0000
	Reset command (trip clear)	0	0513	0020	0000: Does nothing 0020: Reset	—	0000
	Preset speed run command	0	0514	000F	0000: Output frequency selected by FREQUENCY MODE SELECTION 0001 ~ 000F: speeds 1 ~ 15	1	0000

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
RS232C	RS232C communications timer	0 / 1	0445	00FF	0000: Timer OFF 0001 ~ 0064: 1s ~ 100s	1	EEPROM contents

(**Note 1**)   Throughout the remainder of this document, the abbreviations "LL", "UL", and "Fmax" will stand for LOWER LIMIT FREQUENCY, UPPER LIMIT FREQUENCY, and MAXIMUM OUTPUT FREQUENCY, respectively.

(**Note 2**)   This parameter only selects whether or not feedback control is valid when feedback control is selected. In order to use feedback control, parameter FEEDBACK CONTROL SELECTION in GROUP:FEEDBACK CONTROL PARAMETERS must still be set.

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Option Command / Frequency (Valid Only When Option Board Is Installed)

<< The following function is valid only when FREQUENCY MODE SELECTION in GROUP:UTILITY PARAMETERS is set to 3 (communication/12-bit binary option input valid). >>

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
Option	Frequency command	0	0508	FFFF	LL ~ UL	0.01	0000

<< The following functions are valid only when COMMAND MODE SELECTION in GROUP:UTILITY PARAMETERS is set to 3 (communication option input valid). >>

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
Option Command	Run • stop command selection	0	050A	0001	0000: Stop command 0001: Run command	—	0000
	Forward • reverse run selection	0	050A	0004	0000: Reverse 0004: Forward	—	0004 (**Note 1**)
	Acc/dec #1 / #2 selection	0	050A	0008	0000: Acc / dec #1 0008: Acc / dec #2	—	0000
	Jog mode selection	0	050A	0080	0000: Normal (acc/dec mode) 0080: Jog mode	—	0000
	Feedback control (**Note 2**)	0	050B	0001	0000: Feedback valid 0001: Feedback invalid	—	0000
	Compulsory DC injection braking mode	0	050B	0002	0000: No compulsory DC injection braking 0002: Compulsory DC injection below DC INJECTION START FREQUENCY	—	0000
	Fundamental parameter switching	0	050B	0004	0000: V/F #1 0004: V/F #2	—	0000
	Gate block command (coast stop command)	0	050B	0008	0000: Normal 0008: Gate block	—	0000
	Emergency off command	0	050B	0010	0000: Does nothing 0010: Emergency off	—	0000
	Reset command (trip clear)	0	050B	0020	0000: Does nothing 0020: Reset	—	0000
	Preset speed run command	0	050C	000F	0000: Output frequency selected by FREQUENCY MODE SELECTION 0001 ~ 000F: speeds 1 ~ 15	1	0000

Group	Function	Bank	Address	Mask	Adjustment Range	Multiplier	Initialized Value
RS485	RS485 communications timer	0 / 1	04CC	00FF	0000: Timer OFF 0001 ~ 0064: 1s ~ 100s	1	EEPROM contents

(**Note 1**) The initialized value is 0004 only when an option ROM is installed and a communications option (RS485, TOSLINE-F10, TOSLINE-S20, DeviceNet or RIO) is selected (COMMUNICATION SELECTION in GROUP:COMMUNICATION SETTING PARAMETERS = 1 ~ 3). Otherwise, it is initialized to 0000.

(**Note 2**) This parameter only selects whether or not feedback control is valid when feedback control is selected. In order to use feedback control, parameter FEEDBACK CONTROL SELECTION in GROUP:FEEDBACK CONTROL PARAMETERS must still be set.

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Panel Command / Frequency

<< The following function is valid only when FREQUENCY MODE SELECTION in GROUP:UTILITY PARAMETERS is set to 2 (panel input valid) or 4 (local/remote changeover possible). >>

Group	Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
Panel	FREQUENCY COMMAND	0	04F8	FFFF	LL ~ UL	0.01

<< The following functions are valid only when COMMAND MODE SELECTION in GROUP:UTILITY PARAMETERS is set to 2 (panel input valid) or 4 (local/remote changeover possible). >>

Group	Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
Panel Command	Run • stop command selection	0 (**Note 1**)	04FA	0001	0000: Stop command 0001: Run command	—
	DIRECTION SELECTION (FORWARD/REV)	0 / 1	04FA	0004	0000: Reverse 0004: Forward	—
	ACCEL/DECEL #1/#2 SELECTION	0 / 1	04FA	0008	0000: Acc / dec #1 0008: Acc / dec #2	—
	Jog mode selection	0 (**Note 1**)	04FA	0080	0000: Normal (acc/dec mode) 0080: Jog mode	—
	PANEL FEEDBACK CONTROL (**Note 2**)	0 / 1	04FB	0001	0000: Feedback valid 0001: Feedback invalid	—
	Compulsory DC injection braking mode	0 (**Note 1**)	04FB	0002	0000: No compulsory DC injection braking 0002: Compulsory DC injection below DC INJECTION START FREQUENCY	—
	FUNDAMENTAL PARAM SWITCHING	0 / 1	04FB	0004	0000: V/F #1 0004: V/F #2	—
	Gate block command	0 (**Note 1**)	04FB	0008	0000: Normal 0008: Gate block	—
	Emergency off command	0 (**Note 1**)	04FB	0010	0000: Does nothing 0010: Emergency off	—
	Reset command	0 (**Note 1**)	04FB	0020	After writing 0020 ("TRIP CLEAR COMMAND (PRESS CLEAR)") will be displayed), write 0000 and the inverter will reset	—
	Preset speed run command	0 (**Note 1**)	04FC	000F	0000: Output frequency selected by FREQUENCY MODE SELECTION 0001 ~ 000F: speeds 1 ~ 15	1

(**Note 1**) It is also possible to write to bank 1 (EEPROM), but this is not for normal command use. To avoid the possibility of unpredictable operation, do not write these commands to bank 1.

(**Note 2**) This parameter only selects whether or not feedback control is valid when feedback control is selected. In order to use feedback control, parameter FEEDBACK CONTROL SELECTION in GROUP:FEEDBACK CONTROL PARAMETERS must still be set.

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Inverter Status Monitor (Read Only)

Function	Bank	Address	Mask	Data Length	Contents (Units)	Multiplier
Operating frequency monitor	0	0524	FFFF	word	Hz	0.01
Rotation direction monitor	0	05B6	0004	bit	→ *inverter status monitor 1*	—
Frequency command monitor	0	0500	FFFF	word	Hz	0.01
Output current monitor	0	0576	00FF	byte	%	1
Input voltage monitor (**Note 1**)	0	05B2	FFFF	word	%	0.1
Output voltage monitor (**Note 1**)	0	05B0	FFFF	word	%	0.1
Input terminal status monitor	0	057A	FFFF	word	→ *bit monitor 1*	—
Output terminal status monitor	0	0579	00FF	byte	→ *bit monitor 2*	—
Cumulative run time (**Note 2**)	0	05A6	FFFF	word	—	1
		05D2	0008	bit	—	1
Past trips (**Note 3**) (4 most recent trips)	0 / 1	04F3 ~ 04F7	007F	5 bytes	→ *Table 1, Table 2*	—
Pre-compensation frequency	0	0524	FFFF	word	Hz	0.01
Post-compensation frequency	0	0260	FFFF	word	Hz	0.01
Torque current monitor	0	0684	FFFF	word	% (**Note 4**)	0.01
Excitation current monitor	0	0688	00FF	byte	%	1
PID feedback value	0	0506	FFFF	word	Hz (**Note 4**)	0.02
Motor overload ratio	0	0584	FFFF	word	%	(**Note 5**)
Inverter overload ratio	0	0586	FFFF	word	%	(**Note 5**)
DBR overload ratio	0	0588	FFFF	word	%	(**Note 5**)
Input / output power units	0	03AE	0008	bit	0000: 0.01kW 0008: 0.1kW	(**Note 6**)
Input power (%) (**Note 7**)	0	035C	FFFF	word	%	0.1
Input power (kW)	0	0350	FFFF	word	kW	(**Note 6**)
Output power (%) (**Note 7**)	0	035E	FFFF	word	% (**Note 4**)	0.1
Output power (kW)	0	0352	FFFF	word	kW (**Note 4**)	(**Note 6**)
RR input	0	0550	FFFF	word	%	(**Note 5**)
Present trip	0	0591	007F	byte	→ *Table 1*	—
Command mode status	0	05B8	0003	2 bits	00: terminal 01: panel 02: option 03: RS232C	—
Frequency mode selection status	0	05B8	000C	2 bits	00: terminal 04: panel 08: option 0C: RS232C	—
CPU version number	2	8000	FFFF	word	—	1
External ROM version number	3	0000	FFFF	word	—	1
EEPROM version number	1	0380	FFFF	word	—	1
Inverter typeform monitor	0	05CA	00FF	byte	→ *Table 5*	1

(**Note 1**) These monitor voltage units are not affected by the setting of VOLTAGE UNITS SELECTION in GROUP:UTILITY PARAMETERS - they are always in %.

(**Note 2**) The time range for the cumulative run timer is 0000H ~ FFFFH (0 ~ 65535 hours), counted at address 05A6 in bank 0. When the timer reaches a count of 65536, bit 3 of address 05D2 in bank 0 is set, and the count at address 05A6 is cleared. At a count of 65537, therefore, address 05A6 will contain 0001H and bit 3 of address 05D2 will be set.

Cumulative run time monitor example:

HOST COMPUTER → INVERTER   INVERTER → HOST COMPUTER
    (A5D2)   (A05D2) .... select rollover bit address
    (M0008)   (M0008) .... mask off rollover bit
    (R)   (R0008) .... timer has rolled-over (≥ 65536 hours)
    (A5A6)   (A05A6) .... select timer address
    (R)   (R000A) .... timer = 10 (total time = 65546 hours)

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(**Note 3**) Past trips are stored in a ring-buffer format, with the most recent trip located at the address following the 00H starting point.

(**Note 4**) Uses signed data (data values larger than 7FFFH are negative). If internal data is 8000H or larger, the actual value can be obtained by: **actual value = - [FFFFH - (internal data) + 1]**.

(**Note 5**) Multiplier is 100/65535.

(**Note 6**) If the input / output power units data is 0000, the monitored data is in 0.01kW units, and the multiplier is 0.01. If the input / output power units data is 0008, the monitored data is in 0.1kW units, and the multiplier is 0.1. These values are automatically set according to the inverter typeform.

(**Note 7**) 100% = $\sqrt{3} \times$ rated voltage $\times$ rated current (with some variation for losses).

Input Terminal Status Monitor

Bit Monitor 1 Lower Byte	057AH	Input Terminal	0	1	Single-Bit Read Mask
	bit 0	F	terminal - CC open	terminal - CC shorted	0001
	bit 1	R	terminal - CC open	terminal - CC shorted	0002
	bit 2	S1	terminal - CC open	terminal - CC shorted	0004
	bit 3	S2	terminal - CC open	terminal - CC shorted	0008
	bit 4	S3	terminal - CC open	terminal - CC shorted	0010
	bit 5	S4	terminal - CC open	terminal - CC shorted	0020
	bit 6	S5 (option)	terminal - CC open	terminal - CC shorted	0040
	bit 7	S6 (option)	terminal - CC open	terminal - CC shorted	0080

Bit Monitor 1 Upper Byte	057BH	Input Terminal	0	1	Single-Bit Read Mask
	bit 0	unused (always 0)	—	—	—
	bit 1	unused (always 0)	—	—	—
	bit 2	unused (always 0)	—	—	—
	bit 3	unused (always 0)	—	—	—
	bit 4	unused (always 0)	—	—	—
	bit 5	S7 (option)	terminal - CC open	terminal - CC shorted	0020
	bit 6	RES	terminal - CC open	terminal - CC shorted	0040
	bit 7	ST	terminal - CC open	terminal - CC shorted	0080

Ex. 1) *Input terminal monitor example:*

HOST COMPUTER → INVERTER
```
        (A57A)
        (R)
```
INVERTER → HOST COMPUTER
```
        (A057A)
        (R8025)
```
```
     1000   0000   0010  0101
```
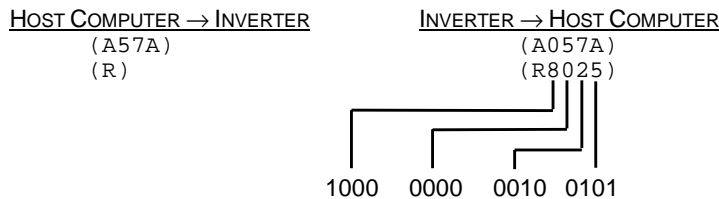
In this example, terminals ST, S4, S1 and F are shorted to CC, and all others are open.

Ex. 2) *Example of monitoring only terminals S1 ~ S4:*

HOST COMPUTER → INVERTER
```
        (A57A)
        (M003C)
        (R)
```
INVERTER → HOST COMPUTER
```
        (A057A)
        (M003C)
        (R0004)
```
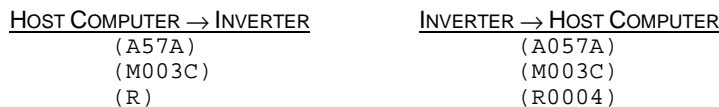
In this example, terminal S1 is shorted to CC, and S2 ~ S4 are open.

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Output Terminal Status Monitor

Bit Monitor 2	0579H	Output Terminal	0	1	Single-Bit Read Mask
	bit 0	unused (always 0)	—	—	—
	bit 1	unused (always 0)	—	—	—
	bit 2	FAN	OFF	ON	0004
	bit 3	FL	FLB-FLC shorted	FLA-FLC shorted	0008
	bit 4	MS relay	OFF	ON	0010
	bit 5	OUT (option)	OUTB-OUTC shorted	OUTA-OUTC shorted	0020
	bit 6	RCH	RCHA-RCHC open	RCHA-RCHC shorted	0040
	bit 7	LOW	LOWA-LOWC open	LOWA-LOWC shorted	0080

Inverter Status Monitor

Inverter Status 1 Lower Byte	05B6H	Inverter Status	0	1	Single-Bit Read Mask
	bit 0	running (acc/dec)	—	running	0001
	bit 1	unused (always 0)	—	—	—
	bit 2	forward / reverse	reverse	forward	0004
	bit 3	acc/dec #1/#2	acc/dec #1	acc/dec #2	0008
	bit 4	for inverter use	—	—	—
	bit 5	for inverter use	—	—	—
	bit 6	for inverter use	—	—	—
	bit 7	jog/normal mode	normal (acc/dec)	jog mode	0080

Inverter Status 1 Upper Byte	05B7H	Inverter Status	0	1	Single-Bit Read Mask
	bit 0	feedback ON/OFF	OFF	feedback active	0001
	bit 1	DC inject. braking	OFF	DC inject. braking active	0002
	bit 2	V/F #1/#2	V/F #1	V/F #2	0004
	bit 3	coasting	not coasting	coasting	0008
	bit 4	emergency off	not in emergency off	in emergency off	0010
	bit 5	for inverter use	—	—	—
	bit 6	for inverter use	—	—	—
	bit 7	for inverter use	—	—	—

Inverter Status 2	05BBH	Inverter Status	0	1	Single-Bit Read Mask
	bit 0	accelerating	not accelerating	accelerating	0001
	bit 1	decelerating	not decelerating	decelerating	0002
	bit 2	for inverter use	—	—	—
	bit 3	retry	not retrying	retrying	0008
	bit 4	running (including DC inject. braking)	stopped	running	0010
	bit 5	for inverter use	—	—	—
	bit 6	for inverter use	—	—	—
	bit 7	tripped	not tripped	tripped	0080

Ex) _Inverter status monitoring example (reading the status of inverter number "00"):_

HOST COMPUTER → INVERTER   INVERTER → HOST COMPUTER
    (00A5B6)   (00A05B6)
    (00R)   (00R000D)

0000 0000 0000 1101
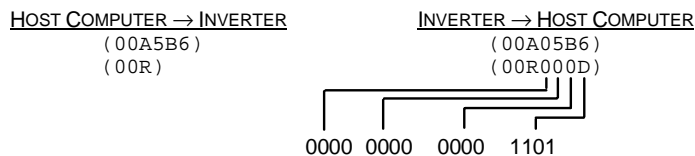
In this example, the inverter is running forward in normal acc/dec mode using acc/dec #2 and V/F #1.

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Table 1. List of trips (trips registered as past faults)

LCD Display Message	Data (Hex)	Explanation
NO ERROR	××00	No error has been recorded since the last inverter reset or trip clear
OVERCURRENT (ACCEL) (PRESS CLEAR)	××01	Overcurrent during acceleration
OVERCURRENT (DECEL) (PRESS CLEAR)	××02	Overcurrent during deceleration
OVERCURRENT (RUN) (PRESS CLEAR)	××03	Overcurrent during constant-speed run
LOAD-END OVERCURRENT (PRESS CLEAR)	××04	Load-end overcurrent detected at start-up (output terminals, motor wiring etc.)
U-PHASE SHORT CKT (PRESS CLEAR)	××05	U-phase armature short circuit
V-PHASE SHORT CKT (PRESS CLEAR)	××06	V-phase armature short circuit
W-PHASE SHORT CKT (PRESS CLEAR)	××07	W-phase armature short circuit
LOST INPUT PHASE (PRESS CLEAR)	××08	Lost input phase (option)
LOST OUTPUT PHASE (PRESS CLEAR)	××09	Lost output phase (option)
OVERVOLTAGE (ACCEL) (PRESS CLEAR)	××0A	Overvoltage during acceleration
OVERVOLTAGE (DECEL) (PRESS CLEAR)	××0B	Overvoltage during deceleration
OVERVOLTAGE (RUN) (PRESS CLEAR)	××0C	Overvoltage during constant-speed run
INVERTER OVERLOAD (PRESS CLEAR)	××0D	Inverter overload
MOTOR OVERLOAD (PRESS CLEAR)	××0E	Motor overload
DBR OVERLOAD TRIP (PRESS CLEAR)	××0F	Dynamic braking resistor overload
OVERHEAT TRIP (PRESS CLEAR)	××10	Inverter overheat
EMERGENCY OFF (PRESS CLEAR)	××11	Emergency off
EEPROM WRITE FAILURE (PRESS CLEAR)	××12	EEPROM failure during write
EEPROM READ FAILURE (PRESS CLEAR)	××13	EEPROM failure during initial read
—	××14	Unused
RAM ERROR (PRESS CLEAR)	××15	RAM error
ROM ERROR (PRESS CLEAR)	××16	ROM error
CPU ERROR (PRESS CLEAR)	××17	CPU error

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LCD Display Message	Data (Hex)	Explanation
COMMUNICATION ERROR (PRESS CLEAR)	××18	RS232C timer time-out
GATE ARRAY FAULT (PRESS CLEAR)	××19	Gate array error
CURRENT DETECT ERROR (PRESS CLEAR)	××1A	Output current detection circuit error
OPTION PCB ERROR (PRESS CLEAR)	××1B	Option PCB error
OPTION ROM ERROR	××1C	Option ROM error
LOW CURRENT TRIP (PRESS CLEAR)	××1D	Low current
UNDERVOLTAGE TRIP (PRESS CLEAR)	××1E	Main circuit undervoltage
—	××1F	Unused
OVERTORQUE TRIP (PRESS CLEAR)	××20	Overtorque
EARTH FAULT (SOFT) (PRESS CLEAR)	××21	Earth fault (software)
EARTH FAULT (HARD) (PRESS CLEAR)	××22	Earth fault (hardware)
OPEN FUSE TRIP (PRESS CLEAR)	××23	Open fuse
DBR OVERCURRENT TRIP (PRESS CLEAR)	××24	Dynamic braking resistor overcurrent
DC OVERCURRENT (ACC) (PRESS CLEAR)	××25	Overcurrent in DC section during acceleration
DC OVERCURRENT (DEC) (PRESS CLEAR)	××26	Overcurrent in DC section during deceleration
DC OVERCURRENT (RUN) (PRESS CLEAR)	××27	Overcurrent in DC section during constant-speed run
AUTO-TUNING ERROR (PRESS CLEAR)	××28	Auto-tuning error
INV TYPEFORM ERROR (PRESS READ/WRITE)	××29	Inverter typeform error

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Table 2. Trip data configuration ([ ] : starting point)

When a trip occurs, the oldest trip becomes the starting point (00H), and the most recent trip is placed at the previous starting point address (refer to Table 1 for trip codes):

04F3H	04F4H	04F5H	04F6H	04F7H	Trip Status
00H	00H	00H	00H	00H	Initial status (no trips)
00H	00H	00H	00H	01H	1st trip
00H	01H	03H	0BH	01H	4th trip
0BH	01H	03H	0BH	00H	5th trip
0BH	01H	03H	00H	13H	6th trip

Table 3. Pre-alarm status monitor data (bank 0)

05D4H	Function	LCD Display Message	0	1
bit 0 ~ bit 3	unused	—	—	—
bit 4	overload pre-alarm status	OVERLOAD	no pre-alarm	pre-alarm
bit 5	overvoltage pre-alarm status	OVERVOLTAGE	no pre-alarm	pre-alarm
bit 6	overcurrent pre-alarm status	OVERCURRENT	no pre-alarm	pre-alarm
bit 7	overheat pre-alarm status	OVERHEAT	no pre-alarm	pre-alarm

Table 4. Messages (non-trips)

LCD Display Message	Bank	Address	Mask	Data
INVERTER OFF (ST-CC IS OPEN)	0	051B	0008	0008: ST-CC open
CONTROL POWER LOW	0	05B4	0010	0010: control circuit undervoltage
DC BUS UNDERVOLTAGE	0	05B4	0001	0001: main circuit undervoltage
FREQUENCY POINT SETTING ERROR	0	05D4	0002	0002: frequency point setting error alarm

Message monitor example:

HOST COMPUTER → INVERTER	INVERTER → HOST COMPUTER
(B0)	(B0000)
(A5B4)	(A05B4)
(M0001)	(M0001)
(R)	(R0001)

In this case, a main circuit undervoltage condition is being indicated.

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Table 5. Inverter typeform codes

230v Class	
Inverter Model	**Typeform Data (Hex)**
G3-2010	××21
G3-2015	××22
G3-2025	××23
G3-2035	××24
G3-2055	××25
G3-2080	××26
G3-2110	××27
G3-2160	××28
G3-2220	××29
G3-2270	××2A
G3-2330	××2B
G3-2400	××2C

460v Class	
Inverter Model	**Typeform Data (Hex)**
G3-4015	××42
G3-4025	××43
G3-4035	××44
G3-4055	××45
G3-4080	××46
G3-4110	××47
G3-4160	××48
G3-4220	××49
G3-4270	××4A
G3-4330	××4B
G3-4400	××4C
G3-4500	××4D
G3-4600	××4E
G3-4750	××4F
G3-410K	××50
G3-412K	××51
G3-415K	××52
G3-420K	××53
G3-425K	××54
G3-430K	××55

575v Class	
Inverter Model	**Typeform Data (Hex)**
G3-6060	××65
G3-6120	××67
G3-6160	××68
G3-6220	××69
G3-6270	××6A
G3-6330	××6B
G3-6400	××6C
G3-6500	××6D
G3-6600	××6E
G3-6750	××6F
G3-610K	××70
G3-612K	××71
G3-615K	××72
G3-620K	××73

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Parameter List

GROUP:FUNDAMENTAL PARAMETERS #1

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
MAXIMUM OUTPUT FREQUENCY (∗)	0 / 1	03C0	FFFF	0BB8 ~ 9C40 (30.00 ~ 400.00)	0.01
BASE FREQUENCY #1	0 / 1	0428	FFFF	09C4 ~ 9C40 (25.00 ~ 400.00)	0.01
BASE FREQUENCY VOLTAGE SELECT (**Note**, ∗)	0 / 1	04BE	0030	0000: Input voltage level (0) 0020: Automatic setting (1) 0030: Stationary setting (2)	—
MAXIMUM OUTPUT VOLTAGE #1	0 / 1	0426	FFFF	0000 ~ 0258 (0 ~ 600)	1
REVERSE OPERATION DISABLE SELECT	0 / 1	04B6	0020	0000: Reverse allowed (0) 0020: Reverse not allowed (1)	—
UPPER LIMIT FREQUENCY	0 / 1	03C2	FFFF	0 ~ Fmax	0.01
LOWER LIMIT FREQUENCY	0 / 1	03C4	FFFF	0 ~ UL, Fmax	
VOLTS PER HERTZ PATTERN (**Note**, ∗)	0 / 1	042D	000F	0000: Constant torque (1) 0001: Variable torque (2) 0002: Auto. torque boost (3) 0006: 3 w/ auto. eng. sav. (4) 000A: vector control (5) 000E: 5 w/ auto. eng. sav. (6)	—
1●2 VOLTAGE BOOST #1	0 / 1	0424	FFFF	0000 ~ 012C (0.0 ~ 30.0)	0.1
ACCELERATION TIME #1 (**Ref. 1**)	0 / 1	03C6	FFFF	0001 ~ EA60	0.01 / 0.1
DECELERATION TIME #1	0 / 1	03C8	FFFF	(0.01 ~ 600.00 / 0.1 ~ 6000.0)	
ACC/DEC PATTERN #1 SELECTION	0 / 1	042D	0030	0000: Linear (0) 0010: Self-adjusting (1) 0020: S-Pattern #1 (2) 0030: S-Pattern #2 (3)	—
ACCEL/DECEL PATTERN ADJUST LOW	0 / 1	04C4	00FF	0003 ~ 00FD (0 ~ 50)	(**Special**)
ACCEL/DECEL PATTERN ADJUST HIGH	0 / 1	04C5	00FF		

Codes used throughout this parameter list:

> (∗) : Cannot set while inverter is running.

> (**Note**) : No data checking performed → "Mask" and "Adjustment Range" sections will be shaded.

(**Special**) : Internal data = (display setting × 5 + 3), converted to hexadecimal.

> (**Ref. 1**) : The adjustment range and multiplier depend on the setting of ACC/DEC TIME UNITS SELECTION in GROUP:UTILITY PARAMETERS as follows:

> When ACC/DEC TIME UNITS SELECTION is set for 0.1 sec. units, adjustment range = 0.1 ~ 6000.0, and multiplier = 0.1.
> When ACC/DEC TIME UNITS SELECTION is set for 0.01 sec. units, adjustment range = 0.01 ~ 600.00, and multiplier = 0.01.

> In addition, if the setting of ACC/DEC TIME UNITS SELECTION is changed after setting the ACC/DEC times, the ACC/DEC times will become 10 times or 0.1 times their former value. Therefore, always reset the ACC/DEC time settings after changing the setting of ACC/DEC TIME UNITS SELECTION.

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GROUP:FUNDAMENTAL PARAMETERS #2

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
BASE FREQUENCY #2	0 / 1	0432	FFFF	09C4 ~ 9C40 (25.00 ~ 400.00)	0.01
MAXIMUM OUTPUT VOLTAGE #2	0 / 1	0430	FFFF	0000 ~ 0258 (0 ~ 600)	1
VOLTAGE BOOST #2	0 / 1	042E	FFFF	0000 ~ 012C (0.0 ~ 30.0)	0.1
ELECTRONIC THERMAL PROTECT LVL #2	0 / 1	0434	00FF	000A ~ 0064 (10 ~ 100)	1
STALL PROTECTION SELECTION #2	0 / 1	0437	0040	0000: ON　　(0) 0040: OFF　　(1)	—
0　　STALL PROTECTION LEVEL #2	0 / 1	0435	00FF	000A ~ 00D7 (10 ~ 215)	1
ACCELERATION TIME #2　　(Ref. 1) DECELERATION TIME #2	0 / 1 0 / 1	03CA 03CC	FFFF FFFF	0001 ~ EA60 (0.01 ~ 600.00 / 0.1 ~ 6000.0)	0.01 / 0.1
ACC/DEC PATTERN #2 SELECTION	0 / 1	0437	0030	0000: Linear　　(0) 0010: Self-adjusting　(1) 0020: S-Pattern #1　(2) 0030: S-Pattern #2　(3)	—
ACC/DEC #1/#2 SWITCH FREQUENCY	0 / 1	0406	FFFF	0000 ~ Fmax	0.01

<< The following functions are valid only when COMMAND MODE SELECTION in GROUP:UTILITY PARAMETERS is set to 2 (panel input valid) or 4 (local/remote changeover possible). >>

GROUP:PANEL CONTROL PARAMETERS

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
DIRECTION SELECTION (FORWARD/REV)	0 / 1	04FA	0004	0000: Reverse　　(0) 0004: Forward　　(1)	—
STOP PATTERN SELECTION	0 / 1	045C	0040	0000: Decelerated stop　(0) 0040: Coast stop　(1)	—
FUNDAMENTAL PARAM SWITCHING	0 / 1	04FB	0004	0000: V/F #1　　(1) 0004: V/F #2　　(2)	—
ACCEL/DECEL #1/#2 SELECTION	0 / 1	04FA	0008	0000: Acc / dec #1　(1) 0008: Acc / dec #2　(2)	—
PANEL RESET SELECTION	0 / 1	045C	0030	0000: All possible　(0) 0010: overload only　(1) 0020: overload, overcurrent 　　only　　(2)	—
PANEL FEEDBACK CONTROL　(Note 1)	0 / 1	04FB	0001	0000: Feedback valid　(0) 0001: Feedback invalid　(1)	—

(**Note 1**): This parameter only selects whether or not feedback control is valid when feedback control is selected. In order to use feedback control, parameter FEEDBACK CONTROL SELECTION in GROUP:FEEDBACK CONTROL PARAMETERS must still be set.

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GROUP:TERMINAL SELECTION PARAMETERS

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
INPUT TERMINAL SELECTION	0 / 1	04BB	0001	0000: Standard functions (0) 0001: Individual selection (1)	—
1 "R" INPUT TERMINAL FUNCTION	0 / 1	046C	FFFF	0000 ~ FFFF (0 ~ 54)	—
"S1" INPUT TERMINAL FUNCTION	0 / 1	046E	FFFF		
"S2" INPUT TERMINAL FUNCTION	0 / 1	0470	FFFF		
"S3" INPUT TERMINAL FUNCTION	0 / 1	0472	FFFF		
"S4" INPUT TERMINAL FUNCTION	0 / 1	0474	FFFF	**Refer to Table 6**	
"F" INPUT TERMINAL FUNCTION	0 / 1	0476	FFFF		
"RES" INPUT TERMINAL FUNCTION	0 / 1	0478	FFFF	**(Note)**	
"ST" INPUT TERMINAL FUNCTION	0 / 1	047A	FFFF		
"S5" INPUT TERMINAL FUNCTION	0 / 1	047C	FFFF		
"S6" INPUT TERMINAL FUNCTION	0 / 1	047E	FFFF		
"S7" INPUT TERMINAL FUNCTION	0 / 1	0480	FFFF		
POTENTIAL TERMINAL FUNCTION	0 / 1	0482	FFFF		
R,S1-S7 TERMINAL RESPONSE TIME	0 / 1	0462	00FF	0001 ~ 0064 (1 ~ 100)	1
F INPUT TERMINAL RESPONSE TIME	0 / 1	0463	00FF	0001 ~ 0064 (1 ~ 100)	1
RES INPUT TERMINAL RESPONSE TIME	0 / 1	0464	00FF	0001 ~ 0064 (1 ~ 100)	1
ST INPUT TERMINAL RESPONSE TIME	0 / 1	0465	00FF	0001 ~ 0064 (1 ~ 100)	1
"RCH" CONTACTS FUNCTION	0 / 1	0490	FFFF	0 ~ FFFF (0 ~ 63) **See Table 7**	—
"RCH" CONTACTS DELAY TIME	0 / 1	0492	00FF	0001 ~ 0064 (1 ~ 100)	
"RCH" CONTACTS HOLD TIME **(Note)**	0 / 1	0493	00FF	0001 ~ 0064 (1 ~ 100)	
"LOW" CONTACTS FUNCTION	0 / 1	048C	FFFF	0 ~ FFFF (0 ~ 63) **See Table 7**	—
"LOW" CONTACTS DELAY TIME	0 / 1	048E	00FF	0001 ~ 0064 (1 ~ 100)	
"LOW" CONTACTS HOLD TIME **(Note)**	0 / 1	048F	00FF	0001 ~ 0064 (1 ~ 100)	
"FL" CONTACTS FUNCTION	0 / 1	0494	FFFF	0 ~ FFFF (0 ~ 63) **See Table 7**	—
"FL" CONTACTS DELAY TIME	0 / 1	0496	00FF	0001 ~ 0064 (1 ~ 100)	
"FL" CONTACTS HOLD TIME **(Note)**	0 / 1	0497	00FF	0001 ~ 0064 (1 ~ 100)	
"OUT" CONTACTS FUNCTION	0 / 1	0498	FFFF	0 ~ FFFF (0 ~ 63) **See Table 7**	—
"OUT" CONTACTS DELAY TIME	0 / 1	049A	00FF	0001 ~ 0064 (1 ~ 100)	
"OUT" CONTACTS HOLD TIME **(Note)**	0 / 1	049B	00FF	0001 ~ 0064 (1 ~ 100)	
LOW SPEED SIGNAL OUTPUT FREQ	0 / 1	03FE	FFFF	0 ~ Fmax	0.01
ACC/DEC COMPLETE DETECT BAND	0 / 1	0400	FFFF	0 ~ Fmax	0.01
SPEED REACH MAXIMUM FREQUENCY	0 / 1	0404	FFFF	0 ~ Fmax	0.01
SPEED REACH MINIMUM FREQUENCY	0 / 1	0402	FFFF	0 ~ Fmax	0.01
COMMERCIAL POWER/INV SWITCHING OUTPUT	0 / 1	04C1	00C0	0000: OFF (0) 0040: Auto. switch on trip (1) 0080: Switch at COMMERCIAL POWER/INV SWITCH FREQ (2) 00C0: Both (1) and (2) (3)	—
2•3 COMMERCIAL POWER/INV SWITCH FREQ	0 / 1	041C	FFFF	0 ~ Fmax	0.01
"FP" OUTPUT TERMINAL PULSE FREQUENCY	0 / 1	04C0	0003	0000: 48f (0) 0001: 96f (1) 0002: 360f (2)	—
RR INPUT SPECIAL FUNCTION SELECT **(Note)**	0 / 1	04B8	00E0	0000: Standard (0) 0040: Fmax (1) 0080: TACC/TDEC mult. (2) 00C0: VB mult. factor (3) 0020: CL mult. factor (4)	—

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Table 6. Input terminal selections

Setting Value	Data (Hex)	Function	Setting Value	Data (Hex)	Function
0	10C8	R　　(reverse run)	28	04AF	Binary bit #6
1	011C	SS1 (preset speed selection)	29	08AF	Binary bit #7
2	021C	SS2 (preset speed selection)	30	10AF	Binary bit #8
3	041C	SS3 (preset speed selection)	31	20AF	Binary bit #9
4	081C	SS4 (preset speed selection)	32	40AF	Binary bit #10
5	20C8	F　　(forward run)	33	04CE	No effect
6	201B	RES (fault reset)	34	01C7	UP/DOWN frequency setting (UP)
7	C0C9	ST　(gate ON/OFF)	35	02C7	UP/DOWN frequency setting (DOWN)
8	0CC8	JOG selection	36	04C7	UP/DOWN frequency clear
9	081A	Acc/dec #1/#2 selection	37	08C7	PUSH-type RUN key
10	101B	Emergency off	38	10C7	PUSH-type STOP key
11	021B	DC injection braking ON/OFF	39	02B9	No effect
12	041B	Fundamental parameter switching (V/F #2)	40	C0C8	Forward/reverse run selection
13	011B	Feedback control ON/OFF	41	20C7	RUN
14	10CE	Pattern run selection #1	42	30C9	Binary data write
15	20CE	Pattern run selection #2	43	0198	[LOCAL/REMOTE] key
16	40CE	Pattern run selection #3	44	0298	[MON] key
17	80CE	Pattern run selection #4	45	0498	[PRG] key
18	02CE	Pattern run continue signal	46	0898	[UP] (▲) key
19	01CE	Pattern run step trigger signal	47	1098	[DOWN] (▼) key
20	0AC9	JOG forward run	48	2098	[READ/WRITE] key
21	06C9	JOG reverse run	49	4098	[RUN] key
22	10AE	Binary bit #0	50	8098	[STOP/CLEAR] key
23	20AE	Binary bit #1	51	08CE	Commercial power / inverter switching signal
24	40AE	Binary bit #2	52	40C7	Reserved for option use
25	80AE	Binary bit #3	53	10CB	RR frequency switching input
26	01AF	Binary bit #4	54	20CB	IV frequency switching input
27	02AF	Binary bit #5			

(**Note**): In order for binary bit #0 ~ #10 (setting values 22 ~ 32) and UP/DOWN frequency setting (setting values 34 & 35) inputs to be valid, parameter FREQUENCY PRIORITY SELECTION #1 or FREQUENCY PRIORITY SELECTION #2 in GROUP:FREQUENCY SETTING PARAMETERS must be set to 5 (BIN (binary setting or UP/DOWN setting)).

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Table 7. Output terminal selections (RCH, LOW, FL, OUT relay contacts)

Setting Value	Data (Hex)	Function	Setting Value	Data (Hex)	Function
0	0000	Lower limit frequency	32	C5B7	Executing emergency off
1	0100	/Lower limit frequency	33	CDB7	/Executing emergency off
2	0200	Upper limit frequency	34	B5BB	Executing retry
3	0300	/Upper limit frequency	35	BDBB	/Executing retry
4	0400	Low speed signal	36	D5CF	Pattern run switching output
5	0500	/Low speed signal	37	DDCF	/Pattern run switching output
6	0600	Accel/decel complete	38	D5D8	PID deviation limit
7	0700	/Accel/decel complete	39	DDD8	/PID deviation limit
8	0800	Selected speed reach signal	40	C5BB	Run/stop
9	0900	/Selected speed reach signal	41	CDBB	/Run/stop
10	0A00	Fault	42	1400	Severe fault (armature short, load-end short, open phase, output error, earth fault)
11	0B00	/Fault	43	1500	/Severe fault (armature short, load-end short, open phase, output error, earth fault)
12	0C00	Fault other than earth fault or load-end overcurrent	44	1600	Non-severe fault (overload, overcurrent, overvoltage)
13	0D00	/Fault other than earth fault or load-end overcurrent	45	1700	/Non-severe fault (overload, overcurrent, overvoltage)
14	95B5	Overcurrent pre-alarm	46	E5D8	Commercial power / inverter switching output #1
15	9DB5	/Overcurrent pre-alarm	47	EDD8	/Commercial power / inverter switching output #1
16	85C5	Inverter overload pre-alarm	48	F5D8	Commercial power / inverter switching output #2
17	8DC5	/Inverter overload pre-alarm	49	FDD8	/Commercial power / inverter switching output #2
18	95C5	Motor overload pre-alarm	50	85C0	Fan ON/OFF
19	9DC5	/Motor overload pre-alarm	51	8DC0	/Fan ON/OFF
20	D5C5	Overheat pre-alarm	52	F5B6	Executing JOG
21	DDC5	/Overheat pre-alarm	53	FDB6	/Executing JOG
22	A5B4	Overvoltage pre-alarm	54	1800	Local/remote operation
23	ADB4	/Overvoltage pre-alarm	55	1900	/Local/remote operation
24	E5B4	Undervoltage alarm	56	A5D1	Cumulative timer alarm
25	EDB4	/Undervoltage alarm	57	ADD1	/Cumulative timer alarm
26	85B5	Undercurrent alarm	58	1A00	Communication error alarm
27	8DB5	/Undercurrent alarm	59	1B00	/Communication error alarm
28	85D1	Overtorque alarm	60	A5B6	F/R
29	8DD1	/Overtorque alarm	61	ADB6	/F/R
30	E5BB	Braking resistor OL pre-alarm	62	1E00	Run preparation complete

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31	EDBB	/Braking resistor OL pre-alarm	63	1F00	/Run preparation complete

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GROUP:SPECIAL CONTROL PARAMETERS

Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
START-UP FREQUENCY		0 / 1	03F8	FFFF	0000 ~ 03E8 (0.00 ~ 10.00)	0.01
END FREQUENCY		0 / 1	03FA	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
RUN FREQUENCY		0 / 1	0408	FFFF	0000 ~ Fmax	0.01
RUN FREQUENCY HYSTERESIS		0 / 1	040A	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
ENABLE JUMP FREQUENCIES		0 / 1	04BB	0080	0000: Function OFF (0)	—
					0080: Function ON (1)	
1	JUMP FREQUENCY #1	0 / 1	03EE	FFFF	0000 ~ Fmax	0.01
	JUMP FREQUENCY #1 BANDWIDTH	0 / 1	03EC	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
	JUMP FREQUENCY #2	0 / 1	03F2	FFFF	0000 ~ Fmax	0.01
	JUMP FREQUENCY #2 BANDWIDTH	0 / 1	03F0	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
	JUMP FREQUENCY #3	0 / 1	03F6	FFFF	0000 ~ Fmax	0.01
	JUMP FREQUENCY #3 BANDWIDTH	0 / 1	03F4	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
PWM CARRIER FREQUENCY (#)		0 / 1	0439	00FF	0005 ~ 0064 (0.5 ~ 10.0)	0.1

(**#**) : Adjustment range depends on inverter rating.

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GROUP:FREQUENCY SETTING PARAMETERS

Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
FREQUENCY PRIORITY SELECTION #1		0 / 1	04BA	0007	0001: RR (1) 0002: IV (2) 0003: RX (3) 0004: PG (4) 0005: BIN (5)	—
FREQUENCY PRIORITY SELECTION #2		0 / 1	04BA	0038	0008: RR (1) 0010: IV (2) 0018: RX (3) 0020: PG (4) 0028: BIN (5)	—
ANALOG INPUT FILTER		0 / 1	04BC	0003	0000: No filter (0) 0001: Small filter (1) 0002: Medium filter (2) 0003: Large filter (3)	—
RR TERMINAL STANDARD OR ADJUSTABLE		0 / 1	04B8	0002	0000: Standard (0) 0002: Adjustable (1)	—
1	RR REFERENCE SETTING POINT #1	0 / 1	0449	00FF	0000 ~ 0064 (0 ~ 100)	1
	RR REF POINT #1 FREQUENCY	0 / 1	03DA	FFFF	0000 ~ Fmax	0.01
	RR REFERENCE SETTING POINT #2	0 / 1	044A	00FF	0000 ~ 0064 (0 ~ 100)	1
	RR REF POINT #2 FREQUENCY	0 / 1	03DC	FFFF	0000 ~ Fmax	0.01
IV TERMINAL STANDARD OR ADJUSTABLE		0 / 1	04B8	0004	0000: Standard (0) 0004: Adjustable (1)	—
1	IV REFERENCE SETTING POINT #1	0 / 1	044B	00FF	0000 ~ 0064 (0 ~ 100)	1
	IV REF POINT #1 FREQUENCY	0 / 1	03DE	FFFF	0000 ~ Fmax	0.01
	IV REFERENCE SETTING POINT #2	0 / 1	044C	00FF	0000 ~ 0064 (0 ~ 100)	1
	IV REF POINT #2 FREQUENCY	0 / 1	03E0	FFFF	0000 ~ Fmax	0.01
RX TERMINAL STANDARD OR ADJUSTABLE		0 / 1	04B8	0008	0000: Standard (0) 0008: Adjustable (1)	—
1	RX REFERENCE SETTING POINT #1	0 / 1	044D	00FF	009C ~ 00FF, 0000 ~ 0064 (-100 ~ -1, 0 ~ 100)	1
	RX REF POINT #1 FREQUENCY	0 / 1	03E2	FFFF	-Fmax ~ Fmax	0.02
	RX REFERENCE SETTING POINT #2	0 / 1	044E	00FF	009C ~ 00FF, 0000 ~ 0064 (-100 ~ -1, 0 ~ 100)	1
	RX REF POINT #2 FREQUENCY	0 / 1	03E4	FFFF	-Fmax ~ Fmax	0.02
PG TERMINAL STANDARD OR ADJUSTABLE		0 / 1	04B8	0010	0000: Standard (0) 0010: Adjustable (1)	—
1	PG REFERENCE SETTING POINT #1	0 / 1	044F	00FF	009C ~ 00FF, 0000 ~ 0064 (-100 ~ -1, 0 ~ 100)	1
	PG REF POINT #1 FREQUENCY	0 / 1	03E6	FFFF	-Fmax ~ Fmax	0.02
	PG REFERENCE SETTING POINT #2	0 / 1	0450	00FF	009C ~ 00FF, 0000 ~ 0064 (-100 ~ -1, 0 ~ 100)	1
	PG REF POINT #2 FREQUENCY	0 / 1	03E8	FFFF	-Fmax ~ Fmax	0.02
BINARY INPUT STD OR ADJUSTABLE		0 / 1	04B8	0001	0000: Standard (0) 0001: Adjustable (1)	—
1	BINARY REF SETTING POINT #1	0 / 1	0447	00FF	0000 ~ 0064 (0 ~ 100)	1
	BINARY REF POINT #1 FREQUENCY	0 / 1	03D6	FFFF	-Fmax ~ Fmax	0.02
	BINARY REF SETTING POINT #2	0 / 1	0448	00FF	0000 ~ 0064 (0 ~ 100)	1
	BINARY REF POINT #2 FREQUENCY	0 / 1	03D8	FFFF	-Fmax ~ Fmax	0.02
JOG RUN FREQUENCY		0 / 1	03EA	FFFF	0000 ~ 07D0 (0.00 ~ 20.00)	0.01
Other than 0	JOG STOP METHOD	0 / 1	04B6	00C0	0000: Decelerated stop (0) 0040: Coast stop (1) 0080: DC injection stop (2)	—
PRESET SPEED SELECTION		0 / 1	04A6	000F	0000 ~ 000F (0 ~ 15)	1

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	Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
Other than 0	PRESET SPEED MODE ACTIVATION	0 / 1	04BB	0004	0000: Deactivated (0) 0004: Activated (1)	—
	PRESET SPEED #1 FREQUENCY	1	0528	FFFF	LL ~ UL	0.01
	PRESET SPEED #1 OPERATING MODE	1	052A	040C	0004 (0) 0000 (1) 000C (2) 0008 (3) (**Note 1**) 0404 (4) 0400 (5) 040C (6) 0408 (7)	1
2 or higher	PRESET SPEED #2 FREQUENCY	1	0530	FFFF	LL ~ UL	0.01
	PRESET SPEED #2 OPERATING MODE	1	0532	040C	(**Note 2**)	1
3 or higher	PRESET SPEED #3 FREQUENCY	1	0538	FFFF	LL ~ UL	0.01
	PRESET SPEED #3 OPERATING MODE	1	053A	040C	(**Note 2**)	1
4 or higher	PRESET SPEED #4 FREQUENCY	1	0540	FFFF	LL ~ UL	0.01
	PRESET SPEED #4 OPERATING MODE	1	0542	040C	(**Note 2**)	1
5 or higher	PRESET SPEED #5 FREQUENCY	1	0548	FFFF	LL ~ UL	0.01
	PRESET SPEED #5 OPERATING MODE	1	054A	040C	(**Note 2**)	1
6 or higher	PRESET SPEED #6 FREQUENCY	1	0550	FFFF	LL ~ UL	0.01
	PRESET SPEED #6 OPERATING MODE	1	0552	040C	(**Note 2**)	1
7 or higher	PRESET SPEED #7 FREQUENCY	1	0558	FFFF	LL ~ UL	0.01
	PRESET SPEED #7 OPERATING MODE	1	055A	040C	(**Note 2**)	1
8 or higher	PRESET SPEED #8 FREQUENCY	1	0560	FFFF	LL ~ UL	0.01
	PRESET SPEED #8 OPERATING MODE	1	0562	040C	(**Note 2**)	1
9 or higher	PRESET SPEED #9 FREQUENCY	1	0568	FFFF	LL ~ UL	0.01
	PRESET SPEED #9 OPERATING MODE	1	056A	040C	(**Note 2**)	1
10 or higher	PRESET SPEED #10 FREQUENCY	1	0570	FFFF	LL ~ UL	0.01
	PRESET SPEED #10 OPERATING MODE	1	0572	040C	(**Note 2**)	1
11 or higher	PRESET SPEED #11 FREQUENCY	1	0578	FFFF	LL ~ UL	0.01
	PRESET SPEED #11 OPERATING MODE	1	057A	040C	(**Note 2**)	1
12 or higher	PRESET SPEED #12 FREQUENCY	1	0580	FFFF	LL ~ UL	0.01
	PRESET SPEED #12 OPERATING MODE	1	0582	040C	(**Note 2**)	1
13 or higher	PRESET SPEED #13 FREQUENCY	1	0588	FFFF	LL ~ UL	0.01
	PRESET SPEED #13 OPERATING MODE	1	058A	040C	(**Note 2**)	1
14 or higher	PRESET SPEED #14 FREQUENCY	1	0590	FFFF	LL ~ UL	0.01
	PRESET SPEED #14 OPERATING MODE	1	0592	040C	(**Note 2**)	1
15	PRESET SPEED #15 FREQUENCY	1	0598	FFFF	LL ~ UL	0.01
	PRESET SPEED #15 OPERATING MODE	1	059A	040C	(**Note 2**)	1

Caution!
- Frequency parameters RX REF POINT #1 FREQUENCY ~ BINARY REF POINT #2 FREQUENCY use signed data (data values larger than 7FFFH are negative). If internal data is 8000H or larger, the actual setting can be obtained by using the conversion formula: **actual setting = - [FFFFH - (internal data) + 1]**. In addition, due to the fact that the multiplier is 0.02, use Fmax ÷ 2 (converted to hexadecimal) for adjustment limits (-Fmax ÷ 2 ~ Fmax ÷ 2 corresponds to -Fmax ~ Fmax).

- Setting point parameters RX REFERENCE SETTING POINT #1 ~ PG REFERENCE SETTING POINT #2 use signed data (data values from 0080H to 00FFH are negative). If internal data is between 0080H and 00FFH, the actual setting can be obtained by using the conversion formula: **actual setting = - [00FFH - (internal data) + 1]**.

(**Note 1**): Use caution with these parameters, as the internal data values do not follow the same setting format as those set from the operating panel. A look-up table, etc., can be used in the application program to reference these values properly.

(**Note 2**): Adjustment range is the same as PRESET SPEED #1 OPERATING MODE.

TOSHIBA

GROUP:PROTECTION FUNCTION PARAMETERS

Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
DYNAMIC BRAKING SELECTION (**Note**)		0 / 1	04BD	0003	0000: no dynam. braking (0) 0001: with dynamic braking, no DBR OL trip (1) 0003: with dynamic braking and DBR OL trip (2)	—
2	BRAKING RESISTOR VALUE	0 / 1	0416	FFFF	000A ~ 2710 (1.0 ~ 1000)	0.1
	BRAKING RESISTOR POWER RATING	0 / 1	0418	FFFF	0001 ~ EA60 (0.01 ~ 600.00)	0.01
OVERVOLTAGE STALL PROTECTION		0 / 1	04BD	0004	0000: ON (0) 0004: OFF (1)	—
DC INJECTION START FREQUENCY		0 / 1	03FC	FFFF	0000 ~ 2EE0 (0.00 ~ 120.00)	0.01
Other than 0	DC INJECTION CURRENT MAGNITUDE	0 / 1	043A	00FF	0000 ~ 0064 (0 ~ 100)	1
	DC INJECTION TIME	0 / 1	043B	00FF	0000 ~ 0064 (0.0 ~ 10.0)	0.1
FWD/REV DC INJECTION PRIORITY CTRL		0 / 1	04BC	0040	0000: OFF (0) 0040: ON (1)	—
MOTOR SHAFT STATIONARY CTRL		0 / 1	04BC	0080	0000: OFF (0) 0080: ON (1)	—
EMERGENCY OFF MODE SELECTION		0 / 1	04BC	0030	0000: Coast stop (0) 0010: Decelerated stop (1) 0020: DC injection stop (2)	—
2	EMERGENCY OFF DC INJECTION TIME	0 / 1	043D	00FF	0000 ~ 0064 (0.0 ~ 10.0)	0.1
NUMBER OF RETRY ATTEMPTS		0 / 1	043F	00FF	0000 ~ 000A (0 ~ 10)	1
Other than 0	TIME BETWEEN RETRY ATTEMPTS	0 / 1	0440	00FF	0000 ~ 0064 (0.0 ~ 10.0)	0.1
REGENERATION POWER RIDE-THROUGH		0 / 1	04BD	0008	0000: OFF (0) 0008: ON (1)	—
1	REGENERATION RIDE-THROUGH TIME	0 / 1	0446	00FF	0000 ~ 00FA (0.0 ~ 25.0)	0.1
AUTO-RESTART (MOTOR SPEED SEARCH)		0 / 1	04B6	0018	0000: OFF (0) 0008: On power failure (1) 0010: On ST make/break (2) 0018: Both (1) and (2) (3)	—
ELECTRONIC THERMAL PROTECT LVL #1		0 / 1	042A	00FF	000A ~ 0064 (10 ~ 100)	1
OVERLOAD REDUCTION START FREQ		0 / 1	0410	FFFF	0000 ~ 0BB8 (0.00 ~ 30.00)	0.01
MOTOR 150% OVERLOAD TIME LIMIT		0 / 1	0444	00FF	0001 ~ 00F0 (10 ~ 2400)	10
OVERLOAD SELECTION		0 / 1	04BD	0030	0000: with motor overload trip, w/o soft-stall (0) 0010: with motor overload trip and soft-stall (1) 0020: w/o soft-stall or motor overload trip (2) 0030: with soft-stall, w/o motor overload trip (3)	—
STALL PROTECTION ENABLE		0 / 1	042D	0040	0000: ON (0) 0040: OFF (1)	—
0	STALL PROTECTION CURRENT LEVEL	0 / 1	042B	00FF	000A ~ 00D7 (10 ~ 215)	1
UNDERVOLTAGE TRIP SELECTION		0 / 1	04BD	0080	0000: Trip disabled (0) 0080: Trip (during run) (1)	—
UNDERVOLTAGE DETECT TIME		0 / 1	0414	FFFF	0000 ~ 03E8 (0.00 ~ 10.00)	0.01
LOW CURRENT DETECT SELECTION		0 / 1	04BC	0008	0000: Trip disabled (0) 0008: Trip on detection (1)	—
LOW CURRENT DETECT LEVEL		0 / 1	0441	00FF	0000 ~ 0064 (0 ~ 100)	1
LOW CURRENT DETECTION TIME		0 / 1	0442	00FF	0000 ~ 00FF (0 ~ 255)	1

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Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
OUTPUT SHORT-CIRCUIT DETECTION SELECT	0 / 1	04BE	0003	0000: Standard motor (0) 0001: High-speed motor (1) 0002: Positioning use (standard motor) (2) 0003: Positioning use (high-speed motor) (3)	—
OVERTORQUE TRIP SELECTION	0 / 1	04BE	0040	0000: Trip disabled (0) 0040: Trip enabled (1)	—
OVERTORQUE TRIP LEVEL	0 / 1	0443	00FF	0000 ~ 00C8 (0 ~ 200)	1
FAULT TRIP EEPROM SAVE ENABLE	0 / 1	04B6	0002	0000: Data cleared when powered OFF (0) 0002: Data retained when powered OFF (1)	—
COOLING FAN CONTROL SELECTION	0 / 1	04BE	0004	0000: Automatic (temperature detection) (0) 0004: Always ON (1)	—
CUMULATIVE RUN TIMER ALARM SETTING	0 / 1	0422	FFFF	0000 ~ C34B (0.00 ~ 999.90)	0.02

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GROUP:PATTERN RUN CONTROL PARAMETERS

	Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
	PATTERN RUN SELECTION	0 / 1	04A7	0008	0000: OFF　　　　　　(0) 0008: ON　　　　　　(1)	—
1	PATTERN RUN CONTINUE MODE	0 / 1	04A7	0001	0000: reset on stop　　(0) 0001: switch when done　(1)	—
	PATTERN GROUP #1 SPEED #0	1	0500	00FF	0000: Skip　　　　　(0) 0001 ~ 000F: Speeds 1 ~ 15	1
	PATTERN GROUP #1 SPEED #1	1	0501	00FF		
	PATTERN GROUP #1 SPEED #2	1	0502	00FF		
	PATTERN GROUP #1 SPEED #3	1	0503	00FF		
	PATTERN GROUP #1 SPEED #4	1	0504	00FF		
	PATTERN GROUP #1 SPEED #5	1	0505	00FF		
	PATTERN GROUP #1 SPEED #6	1	0506	00FF		
	PATTERN GROUP #1 SPEED #7	1	0507	00FF		
	PATTERN GROUP #1 NUMBER OF CYCLES	0 / 1	049E	00FF	0001 ~ 00FF: 1 ~ 255	1
	PATTERN GROUP #2 SPEED #0	1	0508	00FF	0000: Skip　　　　　(0) 0001 ~ 000F: Speeds 1 ~ 15	1
	PATTERN GROUP #2 SPEED #1	1	0509	00FF		
	PATTERN GROUP #2 SPEED #2	1	050A	00FF		
	PATTERN GROUP #2 SPEED #3	1	050B	00FF		
	PATTERN GROUP #2 SPEED #4	1	050C	00FF		
	PATTERN GROUP #2 SPEED #5	1	050D	00FF		
	PATTERN GROUP #2 SPEED #6	1	050E	00FF		
	PATTERN GROUP #2 SPEED #7	1	050F	00FF		
	PATTERN GROUP #2 NUMBER OF CYCLES	0 / 1	04A0	00FF	0001 ~ 00FF: 1 ~ 255	1
	PATTERN GROUP #3 SPEED #0	1	0510	00FF	0000: Skip　　　　　(0) 0001 ~ 000F: Speeds 1 ~ 15	1
	PATTERN GROUP #3 SPEED #1	1	0511	00FF		
	PATTERN GROUP #3 SPEED #2	1	0512	00FF		
	PATTERN GROUP #3 SPEED #3	1	0513	00FF		
	PATTERN GROUP #3 SPEED #4	1	0514	00FF		
	PATTERN GROUP #3 SPEED #5	1	0515	00FF		
	PATTERN GROUP #3 SPEED #6	1	0516	00FF		
	PATTERN GROUP #3 SPEED #7	1	0517	00FF		
	PATTERN GROUP #3 NUMBER OF CYCLES	0 / 1	04A2	00FF	0001 ~ 00FF: 1 ~ 255	1
	PATTERN GROUP #4 SPEED #0	1	0518	00FF	0000: Skip　　　　　(0) 0001 ~ 000F: Speeds 1 ~ 15	1
	PATTERN GROUP #4 SPEED #1	1	0519	00FF		
	PATTERN GROUP #4 SPEED #2	1	051A	00FF		
	PATTERN GROUP #4 SPEED #3	1	051B	00FF		
	PATTERN GROUP #4 SPEED #4	1	051C	00FF		
	PATTERN GROUP #4 SPEED #5	1	051D	00FF		
	PATTERN GROUP #4 SPEED #6	1	051E	00FF		
	PATTERN GROUP #4 SPEED #7	1	051F	00FF		
	PATTERN GROUP #4 NUMBER OF CYCLES	0 / 1	04A4	00FF	0001 ~ 00FF: 1 ~ 255	1
	SPEED #1 CONTINUE MODE	1	052E	00FF	0000: Count in seconds from time of activation (0) 0001: Count in minutes from time of activation (1) 0002: Count in seconds from speed reach (2) 0003: Count in minutes from speed reach (3) 0004: Non-stop (continue until STOP command) (4) 0005: Continue until next step command (5)	—
Less than 4	SPEED #1 DRIVE TIME	1	052C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1

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Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
SPEED #2 CONTINUE MODE		1	0536	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #2 DRIVE TIME	1	0534	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #3 CONTINUE MODE		1	053E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #3 DRIVE TIME	1	053C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #4 CONTINUE MODE		1	0546	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #4 DRIVE TIME	1	0544	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #5 CONTINUE MODE		1	054E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #5 DRIVE TIME	1	054C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #6 CONTINUE MODE		1	0556	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #6 DRIVE TIME	1	0554	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #7 CONTINUE MODE		1	055E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #7 DRIVE TIME	1	055C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #8 CONTINUE MODE		1	0566	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #8 DRIVE TIME	1	0564	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #9 CONTINUE MODE		1	056E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #9 DRIVE TIME	1	056C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #10 CONTINUE MODE		1	0576	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #10 DRIVE TIME	1	0574	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #11 CONTINUE MODE		1	057E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #11 DRIVE TIME	1	057C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #12 CONTINUE MODE		1	0586	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #12 DRIVE TIME	1	0584	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #13 CONTINUE MODE		1	058E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #13 DRIVE TIME	1	058C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #14 CONTINUE MODE		1	0596	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #14 DRIVE TIME	1	0594	FFFF	0000 ~ 1F40 (0 ~ 8000)	1
SPEED #15 CONTINUE MODE		1	059E	00FF	Same as SPEED #1 CONTINUE MODE	—
Less than 4	SPEED #15 DRIVE TIME	1	059C	FFFF	0000 ~ 1F40 (0 ~ 8000)	1

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GROUP：FEEDBACK CONTROL PARAMETERS

Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
FEEDBACK CONTROL SELECTION		0 / 1	04B9	0060	0020: No feedback (0) 0040: PID control (1) 0060: Speed feedback (2)	—
1•2	FEEDBACK INPUT SIGNAL SELECTION	0 / 1	04B9	001C	0004: RR input (1) 0008: IV input (2) 000C: RX input (3) 0010: PG feedback (4) 0014: RS232C input (5) 0018: Communication/12-bit binary option board (6) 001C: BIN input (7)	—
	PROPORTIONAL GAIN	0 / 1	04A8	00FF	0001 ~ 00FF (0.01 ~ 2.55)	0.01
	INTEGRAL GAIN	0 / 1	04AA	FFFF	0001 ~ 8CA0 (0.01 ~ 360.00)	0.01
	ANTI-HUNTING GAIN	0 / 1	04AC	00FF	0000 ~ 00FF (0.0 ~ 25.5)	0.1
	LAG TIME CONSTANT	0 / 1	04AD	00FF	0000 ~ 00FF (0 ~ 255)	1
	PID LOWER LIMIT FREQUENCY	0 / 1	03D2	FFFF	0 ~ Fmax	0.01
PID DEVIATION LIMIT SELECTION		0 / 1	04BE	0080	0000: No PID deviation lim. (0) 0080: PID deviation limited (1)	—
1	PID DEVIATION UPPER LIMIT	0 / 1	04C8	00FF	0000 ~ 0032 (0 ~ 50)	1
	PID DEVIATION LOWER LIMIT	0 / 1	04C9	00FF	0000 ~ 0032 (0 ~ 50)	1
PG INPUT: NUMBER OF PULSES		0 / 1	040E	FFFF	0001 ~ 270F (1 ~ 9999)	1
PG INPUT: NUMBER OF PHASES		0 / 1	04B9	0001	0000: Single-phase input (1) 0001: Two-phase input (2)	—
DROOPING CONTROL ENABLE		0 / 1	04B9	0002	0000: OFF (0) 0002: ON (1)	—
1	DROOPING CONTROL AMOUNT	0 / 1	0451	00FF	0000 ~ 0064 (0 ~ 10.0)	0.1
OVERRIDE CONTROL SELECTION		0 / 1	04C1	0007	0000: OFF (0) 0001: FCRR (1) 0002: FCIV (2) 0003: FCRX (3) 0004: FCPG (4) 0005: FCPNL (5) 0006: FCOPT (6) 0007: FCMLT (7)	—
7	OVERRIDE MULTIPLIER INPUT SELECTION	0 / 1	04C1	0038	0000: Reference (0) 0008: KRR (1) 0010: KIV (2) 0018: KRX (3) 0020: KBIN (4)	—
	OVERRIDE CHANGE MULTIPLIER	0 / 1	0420	FFFF	FC18 ~ 03E8 (-100.0 ~ 100.0)	0.1

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GROUP:COMMUNICATION SETTING PARAMETERS

Function / Title			Bank	Address	Mask	Adjustment Range		Multiplier
RS232 BAUD RATE			1	04AE	0018	0000: 2400 baud	(0)	—
						0008: 4800 baud	(1)	
						0010: 9600 baud	(2)	
NUMBER OF DATA BITS			1	04AE	0040	0000: 7 bits	(0)	—
						0040: 8 bits	(1)	
PARITY SETTING			1	04AE	0080	0000: Even parity	(0)	—
						0080: Odd parity	(1)	
INVERTER ID NUMBER			1	04B1	00FF	0000 ~ 00FF (0 ~ 255)		1
COMMUNICATION SELECTION			1	04AE	0007	0000: OFF	(0)	—
						0001: RS485	(1)	
						0002: F-10, DNet, RIO	(2)	
						0003: TOSLINE S-20	(3)	
						0004: 12 bit binary input	(4)	
						0005: 3-digit BCD (0.1Hz)	(5)	
						0006: 3-digit BCD (1Hz)	(6)	
1	MASTER/SLAVE SELECTION		1	04AF	0018	0000: Slave	(0)	—
						0008: Master (frequency command)	(1)	
						0010: Master (output frequency)	(2)	
	RS485 BAUD RATE		1	04AF	0004	0000: Normal mode	(0)	—
						0004: High-speed mode	(1)	
2	TOSLINE-F10 COMMAND INPUT		1	04B0	0003	0000: OFF	(0)	—
						0001: Frequency command	(1)	
						0002: Command input	(2)	
						0003: Both (1) and (2)	(3)	
	TOSLINE-F10 MONITOR OUTPUT		1	04B0	003C	0000: (0) 0020: (8)		—
						0004: (1) 0024: (9)		
						0008: (2) 0028: (10)		
						000C: (3) 002C: (11)		
						0010: (4) 0030: (12)		
						0014: (5) 0034: (13)		
						0018: (6) 0038: (14)		
						001C: (7) 003C: (15)		
	TOSLINE-F10 COMM ERROR MODE		1	04B0	0080	0000: Data cleared	(0)	—
						0080: Data retained	(1)	
3	TOSLINE-S20 RECEIVE ADDRESS		1	04CE	FFFF	0000 ~ 03FF (0 ~ 1023)		1
	TOSLINE-S20 TRANSMIT ADDRESS		1	04D0	FFFF	0000 ~ 03FF (0 ~ 1023)		1
	TOSLINE-S20 COMMAND INPUT		1	04D2	001F	0000 ~ 001F (0 ~ 31)		1
	TOSLINE-S20 MONITOR OUTPUT		1	04D3	001F	0000 ~ 001F (0 ~ 31)		1
	TOSLINE-S20 FREQ REF ADDR SELECT		1	04D4	0001	0000: Disable	(0)	1
						0001: Enable	(1)	
	1	TOSLINE-S20 FREQ REFERENCE ADDR	1	04D5	FFFF	0000 ~ 03FF (0 ~ 1023)		1
	TOSLINE-S20 COMM ERROR MODE		1	04D4	0002	0000: Data cleared	(0)	1
						0002: Data retained	(1)	
	TOSLINE-S20 COMM OPTION RESET		1	02DC	0004	0000: No effect	(0)	1
						0004: Reset	(1)	
RS485/12-BIT BINARY BIAS,GAIN			0 / 1	04AF	0020	0000: OFF	(0)	—
						0020: ON	(1)	
1	RS485/12-BIT BINARY POINT #1 (**Ref. 1**)		0 / 1	04CA	00FF	0000 ~ 0064 (0 ~ 100)		1
	RS485/12-BIT BINARY PT. #1 FREQ		0 / 1	04B2	FFFF	0000 ~ Fmax (0 ~ Fmax)		0.01
	RS485/12-BIT BINARY POINT #2 (**Ref. 1**)		0 / 1	04CB	00FF	0000 ~ 0064 (0 ~ 100)		1
	RS485/12-BIT BINARY PT. #2 FREQ		0 / 1	04B4	FFFF	0000 ~ Fmax (0 ~ Fmax)		0.01

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(**Note**) All parameters in GROUP:COMMUNICATION SETTING PARAMETERS (except for RS485/12-BIT BINARY BIAS,GAIN, RS485/12-BIT BINARY POINT #1, RS485/12-BIT BINARY PT. #1 FREQ, RS485/12-BIT BINARY POINT #2, and RS485/12-BIT BINARY PT. #2 FREQ) must be set in the EEPROM (bank 1) to be valid. (These parameters can be set in bank 0 (RAM), but the data settings will be written over by the values contained in the EEPROM the next time RAM is reset. Therefore, always write the data settings for these parameters to the EEPROM (bank 1)). After changing the settings of these communication parameters, reset the inverter to validate the data.

(**Ref. 1**) The data settings for parameters RS485/12-BIT BINARY POINT #1 and RS485/12-BIT BINARY POINT #2 are proportional to MAXIMUM OUTPUT FREQUENCY in GROUP:FUNDAMENTAL PARAMETERS #1.

> **Ex:** If MAXIMUM OUTPUT FREQUENCY = 80Hz, RS485/12-BIT BINARY POINT #1 = 10%, RS485/12-BIT BINARY PT. #1 FREQ = 20Hz, and an 8Hz frequency command is input, the output frequency will be 20Hz.

GROUP:AM/FM TERMINAL ADJUSTMENT PARAMS

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
FM TERMINAL FUNCTION SELECTION (**Note**)	0 / 1	0484	FFFF	1194: Pre-compensation reference frequency (0) 6686: Post-compensation output frequency (1) 1500: Frequency setting (2) 2576: Output current (3) 2689: DC voltage (4) 5668: Output voltage (5) 3684: Torque current (6) 2688: Excitation current (7) 7506: PID feedback value (8) 0584: Motor overload ratio (9) 0586: Inv. overload ratio (10) 0588: Dynamic braking resistor OL ratio (11) 835C: Input power (12) 835E: Output power (13) A000: Fixed output (14) 2304: Peak output current (15) 8302: Peak input voltage (16)	—
FREQUENCY METER ADJUSTMENT	0 / 1	0486	FFFF	0000 ~ FFFF	1
AM TERMINAL FUNCTION SELECTION (**Note**)	0 / 1	0488	FFFF	Same as FM TERMINAL FUNCTION SELECTION	—
CURRENT METER ADJUSTMENT	0 / 1	048A	FFFF	0000 ~ FFFF	1

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GROUP:UTILITY PARAMETERS

Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
INDUSTRIAL APPLICATIONS (previous setting monitor for read use) **Note**: If data is written to this address, the previous setting displayed on the panel will be changed.	0 / 1	0438	00FF	0000: Std. shpmt. setting (0) 0001: Pump application (1) 0002: Fan application (2) 0003: Conveyor application (3) 0004: Hoist application (4) 0005: Textiles application (5) 0006: Machine tools appl. (6)	—
INDUSTRIAL APPLICATIONS (for write use) (**Note**, ∗)	0 / 1	04C2	00FF	0000: Does nothing (0) 0011: Pump application (1) 0012: Fan application (2) 0013: Conveyor application (3) 0014: Hoist application (4) 0015: Textiles application (5) 0016: Machine tools appl. (6)	—
STANDARD SETTING MODE SELECTION (**Note**, ∗) (**Ref. 1**)	0 / 1	04C2	00FF	0000: Does nothing (0) 0001: 50Hz std. settings (1) 0002: 60Hz std. settings (2) 0003: Factory settings (3) 0004: Trip clear (4) 0005: Save user-set param. (5) 0006: TYPE 5 reset (6) 0007: Initialize typeform (7)	—
COMMAND MODE SELECTION	0 / 1	04B7	0007	0000: Only RS232C valid (0) 0001: Terminal input valid (1) 0002: Panel input valid (2) 0003: Communication option input valid (3) 0004: local/remote valid (4)	—
FREQUENCY MODE SELECTION	0 / 1	04B7	0038	0000: Only RS232C valid (0) 0008: Terminal input valid (1) 0010: Panel input valid (2) 0018: Comm./12-bit binary option input valid (3) 0020: local/remote valid (4)	—
PANEL OPERATION MODE SELECTION (**Ref. 2**)	0 / 1	0452	00FB	0000 ~ 003F (0 ~ 63) (except 0004, 0008, 000C....)	1
PASS NUMBER	0 / 1	049D	00FF	0000 ~ 0063 (0 ~ 99)	1
CPU VERSION ROM VERSION EEPROM VERSION	2 3 1	8000 0000 0380	—	(Monitor only)	1
INVERTER TYPEFORM	0	05CA	—	(Monitor only)	—
STATUS MONITOR #1 DISPLAY SELECT	0 / 1	0454	FFFF	0001 ~ 0010 (1 ~ 16)	1
STATUS MONITOR #2 DISPLAY SELECT	0 / 1	0456	FFFF	0001 ~ 0010 (1 ~ 16)	1
STATUS MONITOR #3 DISPLAY SELECT	0 / 1	0458	FFFF	0001 ~ 0010 (1 ~ 16)	1
STATUS MONITOR #4 DISPLAY SELECT	0 / 1	045A	FFFF	0001 ~ 0010 (1 ~ 16)	1
FREQUENCY UNITS SCALE FACTOR	0 / 1	0412	FFFF	0000 ~ 4E20 (0.00 ~ 200.00)	0.01
FREQUENCY DISPLAY RESOLUTION	0 / 1	045D	0003	0000: 1Hz (0) 0001: 0.1Hz (1) 0002: 0.01Hz (2)	—
ACC/DEC TIME UNITS SELECTION (**Ref. 3**)	0 / 1	045D	0004	0000: 0.1 sec. (0) 0004: 0.01 sec. (1)	—

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	Function / Title	Bank	Address	Mask	Adjustment Range	Multiplier
	CURRENT UNITS SELECTION	0 / 1	045D	0008	0000: % (0) 0008: A (1)	—
	VOLTAGE UNITS SELECTION	0 / 1	045D	0010	0000: % (0) 0010: V (1)	—
	BLIND FUNCTION SELECTION	0 / 1	045E	0001	0000: Blind (0) 0001: Selective unblinding (1)	—
1	FUNDAMENTAL PARAMS #2 BLIND	0 / 1	045E	0040	0000: Blind (0) 0040: Unblind (1)	—
	PANEL CONTROL PARAMS BLIND	0 / 1	045E	0080	0000: Blind (0) 0080: Unblind (1)	—
	TERMINAL SELECTION PARAMS BLIND	0 / 1	045F	0001	0000: Blind (0) 0001: Unblind (1)	—
	SPECIAL CONTROL PARAMS BLIND	0 / 1	045F	0002	0000: Blind (0) 0002: Unblind (1)	—
	FREQUENCY SETTING PARAMS BLIND	0 / 1	045F	0004	0000: Blind (0) 0004: Unblind (1)	—
	PROTECTION FUNCTION PARAMS BLIND	0 / 1	045F	0008	0000: Blind (0) 0008: Unblind (1)	—
	PATTERN RUN CONTROL PARAMS BLIND	0 / 1	045F	0010	0000: Blind (0) 0010: Unblind (1)	—
	FEEDBACK CONTROL PARAMS BLIND	0 / 1	045F	0020	0000: Blind (0) 0020: Unblind (1)	—
	COMMUNICATION PARAMS BLIND	0 / 1	045F	0040	0000: Blind (0) 0040: Unblind (1)	—
	INDUSTRIAL APPL:PUMP PARAMS BLIND	0 / 1	045F	0080	0000: Blind (0) 0080: Unblind (1)	—
	INDUSTRIAL APPL:FAN PARAMS BLIND	0 / 1	0460	0001	0000: Blind (0) 0001: Unblind (1)	—
	INDUSTRIAL APPL: CONVEYOR BLIND	0 / 1	0460	0002	0000: Blind (0) 0002: Unblind (1)	—
	INDUSTRIAL APPL: HOIST BLIND	0 / 1	0460	0004	0000: Blind (0) 0004: Unblind (1)	—
	INDUSTRIAL APPL: TEXTILES BLIND	0 / 1	0460	0008	0000: Blind (0) 0008: Unblind (1)	—
	INDUST APPL:MACHINE TOOLS BLIND	0 / 1	0460	0010	0000: Blind (0) 0010: Unblind (1)	—
	AM/FM ADJUSTMENT PARAMS BLIND	0 / 1	0461	0001	0000: Blind (0) 0001: Unblind (1)	—
	MOTOR PARAMETERS BLIND	0 / 1	0461	0004	0000: Blind (0) 0004: Unblind (1)	—

(**Ref. 1**): The data setting value will be retained in the EEPROM even if it was written to RAM (bank 0).
Note) If 0000 (does nothing) is written to the EEPROM, the previous setting monitor value will become 0. Also, if the industrial application parameters selection is written to after writing to the standard setting mode selection, the standard setting mode selection's previous data setting will be cleared.

(**Ref. 2**): If the setting value is written to RAM only, the value displayed on the panel will not change. Also, when the setting value is written to EEPROM, the value displayed on the panel will not change until a reset is performed.

(**Ref. 3**): If the setting of ACC/DEC TIME UNITS SELECTION is changed after setting the ACC/DEC times, the ACC/DEC times will become 10 times or 0.1 times their former value. Therefore, always reset the ACC/DEC time settings after changing the setting of ACC/DEC TIME UNITS SELECTION.

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GROUP:MOTOR RATING PARAMETERS

Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
NUMBER OF MOTOR POLES		0 / 1	04C3	00FF	0001: (2) 0002: (4) 0003: (6) 0004: (8) 0005: (10) 0006: (12) 0007: (14) 0008: (16)	2
MOTOR RATED CAPACITY		0 / 1	041E	FFFF	0001 ~ 270F (0.1 ~ 999.9)	0.1
MOTOR TYPE		0 / 1	04BF	0030	0000:Toshiba EQPIII motor (0) 0010:Toshiba STD motor (1) 0020:Other (2)	—
2	MOTOR RATED VOLTAGE (230 / 460v units) (575v units)	0 / 1	04C6 042C	00FF	0012 ~ 0078 (90 ~ 600) 001A ~ 00AC (130 ~ 860)	5
	MOTOR RATED FREQUENCY	0 / 1	04C7	00FF	0000 ~ 00C8 (0 ~ 400)	2
	MOTOR RATED RPM	0 / 1	040C	FFFF	0000 ~ 270F (0 ~ 9999)	1
	AUTO-TUNING ENABLE	0	04BE	0008	0000: Auto-tuning disabled (0) 0008: Auto-tuning enabled (1)	—
LOAD MOMENT OF INERTIA		0 / 1	04BF	00C0	0000: Small (0) 0040: Medium (1) 0080: Large (2) 00C0: Very large (3)	—

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8.5 ASCII Character Codes

	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL

Note: Shaded items in the above table indicate valid RS232 communication codes.

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8.6 Notes

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