

Toshiba inverter G3-Series Remote I/O Manual

**HIGH PERFORMANCE TRANSISTOR ADJUSTABLE SPEED DRIVE
TRUE TORQUE CONTROL SERIES**

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TOSVERT-130 TRANSISTOR INVERTER

REMOTE I/O COMMUNICATIONS OPTION MANUAL

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1. Introduction

Thank you for purchasing the “Remote I/O Communications Interface” for the Toshiba TOSVERT-130 G3 High-Performance Transistor Adjustable Speed Drive (ASD). Before using the Remote I/O interface option, 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 ASD unit into which the Remote I/O option kit is installed, and keep this instruction manual in a safe place for future reference or ASD inspection.

This instruction manual describes the device specifications, wiring methods, maintenance procedures, protocol, functions and usage methods for the Remote I/O communications interface option.

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2. Usage Precautions

Operating Environment

- Please use the option board only when the ambient temperature of the ASD unit into which the option board is installed is within the following specified temperature limits:

Operation: -10 ~ +40°C (+14 ~ +104°F)

Storage: -25 ~ +65°C (-13 ~ +149°F)

- Avoid installation locations that may be subjected to large shocks or vibrations.
- Avoid installation locations that may be subjected to rapid changes in temperature or humidity.

Installation • Wiring

- Do not touch charged parts such as the terminal block while the ASD's CHARGE lamp is lit. A charge will still be present in the ASD unit's internal electrolytic capacitors, and therefore touching these areas may result in an electrical shock. Always turn all ASD input power supplies OFF, and wait at least 5 minutes after the CHARGE lamp has gone out before wiring the communication cables or motor wiring.
- When installing the option board into the ASD and making wiring connections, make certain that no clippings or wiring leads that could cause device failure fall into the ASD or onto electronic components.
- Proper ground connections are vital for both safety and signal reliability reasons. For proper grounding procedures, please refer to the G3 Operations Manual.
- Route the communication cables separate from the ASD input/output power wiring.
- To avoid the possibility of electric shock due to leakage currents, always ground the ASD unit's E/GND terminal and the motor.
- If I/O communications to the G3 are interrupted, the ASD will continue with the same settings as before communications were interrupted. If the drive was running at 60Hz, it will continue to do so. Therefore, hardwired precautions should be taken considering preferred operation during loss of communications.

Other Precautions

- The ASD's EEPROM has a life span of 10,000 write cycles. Do not write to the same holding register (other than register 01 (frequency command) or 02 (input command)) more than 10,000 times.
- Do not touch or insert a rod or any other item into the ASD while power is applied, as this may lead to electrical shock or ASD damage.
- Commission the disposal of the option board to a specialist.
- Do not assign the same address to more than one ASD in the same network.
- When the ASD's control power supply is turned on, the ASD 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 ASD resets.

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3. Option Board Installation / Removal

The Remote I/O Communications Option ROM enclosed with the Remote I/O kit is compatible only with G3 ASDs with V120 or later main software. An error will occur if the option ROM is installed in an ASD with pre-V120 main software. The main software version number is printed on the CPU package (IC1) on the control board. Additionally, this version number can be read from ASD memory by displaying the parameter `CPU VERSION` in `GROUP:UTILITY PARAMETERS`. If you are unsure of the software version of your ASD, please contact Toshiba International Corporation for more information.

The Remote I/O option ROM version number is printed on the label attached to the ROM. The option ROM version number can also be read from the ASD's memory and displayed on the LCD panel after initialization by displaying the parameter `ROM VERSION` in `GROUP:UTILITY PARAMETERS`. The option ROM version number replaces the standard ROM version number after installation/initialization.

3.1 Before Installation

All parameters will be automatically reset to the factory default values after the option ROM is installed in the ASD. If it is desired to retain the current parameter settings, the user should access the user-changed parameter group to display and record all the parameters and setting values that have been changed from factory defaults. Even if the current settings are saved to non-volatile memory by setting the `STANDARD SETTING MODE SELECTION` parameter in `GROUP:UTILITY PARAMETERS` to 5, they will be erased from memory during initialization of the option ROM.

- *Setting the standard mode selection parameter will be referred to in this manual as performing a **TYPE X RESET**, where X is the parameter setting value*

3.2 Installation Procedure

Installation of the TOSHIBA Remote I/O option ROM and option board into a TOSVERT-130 G3 ASD should only be performed by a qualified technician familiar with the maintenance and operation of the G3. To install the option ROM and option board, complete the following steps:

3.3 Option ROM

3.3.1 640x Option ROM:

Your Remote I/O card comes with an option ROM which has the number 6401 at the time of this printing. Sometime in the future, this will be updated to 6402. In the notes below, this is referred to as the "640x" Option ROM.



CAUTION!

When an Option ROM is installed into the G3, the G3's memory will be set back to factory defaults. The message "Inverter Typeform Error" will appear.

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The 640x Option ROM should only be installed in the 230 or 460Vac G3. The 600 Vac G3 and the H3 come with an option ROM already installed. Do not remove it.

Do not install the 640x Option ROM into any E3.

At the time of this printing, G3s over 300HP are planned. These may come with an Option ROM. If so, do not remove it.

3.3.2 Which Drives Need the V640x Option ROM?

DRIVE	Install 640x Option ROM?
230 and 460Vac G3s 300HP and under	YES
H3	NO
E3	NO
600Vac G3	NO
Any drive which already has an Option ROM	NO

1.  **CAUTION!** Verify that all input power sources to the ASD have been turned OFF and are locked and tagged out.
2.  **DANGER!**  Wait at least 5 minutes for the ASD's electrolytic capacitors to discharge before proceeding to step 4. **Do not touch any internal parts with power applied to the ASD, or for at least 5 minutes after power to the ASD has been removed. A hazard exists temporarily for electrical shock even if the source power has been removed.**
3.  Remove the ASD's cover (open the door on units with hinged doors). Verify that the CHARGE LED has gone out before continuing the installation process.
4. Loosen the 4 screws attaching the G3's operation panel support bracket to the control board support bracket, and then remove the operation panel and support bracket as a unit (refer to Figure 1).

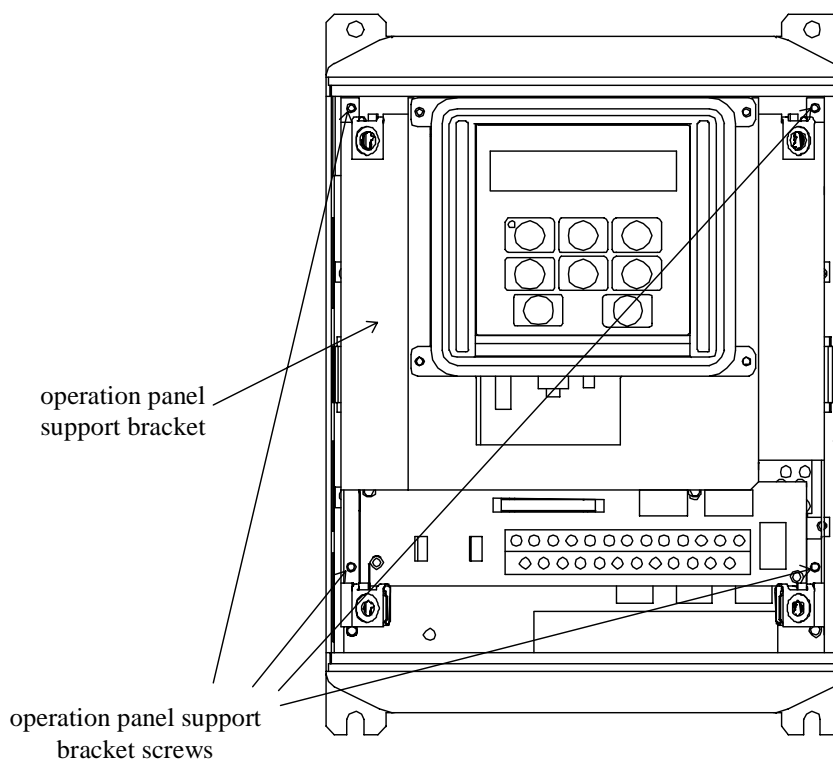



Figure 1: *G3 with front cover removed*

6.  **CAUTION!** The option ROM PCB assembly and option board are static-sensitive devices. Standard electrostatic-sensitive component handling precautions should be observed. Locate the option ROM connector, labeled CN41, on the lower-left side of the control PCB. Line up the connector on the back of the option ROM PCB with CN41. Install the option ROM by pressing gently but firmly on the option ROM PCB until a slight “click” is felt. Verify that the option ROM PCB is seated properly and firmly in CN41. If the option ROM connector does not appear to be mating with CN41 properly, verify that the ROM is oriented properly and that there are no obstructions in either connector.
7. Set the Remote I/O option board's DIP switches for the desired communication parameters (refer to section 8).
8. Install the 4 plastic option board standoffs into the holes provided in the control board support bracket (refer to Figure 2).

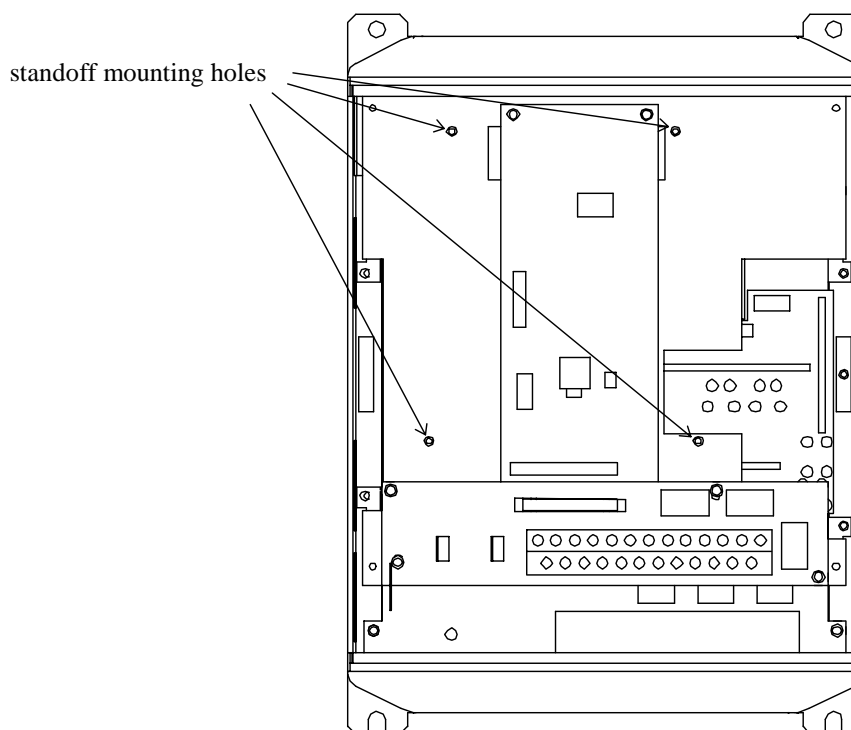



Figure 2: G3 with front cover and operation panel support bracket removed

9. Install the Remote I/O network cable through the access holes at the bottom of the ASD and route the cable in order to make connections to the option board connector (TB1). Take care to not route the cable near any sharp edges or in positions where it may be pinched.

10. Connect the Remote I/O cable to the option board connector (TB1).  **CAUTION!**
Extremely high voltages exist in the area near the Remote I/O option board and connector (TB1). Ensure that no stray wires (such as the shield on the Remote I/O communications wire) come into contact with any internal ASD components. Also ensure that the communications cable is not routed in such a manner that it may come into contact with high-voltage ASD components, or ASD components that may heat up during operation and melt the cable insulation.

11. Install the option board into the ASD by carefully aligning the 4 plastic supports with the 4 mounting holes provided in the option board. Ensure that connector CN5A on the back side of the option board is aligned with connector CN5 on the front side of the control board.
12. Press the option board firmly onto the standoffs and connector CN5 until the standoff retaining tabs lock. Ensure that CN5 and CN5A are thoroughly interlocked.
13. Carefully re-install the operation panel and support bracket and tighten the 4 screws that attach the operation panel support bracket to the control board support bracket.
14. Reinstall the ASD's cover (close and latch the door on units with hinged doors).



DANGER!



Do not operate the unit with the cover off / cabinet door open.

15. Turn all power sources to the ASD unit ON, and verify that the ASD functions properly. If the ASD unit does not appear to power up, or does not function properly, immediately turn power OFF.

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Repeat steps 2 ~ 4 to remove all power from the ASD. Then, verify all connections. Contact Toshiba International Corporation for assistance if the problem persists.

- To perform final verification that the option ROM is installed properly, display the value of the ROM VERSION parameter in GROUP:UTILITY PARAMETERS. This number should match the option ROM version number that was recorded in step 1. If this parameter value does not match the option ROM version number recorded in step 1, **repeat steps 2 ~ 4 to remove all power from the ASD**, then re-verify that the option ROM is installed properly. If the option ROM appears to be installed properly, but the version numbers still do not match, contact Toshiba International Corporation for further assistance.

3.4 Before Removal






Removal of the Remote I/O option board from a TOSVERT-130 G3 ASD should only be performed by a qualified technician familiar with the maintenance and operation of the G3. In order to protect the option board connector's reliability, do not repeatedly connect and disconnect the option board. Use the following procedure if it becomes necessary to remove the Remote I/O option board from the ASD.



CAUTION! Do not remove the option board while power is applied to the ASD. Removing the option board with power applied may damage the ASD.

The ASD will display an error message if the option ROM becomes dislodged or is removed from its socket. The ASD must be reset to clear this error. Therefore, all parameters will be automatically reset to the factory default values after an option ROM has been removed from the ASD. If it is desired to retain the current parameter settings, the user should access the user-changed parameter group to display and record all the parameters and setting values that have been changed from factory defaults. Even if the current settings are saved using the TYPE 5 RESET function, they will be erased from memory during the re-initialization of the ASD after the option ROM has been removed.

3.5 Removal Procedure

-  **CAUTION!** Verify that all input power sources to the ASD have been turned OFF and are locked and tagged out.
-  **DANGER!**  Wait at least 5 minutes for the ASD's electrolytic capacitors to discharge before proceeding to step 3. **Do not touch any internal parts with power applied to the ASD, or for at least 5 minutes after power to the ASD has been removed. A hazard exists temporarily for electrical shock even if the source power has been removed.**
-  Remove the ASD's cover (open the door on units with hinged doors). Verify that the CHARGE LED has gone out before continuing the removal process.
- Loosen the 4 screws attaching the operation panel support bracket to the control board support bracket and remove the operation panel and support bracket as a unit (refer to Figure 3).
-  **CAUTION!** The option ROM PCB and Remote I/O option board are static-sensitive devices. Standard electrostatic-sensitive component handling precautions should be observed.

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Release the 4 corners of the option board from the standoffs by pressing down on the standoff locking tabs with a small flat-headed screwdriver. Be careful to not apply any abnormal stress to the option board while performing this, as this may damage the option board or control board connectors.

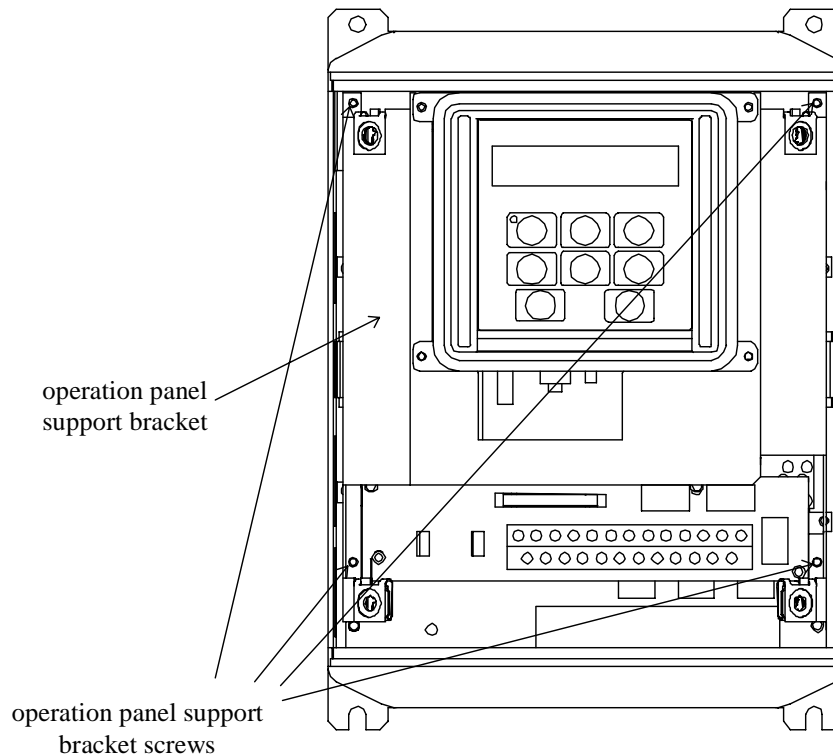


Figure 3: *G3 with front cover removed*

6. Remove the option board from the ASD.
7. Disconnect the communications cable from the option board connector (TB1), and pull the cable out through the access holes at the bottom of the ASD.
8. Locate the option ROM in the option ROM connector, labeled CN41, on the lower-left side of the control PCB. Gently work the option ROM PCB up and down while pulling on it until the ROM releases from the control PCB option ROM connector.
9. Carefully re-install the operation panel and support bracket and tighten the 4 screws that attach the operation panel support bracket to the control board support bracket.
10. Reinstall the ASD's cover (close and latch the door on units with hinged doors).



DANGER!



Do not operate unit with the cover off / cabinet door open.

11. Turn all power sources to the ASD unit ON, and verify that the ASD functions properly. If the ASD unit does not appear to power up, or does not function properly, immediately turn power OFF.

Repeat steps 1 ~ 3 to remove all power from the ASD. Then, verify all connections. Contact Toshiba International Corporation for assistance if the problem persists.

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12. To re-initialize the ASD after the ROM has been removed, perform a TYPE 3 reset. After the initialization sequence, display the value of the ROM VERSION parameter in GROUP:UTILITY PARAMETERS. This number should match the standard ROM version number that was recorded prior to option ROM installation. If this parameter value does not match the value recorded earlier, contact Toshiba International Corporation for further assistance.

4. Grounding

Grounding is of particular importance for reliable, stable operation. Communication system characteristics may vary from system to system, depending on the system environment and grounding method used. A ground connection with an impedance of less than 100Ω should be used. Please be sure to consider the following points for making proper ground connections:

Grounding method checkpoints

1. Make all ground connections such that no ground current flows through the ASD case.
2. Ensure that all grounds are connected to points that are at the same potential as ASD grounds.
3. Do not connect the Remote I/O option board's SHIELD terminal to a power ground or any other potential noise-producing ground connection (such as the ASD's E/GND terminal).
4. Do not make connections to unstable grounds (paint-coated screw heads, grounds that are subjected to inductive noise, etc.)
5. Use copper wire with a cross-sectional area of 2mm^2 or larger, or aluminum wire with a cross-sectional area of 2.6mm^2 or larger for grounding.

5. Equipment Specifications

Item	Specification
Operating Environment	Indoors, less than 1000m above sea level, do not expose to direct sunlight or corrosive / explosive gasses.
Operating Temperature	-10 ~ +40°C (+14 ~ +104°F)
Storage Temperature	-25°C ~ +65°C (-13 ~ +149°F)
Relative Humidity	20% ~ 90% (without condensation)
Vibration	5.9m/s ² {0.6G} or less (10 ~ 55Hz)
Grounding	Use a ground connection with an impedance of less than 100Ω.
Cooling Method	Self-cooled

6. Maintenance And Inspection

Preventive maintenance and inspection is required to maintain the Remote I/O communication option in its optimal condition, and to ensure a long operational lifetime. Depending on usage and operating conditions, perform a periodic inspection once every three to six months. Before starting inspections, always turn off all power supplies to the ASD unit, and wait at least five minutes after the ASD's "CHARGE" lamp has gone out.

**DANGER!**

Do not touch any internal parts with power applied to the ASD, or for at least 5 minutes after power to the ASD has been removed. A hazard exists temporarily for electrical shock even if the source power has been removed.

Inspection Points

- Check that the wiring terminal screws are not loose. Tighten if necessary.
- Check that there are no defects in any wire terminal crimp points. Visually check that the crimp points are not scarred by overheating.
- Visually check the wiring and cables for damage.
- Clean off any accumulated dust and dirt. Place special emphasis on cleaning the ventilation ports of the ASD and all installed PCBs. Always keep these areas clean, as adherence of dust and dirt can cause premature component failure.
- If use of the ASD unit is discontinued for extended periods of time, turn the power on at least once every two years and confirm that the unit still functions properly.
- Do not perform hi-pot tests on the ASD or Remote I/O option card, as they may damage the unit's internal components.

Please pay close attention to all periodic inspection points and maintain a good operating environment.

7. Storage And Warranty

7.1 Storage

Observe the following points when the Remote I/O option board is not used immediately after purchase or when it is not used for an extended period of time.

- Avoid storing the option board in places that are hot or humid, or that contain large quantities of dust or metallic dust. Store the option board in a well-ventilated location.
- When not using the Remote I/O option board for an extended period of time, turn the power on at least once every two years and confirm that it still functions properly.

7.2 Warranty

The Remote I/O communication option kit is covered under warranty for a period of 12 months from the date of installation, but not to exceed 18 months from the date of shipment from the factory. For further warranty or service information, please contact Toshiba International Corporation.

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8. Remote I/O Card Setup Information

This card operates by taking data from the Allen-Bradley Remote I/O network, and then sending this data to the G3 CPU. There are two basic methods the G3 uses to communicate: Scan and Block Transfer. Scan data is read and written directly from AB Input/Output registers. Block Transfer data access uses the Block Transfer Read and Block Transfer Write instructions in the Allen-Bradley PLC to read or write data into the G3's memory. To facilitate this, the G3's memory map is included in this document.

8.1 Baud Rate

The G3's **RS232 Baud Rate** is used for the RIO baud rate settings. Note that this will also change the baud rate of the G3's built-in RS232 port.

Parameter Description	Item No.	Setting	RIO Baud Rate
RS232 Baud Rate	260	0	57.6 KBaud
		1	115.2 KBaud
		2	230.4 KBaud

8.2 RIO Rack Address

The **ASD ID NUMBER** (Item 263) is used for the RIO Rack Address. It has a range of 1 to 255.

8.3 Communication Selection

The **COMMUNICATION SELECTION** (Item No. 264) must be set to **TOSLINE-F10 "2"** to select the G3 RIO option Board.

8.4 Rack Size and Placement

The Tosline-F10/S20 Monitor Output is used to define the Rack Size and Placement.

Parameter Description	Item No.	Setting	RIO Rack Size	Starting Group
TOSLINE-F10 Monitor Output	268	0	1/4	0
		1	1/4	2
		2	1/4	4
		3	1/4	6
		4	1/2	0
		5	1/2	4
		6	FULL	0

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8.5 Tosline F10 Command Input

This table shows how to configure the G3 Remote I/O Card to send and receive data over the RIO scan. The Scan Data to PLC column corresponds to data in the INPUT IMAGE table, while the Scan Data to Option Board column corresponds to data in the OUTPUT IMAGE table.

Parameter Description	Item No.	Setting	Rack Size	Scan Data to PLC	Scan Data to Option Card	
TOSLINE-F10 Command Input	267	0	1/4	RIO Status	Input Status	
				Frequency	Frequency	
		0	1/2	RIO Status	Input Status	
				Frequency	Frequency	
				Drive Status	Scan In 1	
		0	FULL	Current	Scan In 2	
				RIO Status	Input Status	
				Frequency	Frequency	
				Drive Status	Scan In 1	
				Current	Scan In 2	
				Voltage	Scan In 3	
		Scan Out 1	Scan In 4			
	Scan Out 2	Scan In 5				
	Scan Out 3	Scan In 6				
	1	1/4	Drive Status	Input Status		
			Frequency	Frequency		
	1	1/2	Drive Status	Input Status		
			Frequency	Frequency		
			Current	Scan In 1		
			Voltage	Scan In 2		
	1	FULL	Drive Status	Input Status		
			Frequency	Frequency		
			Current	Scan In 1		
Voltage			Scan In 2			
Scan Out 1			Scan In 3			
Scan Out 2			Scan In 4			
Scan Out 3			Scan In 5			
Scan Out 4			Scan In 6			

...table continues on next page...

Tosline F10 Command Input continued

Parameter Description	Item No.	Setting	Rack Size	Scan Data to PLC	Scan Data to Option		
TOSLINE-F10 Command Input	267	2	1/4	RIO Status	Input Status		
				Scan Out 1	Scan In 1		
		2	1/2	RIO Status	Input Status		
				Scan Out 1	Scan In 1		
				Scan Out 2	Scan In 2		
				Scan Out 3	Scan In 3		
		2	FULL	RIO Status	Input Status		
				Frequency	Frequency		
				Current	Scan In 1		
				Voltage	Scan In 2		
				Scan Out 1	Scan In 3		
				Scan Out 2	Scan In 4		
				Scan Out 3	Scan In 5		
				Scan Out 4	Scan In 6		
		3	1/4	Scan Out 1	Scan In 1		
				Scan Out 2	Scan In 2		
		3	1/2	Scan Out 1	Scan In 1		
				Scan Out 2	Scan In 2		
				Scan Out 3	Scan In 3		
				Scan Out 4	Scan In 4		
		3	FULL	Drive Status	Input Status		
				Frequency	Frequency		
				Current	Scan In 1		
				Voltage	Scan In 2		
				Scan Out 1	Scan In 3		
				Scan Out 2	Scan In 4		
				Scan Out 3	Scan In 5		
Scan Out 4	Scan In 6						

Current is scaled 0 to 100% of full load amps, and voltage is scaled 10 X % of 400V for a 460Vac drive, or 10 X % of 200V for a 230Vac drive.

Rack Size is set by Tosline F10 Monitor Output.

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8.6 Input Status Register (Scan Data)

The following is the Bit definition for the Input Status (PLC to Option Board).

Bit	Function	State "0"	State "1"
0	Run Command	Stop	Run
1	Run Enable	Run Enable	Run Disable
2	Forward / Reverse	Reverse	Forward
3	Accel/Decel #1/#2 Switching	#1	#2
4	Reserved: Set at 0	-	-
5	Reserved: Set at 0	-	-
6	Reserved: Set at 0	-	-
7	JOG Mode Selection	Normal Mode	JOG Mode
8	Feedback Enable	Feedback Valid	Feedback Invalid
9	DC Injection Braking	Off	Available
A	Fundamental Parameter Switching	V/F #1	V/F #2
B	Gate Block Command (Coast Stop)	Normal Operation	Gate Block
C	Emergency Off Command	Normal Operation	Emergency Off
D	Reset Command (Trip Clear)	Normal Operation	Reset
E	Reserved: Set at 0	-	-
F	Reserved: Set at 0	-	-

8.7 Output Status Register

The following is the Bit definition for the Drive Status (Option Board to PLC).

Bit	Function	State "0"	State "1"
0	Run Status	Stopped	Running
1	Run Enabled	Run Enabled	Run Disabled
2	Forward / Reverse	Reverse	Forward
3	Accel/Decel #1/#2 Mode	#1	#2
4	Reserved	-	-
5	Gate Block (Fault)	Active	Not Active
6	Reserved	-	-
7	JOG Mode Selection	Normal Mode	JOG Mode
8	Feedback Enable	Feedback Valid	Feedback Invalid
9	DC Injection Braking	Off	Available
A	Fundamental Parameter Group Active	V/F #1	V/F #2
B	Gate Block Command (Coast Stop)	Normal Operation	Gate Block
C	Emergency Off Command	Normal Operation	Emergency Off
D	Reserved	-	-
E	Main Circuit Bus UnderVoltage (BUV)	Normal	BUV
F	Reserved	-	-

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8.8 Remote I/O Status Word

This register is available in the Allen-Bradley PLC, and indicates the status of Remote I/O communications.

Bit	Function	State "0"	State "1"
0	Reserved	-	-
1	Reserved	-	-
2	Reserved	-	-
3	Reserved	-	-
4	Reserved	-	-
5	Reserved	-	-
6	Reserved	-	-
7	Reserved	-	-
8	Block Transfer Ready (Communications Are Working)	Not Ready	Ready
9	Block Transfer Write In Progress	Not In Progress	In Progress
A	Block Transfer Read Available (Indicates that the Remote I/O Option Board has data available for the PLC)	BTR Not Available	BTR Available
B	Block Transfer Wait (Indicates that the option board is communicating. This bit is cleared when the data transfer is complete.)	Not Communicating	Communicating
C	Block Transfer Error (Indicates that a communication error occurred, or that a BTW contained invalid data.)	Normal Operation	Block Transfer Error
D	Block Transfer Write Available (Indicates that the option board is ready to receive a BTW.)	BTW Not Ready	BTW Ready
E	Reserved	-	-
F	Reserved	-	-

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8.9 Setting Additional Scan In/Out Parameters

This table provides information necessary to set the data provided in the Allen-Bradley I/O registers (Input and Output Image Tables). Refer to section 8.5 to see how to set the PLC for different rack sizes.



Extreme caution must be used when setting the scan-in addresses and masks, as unpredictable ASD operation or ASD damage may occur if they are incorrectly set.

EEPROM Address	Factory Preset Value	Comment
0x05A0	0x0000	Scan-in address #1
0x05A2	0xFFFF	Scan-in mask #1
0x05A4	0x0000	Scan-in address #2
0x05A6	0xFFFF	Scan-in mask #2
0x05A8	0x0000	Scan-in address #3
0x05AA	0xFFFF	Scan-in mask #3
0x05AC	0x0000	Scan-in address #4
0x05AE	0xFFFF	Scan-in mask #4
0x05B0	0x0000	Scan-in address #5
0x05B2	0xFFFF	Scan-in mask #5
0x05B4	0x0000	Scan-in address #6
0x05B6	0xFFFF	Scan-in mask #6
0x05B8	0x0000	Scan-out address #1
0x05BA	0xFFFF	Scan-out mask #1
0x05BC	0x0000	Scan-out address #2
0x05BE	0xFFFF	Scan-out mask #2
0x05C0	0x0000	Scan-out address #3
0x05C2	0xFFFF	Scan-out mask #3
0x05C4	0x0000	Scan-out address #4
0x05C6	0xFFFF	Scan-out mask #4

Scan In refers to data sent from the PLC to the G3 Remote I/O Option Card.
Note that these are byte addresses, which is why they skip every other address.
Only bank 0 (RAM) can be read or written to with this method.

Example: To set Scan Out #1 for overload pre-alarm status monitor (see 9.2.6.1)
This item is address 05D4, bit 4.

05B8: enter D4	05B9: enter 05	05BA: enter 00	05BB: enter 01
----------------	----------------	----------------	----------------

A mask of 0x0100 corresponds to binary 0000000000010000. Bit 4 is left unmasked here.
Setting these values can be done with the BTW command or by G3 Super User Mode EEP Group.
The drive must be reset for the Scan list to be updated.

Scan In Problem

When using the G3's 6400 option ROM, only a mask of FFFF can be specified for Scan In parameters. This will be fixed in a future revision of the G3's option ROM. At the time of this writing, the version number of the G3's option ROM is 6400.

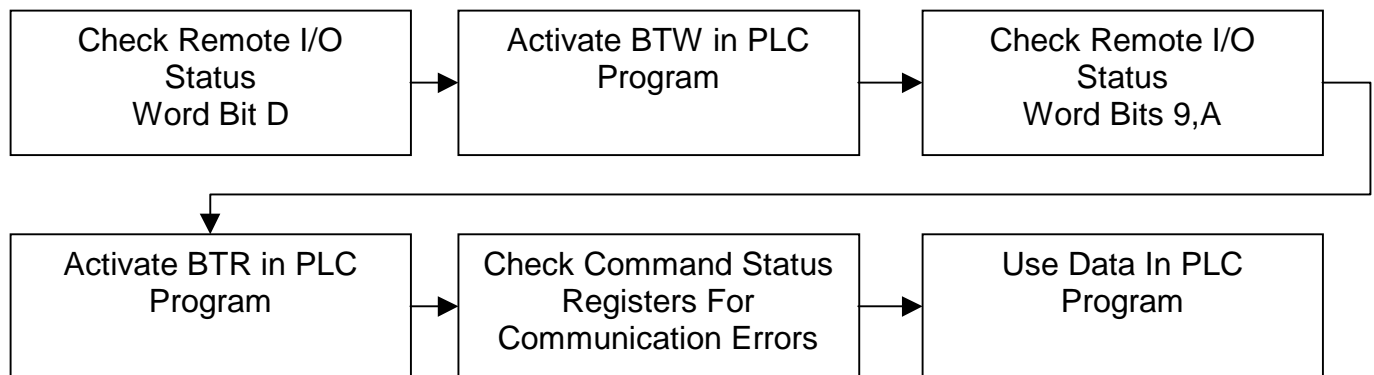
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8.10 Block Transfer Reads and Writes

Data can be read from or written to the G3 Remote I/O card using the Allen-Bradley's Block Transfer commands. Using these commands enables complete access the G3's memory. Use the memory map in the next chapter to determine the addresses of the G3 parameters you need to access.

There are two steps to using the Block Transfer commands with the G3: First do a Block Transfer Write (BTW), then do a Block Transfer Read (BTR). Below is a sketch which shows the steps involved in this process.

All BTs are done to Module 1 of the Starting Group and only Tosline F10 Command Input Settings of 0 or 2 allow BT's.



8.10.1 Status Words

Some of the commands in this chapter have a status register associated with them. Below is a description of these status registers.

8.10.1.1 Command Status Word Description

Bit 15, when on, indicates an error has occurred with communications between the option card and the G3 ASD. The low byte of this register contains a count of the number of errors which occurred.

8.10.1.2 Individual Status Words Description

Bit 15, when on, indicates an error occurred, and bit 14, when on, indicates that a successful write command was issued.

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8.10.2 Single Register Read (Command #1)

The single register read is Command #1. Data is acquired by using two commands: A block transfer write (BTW) followed by a block transfer read (BTR). The BTW has Command, Bank, Address, and Mask.

Command #1 – Single Read reads the Operating Frequency Monitor in this example BTW.

WORD NUMBER	DEFINITION	EXAMPLE VALUE
1	COMMAND	0001
2	BANK	0000
3	ADDRESS	0524
4	MASK	FFFF

Data from Command #1 - Single Read

The Block Transfer Read Available bit in the Remote I/O status word must be set to get this data. The Value from the Operating Frequency Monitor is 1500 in this example. By checking in the Inverter Status Monitor section of the G3 Memory Configuration chapter, it can be seen that this register has the operating frequency X 100. Therefore, the drive is running at 15 Hz here.

WORD	DEFINITION	EXAMPLE VALUE
1	HEADER WORD/LENGTH	0006
2	COMMAND STATUS	----
3	BANK	0000
4	ADDRESS	0524
5	MASK	FFFF
6	VALUE/STATUS	1500

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8.10.3 Single Register Write (Command #2)

The single register write is Command #2. Data is written by using two commands: A block transfer write (BTW) followed by a block transfer read (BTR). The BTW has Command, Bank, Address, Mask, and Value.

Command #2 – Single Register Write writes the drive's Frequency Command to a value of 2000 (20Hz) in this example. This register can be found in section 9.2.2.

WORD NUMBER	DEFINITION	EXAMPLE VALUE
1	COMMAND	0002
2	BANK	0000
3	ADDRESS	0510
4	MASK	FFFF
5	VALUE	2000

Data from Command #2 - Single Write

The Block Transfer Read Available bit in the Remote I/O status word must be set to get this data. This command shows the status of writing a value of 2000 (20Hz) to the Frequency Command.

WORD	DEFINITION	EXAMPLE
1	HEADER WORD/LENGTH	0006
2	COMMAND STATUS	----
3	BANK	0000
4	ADDRESS	0510
5	MASK	003C
6	STATUS	----

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8.10.4 Multiple Scattered Read (Command #5)

Command #5 – Multiple Scattered Read reads the following three parameters in this example:

1. RS232 Baud Rate (Bank 1, Address 04AE, mask 0018).
2. ASD ID Number (Bank 1, Address 04B1, mask 00FF).
3. Tosline-F10/S20 monitor output (Bank 1, Address 04B0, mask 003C).

This data can be found in section 9.2.19.

WORD NUMBER	DEFINITION	EXAMPLE VALUE
1	COMMAND	0005
2	NUMBER OF PARAMETERS	0003
3	BANK PARAMETER 1	0001
4	ADDRESS PARAMETER 1	04AE
5	MASK PARAMETER 1	0018
6	BANK PARAMETER 2	0001
7	ADDRESS PARAMETER 2	04B1
8	MASK PARAMETER 2	00FF
9	BANK PARAMETER 3	0001
10	ADDRESS PARAMETER 3	04B0
11	MASK PARAMETER 3	003C

Data From Command #5 - Multiple Scattered Read

The Block Transfer Read Available bit in the Remote I/O status word must be set to get this data.

This example contains the values from a read of the following three parameters:

1. RS232 Baud Rate (Bank 1, Address 04AE, mask 0018).
2. ASD ID Number (Bank 1, Address 04B1, mask 00FF).
3. Tosline-F10/S20 monitor output (Bank 1, Address 04B0, mask 003C).

This data can be found in section 9.2.19.

WORD NUMBER	DEFINITION	EXAMPLE VALUE
1	HEADER WORD/LENGTH	0015
2	COMMAND STATUS	-
3	NUMBER OF PARAMETERS	0003
4	STATUS & BANK #1	0001
5	ADDRESS #1	04AE
6	MASK #1	0018
7	VALUE #1/STATUS #1	0000
8	STATUS & BANK #2	0001
9	ADDRESS #2	04B1
10	MASK #2	00FF
11	VALUE #1/STATUS	0001
12	STATUS & BANK #3	0001
13	ADDRESS #3	04B0
14	MASK #3	003C
15	VALUE #3/STATUS #3	0018

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8.10.5 Multiple Scattered Write (Command #6)

Command #6 – Multiple Scattered Write writes to three parameters in this example.

1. RS232 Baud Rate (Bank 1, Address 04AE, mask 0018) - Value 0 (57.6K).
 2. ASD ID Number (Bank 1, Address 04B1, mask 00FF) - Value 3 (Rack 3)
 3. Tosline-F10/S20 monitor output (Bank 1, Address 04B0, mask 003C) - Value 6 (Full).
- This data can be found in section 9.2.19.

WORD NUMBER	DEFINITION	EXAMPLE VALUE
1	COMMAND	0006
2	NUMBER OF PARAMETERS	0003
3	BANK PARAMETER 1	0001
4	ADDRESS PARAMETER 1	04AE
5	MASK PARAMETER 1	0018
6	VALUE PARAMETER 1	0000
7	BANK PARAMETER 2	0001
8	ADDRESS PARAMETER 2	04B1
9	MASK PARAMETER 2	00FF
10	VALUE PARAMETER 2	0003
11	BANK PARAMETER 3	0001
12	ADDRESS PARAMETER 3	04B0
13	MASK PARAMETER 3	003C
14	VALUE PARAMETER 3	0018

Data from Command #6 - Multiple Scattered Write

This example shows writing these following three parameters:

1. RS232 Baud Rate (Bank 1, Address 04AE, mask 0018) - Value 0 (57.6K).
 2. ASD ID Number (Bank 1, Address 04B1, mask 00FF) - Value 3 (Rack 3)
 3. Tosline-F10/S20 monitor output (Bank 1, Address 04B0, mask 003C) - Value 6 (Full)
- This data can be found in section 9.2.19.

WORD	DEFINITION	EXAMPLE VALUE
1	HEADER WORD/LENGTH	0015
2	COMMAND STATUS	-
3	NUMBER OF PARAMETERS	0003
4	BANK #1	0001
5	ADDRESS #1	04AE
6	MASK #1	0018
7	STATUS #1	-
8	BANK #2	0001
9	ADDRESS #2	04B1
10	MASK #2	00FF
11	STATUS #2	-
12	BANK #3	0001
13	ADDRESS #3	04B0
14	MASK #3	003C
15	STATUS #3	-

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8.11 Allen-Bradley PLC Ladder Logic Examples

These programs were run on an Allen-Bradley programmable logic controller. They are included here to show detail on what is needed in the ladder logic. Note that the ladder logic is set up to initiate BTWs, wait until that command is completed and processed by the ASD, then initiate the BTR.

8.11.1 Command #1 - Single Read

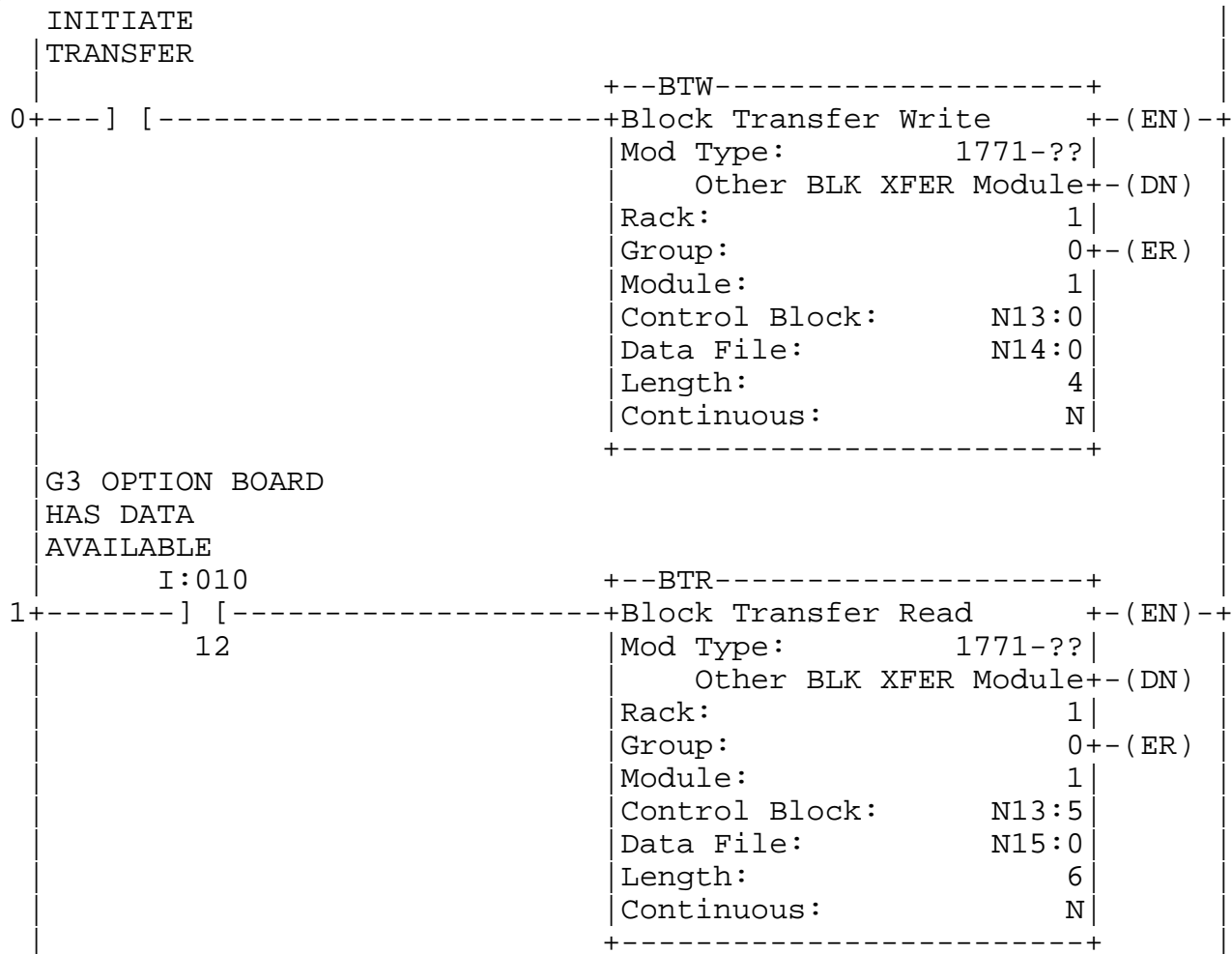
The following example will read the ACCELERATION RATE #1 from the RAM (bank 0) of the G3. See section 9.2.8 for information on this parameter.

G3 Inverter Settings

INVERTER ID NUMBER	1 (Sets the rack number for the G3 to the PLC)
TOSLINE-F10 MONITOR OUTPUT	6 (Sets Remote IO rack size to FULL)
TOSLINE-F10 COMMAND INPUT	0 (Selects the data for the discrete IO)

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The following ladder logic reads data from the G3 Inverter. Rung 0 writes the request to the G3 Inverter. Rung 1 reads the data from the G3 Inverter when data is available.



This data is formatted as Command (1), Bank (0), Address (03C6), and Mask (FFFF).

Addr	0	1	2	3	4	5	6	7	8	9
N14:0	1 Integer	0 Integer	03C6 HEX	FFFF HEX	0	0	0	0	0	0
N14:10	0	0	0	0	0	0	0	0	0	0

Addr	0	1	2	3	4	5	6	7	8	9
N15:0	6 Integer	0 Integer	0 Integer	03C6 HEX	FFFF HEX	10 Integer	0	0	0	0
N14:10	0	0	0	0	0	0	0	0	0	0

The proper Header Word (N15:0), Bank (N15:2), Address (N15:3) and Mask (N15:4) should be verified before the data is accepted.

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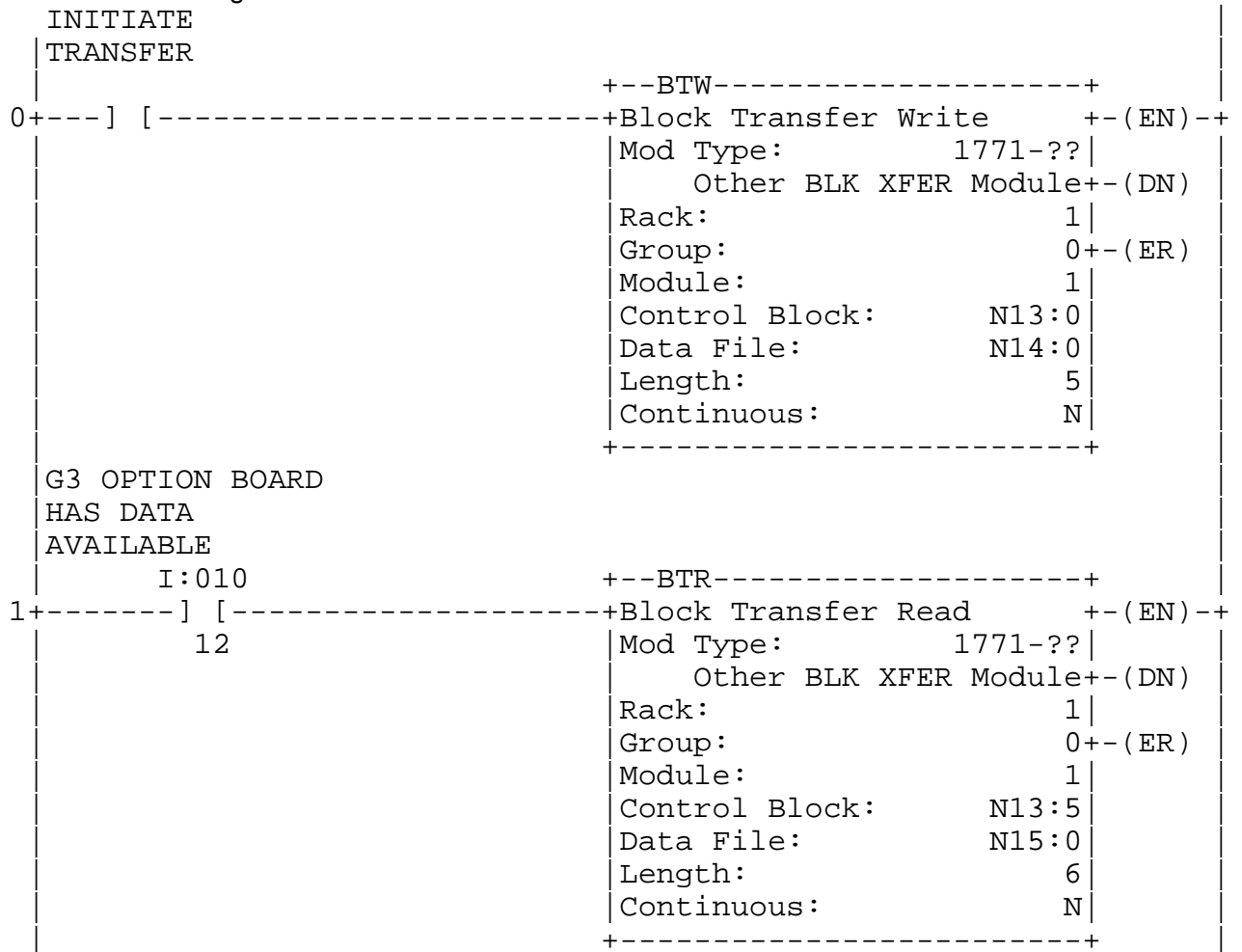
8.11.2 Command #2 - Single Write

The following example will set the ACCELERATION RATE #1 to 10 seconds in the RAM (bank 0) of the G3. See section 9.2.8 for information on this parameter.

G3 Inverter Settings

INVERTER ID NUMBER	1 (Sets the rack number for the G3 to the PLC)
TOSLINE-F10 MONITOR OUTPUT	6 (Sets Remote IO rack size to FULL)
TOSLINE-F10 COMMAND INPUT	0 (Selects the data for the discrete IO)

The following ladder logic would be necessary to write data to the G3 Inverter. Rung 0 writes the data to the G3 Inverter. Rung 1 reads the confirmation from the G3 Inverter when data is available.



Addr	0	1	2	3	4	5	6	7	8	9
N14:0	2	0	03C6	FFFF	100	0	0	0	0	0
	Integer	Integer	HEX	HEX	Integer					
N14:10	0	0	0	0	0	0	0	0	0	0

Addr	0	1	2	3	4	5	6	7	8	9
N15:0	6	0	0	03C6	FFFF	0	0	0	0	0
	Integer	Integer	Integer	HEX	HEX					
N14:10	0	0	0	0	0	0	0	0	0	0

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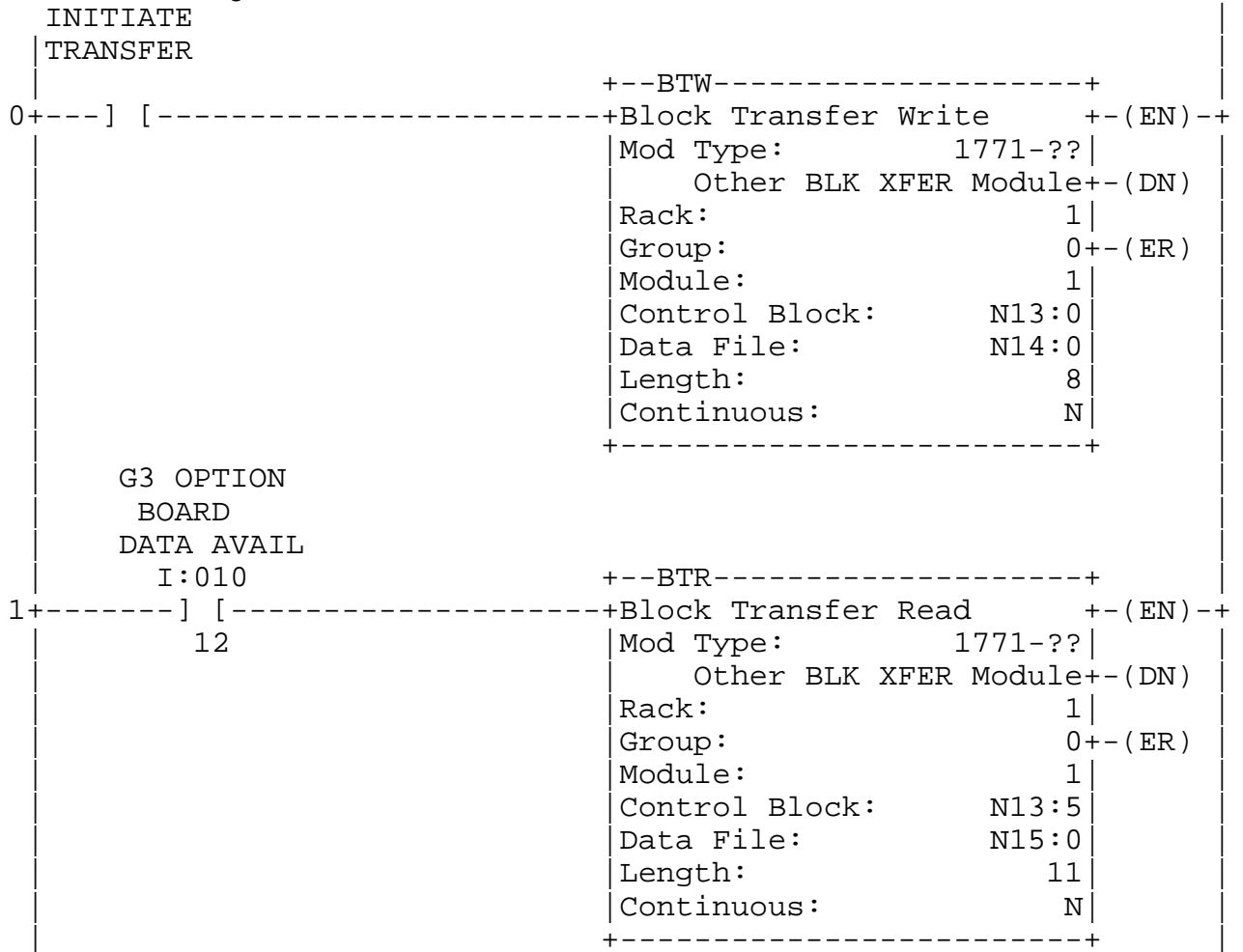
8.11.3 Command #5 - Multiple Scattered Read

The following example will read the OUTPUT CURRENT MONITOR and the OUTPUT VOLTAGE MONITOR from the RAM (bank 0) of the G3.

G3 Inverter Settings.

INVERTER ID NUMBER	1 (Sets the rack number for the G3 to the PLC)
TOSLINE-F10 MONITOR OUTPUT	6 (Sets Remote IO rack size to FULL)
TOSLINE-F10 COMMAND INPUT	0 (Selects the data for the discrete IO)

The following ladder logic would be necessary to write data to the G3 Inverter. Rung 0 writes the data to the G3 Inverter. Rung 1 reads the confirmation from the G3 Inverter when data is available.



Addr	0	1	2	3	4	5	6	7	8	9
N14:0	5 Integer	2 Integer	0 Integer	0576 HEX	FFFF HEX	0 Integer	05B0 HEX	FFFF HEX	0	0
N14:10	0	0	0	0	0	0	0	0	0	0

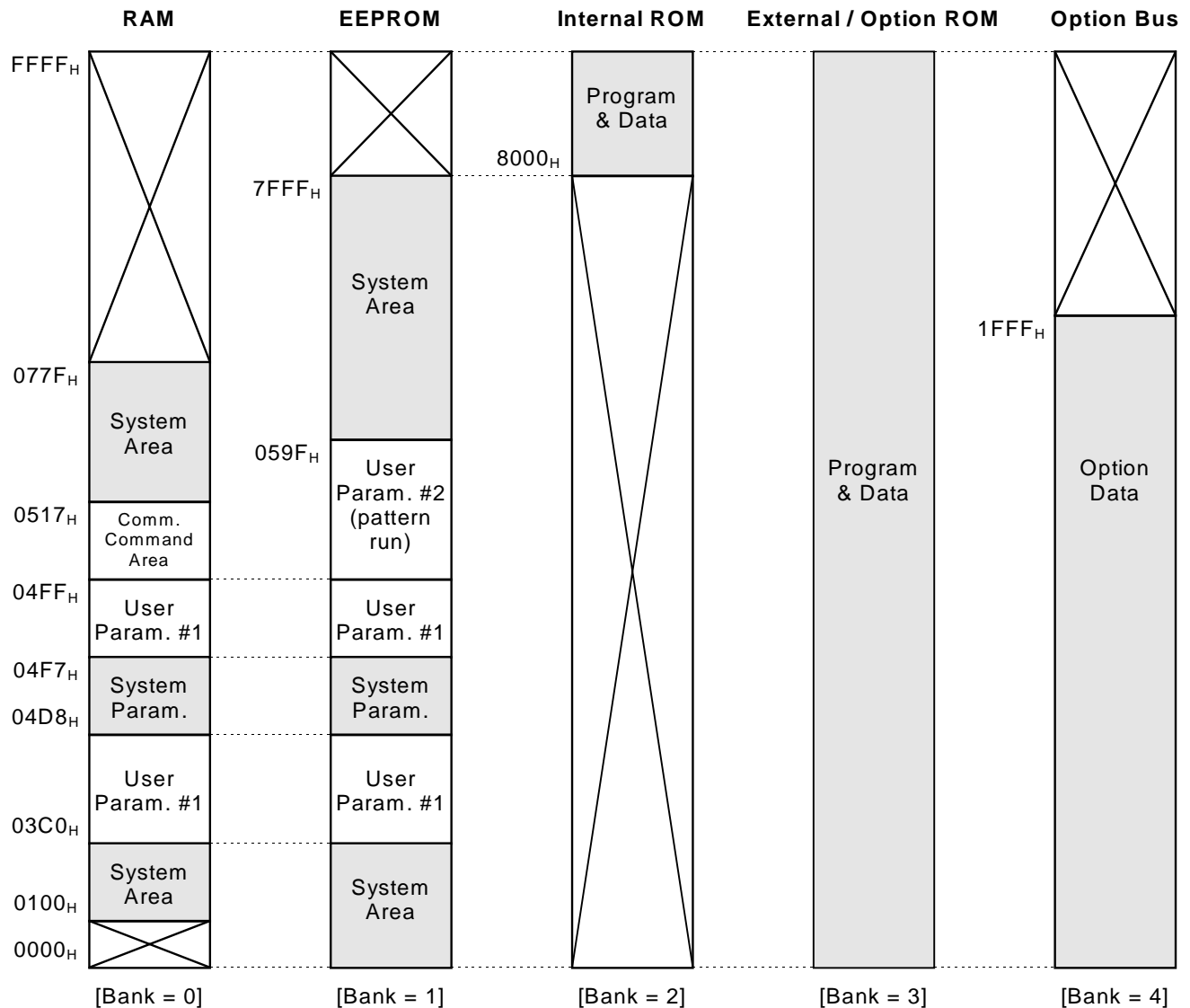
Addr	0	1	2	3	4	5	6	7	8	9
N15:0	11 Integer	0 Integer	2 Integer	0 Integer	0576 HEX	FFFF HEX	10 Integer	0 Integer	05B0 HEX	FFFF HEX
N14:10	500 Integer	0	0	0	0	0	0	0	0	0

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OUTPUT CURRENT MONITOR (N15:6) indicates 10% of the inverter output.
OUTPUT VOLTAGE MONITOR (N15:10) indicates 50% of 400 volts.

9. G3 Memory Configuration

9.1 Memory Map



RAM: Contains parameter settings and other data that the ASD uses for system control (parameters, commands, status, etc.) When the ASD is powered-off, this data is erased. When the ASD 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 with power loss.

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.

<< 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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9.2 Communications Memory Addresses

- **Symbol Definitions**

(#): Depends on ASD rating.

(*): Cannot be set while ASD is running (attempting to write data while the ASD 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 ASD 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 ASD numbered “00” will be changed from 80Hz to 60Hz.

HOST COMPUTER → INV. INV. → HOST COMPUTER

(00B0) (00B0000) Bank

(00A3C0) (00A03C0) Address

(00MFFFF) (00MFFFF) Mask

(00W1770) (00W1770) Data (within adjustment range)

(Since the mask is automatically set to FFFFH whenever the address is set, setting it as shown here is optional).

Bank 0 is RAM memory, Bank 1 is EEPROM memory. Changes to Bank 1 do not affect operation of the G3 until the drive is reset, or power is cycled. On power-up, data from EEPROM is written to RAM.

- **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 → h1770).

- **Shaded Parameters**

Data checks are not performed on parameters that appear in the following data tables with shaded “Mask” and “Adjustment Range” sections. Therefore use extreme caution when setting these parameters, as incorrect mask or data settings may cause unpredictable operation.

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9.2.1 Option Command / Frequency

<< 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 (Note 1)	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 2)
	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 3)	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) 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) 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 3) 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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9.2.2 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	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 1)	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) 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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9.2.3 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 ASD 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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9.2.4 ASD 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	→ ASD 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)
ASD 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
ASD 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.

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

9.2.4.1 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

9.2.4.2 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

9.2.4.3 ASD Status Monitor

ASD Status 1 Lower Byte	05B6H	ASD 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 ASD use	—	—	—
	bit 5	for ASD use	—	—	—
	bit 6	for ASD use	—	—	—
bit 7	jog/normal mode	normal (acc/dec)	jog mode	0080	

ASD Status 1 Upper Byte	05B7H	ASD 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 ASD use	—	—	—
	bit 6	for ASD use	—	—	—
bit 7	for ASD use	—	—	—	

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

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9.2.5 Trips Registered as Past Faults

LCD Display Message	Data (Hex)	Explanation
NO ERROR	××00	No error has been recorded since the last ASD 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
ASD OVERLOAD (PRESS CLEAR)	××0D	ASD overload
MOTOR OVERLOAD (PRESS CLEAR)	××0E	Motor overload
DBR OVERLOAD TRIP (PRESS CLEAR)	××0F	Dynamic braking resistor overload
OVERHEAT TRIP (PRESS CLEAR)	××10	ASD 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
COMMUNICATION ERROR (PRESS CLEAR)	××18	RS232C timer time-out

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LCD Display Message	Data (Hex)	Explanation
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	ASD typeform error

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9.2.6 Trip Data Configuration

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):

■ = starting point

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

9.2.6.1 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

9.2.6.2 Messages (non-trips)

LCD Display Message	Bank	Address	Mask	Data
ASD 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

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9.2.7 ASD Typeform Codes

230v Class	
ASD Model	Typeform Data (Hex)
G3-2010	xx21
G3-2015	xx22
G3-2025	xx23
G3-2035	xx24
G3-2055	xx25
G3-2080	xx26
G3-2110	xx27
G3-2160	xx28
G3-2220	xx29
G3-2270	xx2A
G3-2330	xx2B
G3-2400	xx2C

460v Class	
ASD Model	Typeform Data (Hex)
G3-4015	xx42
G3-4025	xx43
G3-4035	xx44
G3-4055	xx45
G3-4080	xx46
G3-4110	xx47
G3-4160	xx48
G3-4220	xx49
G3-4270	xx4A
G3-4330	xx4B
G3-4400	xx4C
G3-4500	xx4D
G3-4600	xx4E
G3-4750	xx4F
G3-410K	xx50
G3-412K	xx51
G3-415K	xx52
G3-420K	xx53
G3-425K	xx54
G3-430K	xx55

575v Class	
ASD Model	Typeform Data (Hex)
G3-6060	xx65
G3-6120	xx67
G3-6160	xx68
G3-6220	xx69
G3-6270	xx6A
G3-6330	xx6B
G3-6400	xx6C
G3-6500	xx6D
G3-6600	xx6E
G3-6750	xx6F
G3-610K	xx70
G3-612K	xx71
G3-615K	xx72
G3-620K	xx73

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9.2.8 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 ASD 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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9.2.9 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)	0 / 1	03CA	FFFF	0001 ~ EA60	0.01 / 0.1
DECELERATION TIME #2	0 / 1	03CC	FFFF	(0.01 ~ 600.00 / 0.1 ~ 6000.0)	—
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). >>

9.2.10 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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9.2.11 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) Refer to Table 6 (Note)	—	
	"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			
	"F" INPUT TERMINAL FUNCTION	0 / 1	0476	FFFF			
	"RES" INPUT TERMINAL FUNCTION	0 / 1	0478	FFFF			
	"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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9.2.12 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 / ASD 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)).

9.2.13 Output Terminal Selections for Contact Outputs

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 / ASD switching output #1
15	9DB5	/Overcurrent pre-alarm	47	EDD8	/Commercial power / ASD switching output #1
16	85C5	ASD overload pre-alarm	48	F5D8	Commercial power / ASD switching output #2
17	8DC5	/ASD overload pre-alarm	49	FDD8	/Commercial power / ASD 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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9.2.14 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 ASD rating.

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9.2.15 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
Other than 0	PRESET SPEED MODE ACTIVATION	0 / 1	04BB	0004	0000: Deactivated (0) 0004: Activated (1)	—

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Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
	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 $F_{max} \div 2$ (converted to hexadecimal) for adjustment limits ($-F_{max} \div 2 \sim F_{max} \div 2$ corresponds to $-F_{max} \sim F_{max}$).
 - 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**9.2.16 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

TOSHIBA**9.2.17 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)	1
	PATTERN GROUP #1 SPEED #1	1	0501	00FF	0001 ~ 000F: Speeds 1 ~ 15	
	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)	1
	PATTERN GROUP #2 SPEED #1	1	0509	00FF	0001 ~ 000F: Speeds 1 ~ 15	
	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)	1
	PATTERN GROUP #3 SPEED #1	1	0511	00FF	0001 ~ 000F: Speeds 1 ~ 15	
	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)	1	
PATTERN GROUP #4 SPEED #1	1	0519	00FF	0001 ~ 000F: Speeds 1 ~ 15		
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
	SPEED #2 CONTINUE MODE	1	0536	00FF	Same as SPEED #1 CONTINUE MODE	—

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Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
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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9.2.18 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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9.2.19 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)	—	
ASD 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) 0001: Enable (1)	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) 0002: Data retained (1)	1	
	TOSLINE-S20 COMM OPTION RESET	1	02DC	0004	0000: No effect (0) 0004: Reset (1)	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 ASD 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.

9.2.20 AM/FM Terminal Adjustment Parameters

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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9.2.21 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	2	8000			
ROM VERSION	3	0000	—	(Monitor only)	1
EEPROM VERSION	1	0380			
ASD 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)	—
CURRENT UNITS SELECTION	0 / 1	045D	0008	0000: % (0) 0008: A (1)	—

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Function / Title		Bank	Address	Mask	Adjustment Range	Multiplier
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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9.2.22 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	00FF	0012 ~ 0078 (90 ~ 600)	5
	042C		001A ~ 00AC (130 ~ 860)			
	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)	—

10. Other G3 Communication Options Available

Toshiba is committed to providing the best connectivity possible for the G3 ASD. Below are some of the networks we support. Please give us a call if you need a support for a network not shown below. Also let us know if you would like technical literature on any of our communication option cards. We value your feedback concerning what networks are important for us to support.

10.1 Modbus Plus

Modbus Plus is a trademark of Group Schneider. Toshiba is a ModConnect Partner, and this option card is certified as being Modbus Plus compatible.

Modbus Plus is a communication network supported by Modicon, Square D, and Allen-Bradley PLCs.

10.2 Modbus RTU RS485

Modbus is a trademark of Group Schneider.

Modbus is a low speed communication network generally used to connect a computer to multiple remote devices. Almost all Supervisory Control and Data Acquisition software packages support Modbus. Consult the factory for availability of this card.

10.3 DeviceNet

DeviceNet is a trademark of ODVA (Open DeviceNet Vendor Association), of which Toshiba is a member, and the G3's DeviceNet card is certified by ODVA as being DeviceNet compatible.

DeviceNet is used to connect PLCs, computers, ASDs, and a wide variety of input / output devices. Toshiba PLCs support DeviceNet in addition to the drives.

10.4 Tosline F10

Tosline F10 is a proprietary network of Toshiba. Toshiba PLCs and drives support this network. It is a high-speed, RS485 network.

10.5 Fiber Optic Tosline S20

Tosline S20 is a proprietary network of Toshiba. Fiber Optic Tosline S20 connects the G3 ASD to Toshiba's PLCs. This is Toshiba's highest speed and performance network, intended for the most demanding applications.

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10.6 RS232

The G3 has a built-in RS232 port. This port is generally used to set up the drive using Toshiba's Windows-based software.

10.7 RS485

The RS485 option card allows multiple G3 drives to be multi-dropped back to a main computer. Also, this card allows a master-follower network to be set up in which a multiple G3s run at a speed proportional to the master G3. No computer is needed when the master-follower network is used.

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11. Support

11.1 Contact Information

Toshiba and your local ASD distributor provide technical support on this product. To obtain this support, please contact your local ASD distributor, or contact Toshiba in Houston, Texas.

Toshiba International Corporation
Industrial Division
13131 West Little York Road
Houston, TX 77041

Telephone 713-466-0277
Toll Free U.S. 800-231-1412
Toll Free Mexico 95-800-527-1204
Toll Free Canada 800-872-2192
Fax 713-466-0277

When contacting us, please ask for the ASD Marketing Department. Please have your G3 Operations Manual and this manual available, so that we can refer to it over the telephone.

11.2 Documentation

To operate this product, you will need the following manuals:
G3 Remote I/O Option Card Manual (this manual)
G3 Operation Manual (Part #45086-000)

Each of these manuals is available at no charge. Please contact us to obtain them.

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