TOSHIBA

ASD Optional DeviceNet Module

Installation and Operation Manual

ASD Optional DeviceNet Module DEV002Z

Installation and Operation Manual

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Introduction

Congratulations on your purchase of the **DeviceNet module** option. Installing the **DeviceNet module** on your ASD enables data communication with a host computer or other device via DeviceNet. Please read the entire manual carefully before attempting to install and control your ASD via the **DeviceNet module**.

This manual is required to develop software for communicating with your Toshiba ASD. For additional information contact your Toshiba sales representative.

To maximize the functionality of your ASD when using the **DeviceNet module** option, a working familiarity with this manual will be required. This manual has been prepared for the ASD installer, user, and maintenance personnel. This manual may also be used as a reference guide or for training. With this in mind, use this manual to develop a system familiarity before attempting to install or operate the ASD using the **DeviceNet module**.

Important Notice

The instructions contained in this manual are not intended to cover all details or variations in equipment types. Nor may it provide for every possible contingency concerning the installation, operation, or maintenance of this equipment. Should additional information be required contact your Toshiba representative.

The contents of this manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Toshiba International Corporation. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation and any statements contained herein do not create new warranties or modify the existing warranty.

Any electrical or mechanical modifications to this equipment without prior written consent of Toshiba International Corporation will void all warranties and may void other safety certifications. Unauthorized modifications may also result in a safety hazard or equipment damage.

Misuse of this equipment could result in injury and equipment damage. In no event will Toshiba Corporation be responsible or liable for direct, indirect, special, or consequential damage or injury that may result from the misuse of this equipment.

Contacting Toshiba's Customer Support Center

Toshiba's Customer Support Center can be contacted to obtain help in resolving any **Adjustable Speed Drive** system problem that you may experience or to provide application information.

The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is US (800) 231-1412/Fax (713) 466-8773 — Canada (800) 527-1204.

You may also contact Toshiba by writing to:

Toshiba International Corporation

13131 West Little York Road

Houston, Texas 77041-9990

Attn.: ASD Product Manager.

For further information on Toshiba's products and services, please visit our website at **www.toshiba.com/ind/**.

TOSHIBA INTERNATIONAL CORPORATION

DEV002Z DeviceNet Module

Please complete the Warranty Card supplied with the **DeviceNet Module** option card and return it to Toshiba by prepaid mail. This will activate the 12 month warranty from the date of installation; but, shall not exceed 18 months from the shipping date.

Complete the following information and retain for your records.

Model Number: _____

Serial Number:_____

Project Number (if applicable):_____

Date of Installation:_____

Inspected By:_____

Name of Application:_____

About This Manual

This manual was written by the Toshiba Technical Publications Group. This group is tasked with providing technical documentation for the DeviceNet module option card. Every effort has been made to provide accurate and concise information to you, our customer.

At Toshiba we're continuously searching for better ways to meet the constantly changing needs of our customers. E-mail your comments, questions, or concerns about this publication to **Technical-Publications-Dept@tic.toshiba.com**.

Manual's Purpose and Scope

This manual provides information on how to safely install, operate, maintain, and dispose of your DeviceNet module option card. The information provided in this manual is applicable to the DeviceNet module option card only.

This manual provides information on the various features and functions of this device, including

- Installation
- Operation
- Configuration
- Mechanical and electrical specifications

Included is a section on general safety instructions that describe the warning labels and symbols that are used throughout the manual. Read the manual completely before installing, operating, performing maintenance, or disposing of this equipment.

This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English equivalent.

Because of our commitment to continuous improvement, Toshiba International Corporation reserves the right, without prior notice, to update information, make product changes, or to discontinue any product or service identified in this publication.

Toshiba International Corporation (TIC) shall not be liable for direct, indirect, special, or consequential damages resulting from the use of the information contained within this manual.

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General Safety Information

DO NOT attempt to install, operate, maintain or dispose of this equipment until you read and understand all of the product safety information and directions that are contained in this manual.

Safety Alert Symbol

The **Safety Alert Symbol** indicates that a potential personal injury hazard exists. The symbol is comprised of a triangle enclosing an exclamation mark.

Signal Words

Listed below are the signal words that are used throughout this manual followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING** and **CAUTION** are used in this manual they will be followed by important safety information that must be carefully adhered to.

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided, will result in death or serious injury to personnel.

The word **WARNING** preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided, could result in death or serious injury to personnel.

The word **CAUTION** preceded by the safety alert symbol indicates that a potentially hazardous situation exists which, if not avoided, may result in minor or moderate injury.

The word **CAUTION** without the safety alert symbol indicates a potentially hazardous situation exists which, if not avoided, may result in equipment and property damage.

Special Symbols

To identify special hazards, other symbols may appear in conjunction with the **DANGER**, **WARNING** and **CAUTION** signal words. These symbols indicate areas that require special and/or strict adherence to the procedures to prevent serious injury to personnel or death.

Electrical Hazard Symbol

A symbol which indicates a hazard of injury from electrical shock or burn. It is comprised of a triangle enclosing a lightning bolt.

Explosion Hazard Symbol

A symbol which indicates a hazard of injury from exploding parts. It is comprised of a triangle enclosing an explosion image.

Equipment Warning Labels

DO NOT attempt to install, operate, perform maintenance on, or dispose of this equipment until you have read and understand all of the product labels and user directions that are contained in this manual.

Qualified Personnel

Installation, operation, and maintenance shall be performed by **Qualified Personnel <u>Only</u>**. A **Qualified Person** is one that has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved. (Refer to the latest edition of NFPA 70E for additional safety requirements.)

Qualified Personnel shall:

- Have carefully read the entire operation manual.
- Be able to recognize and properly address hazards associated with the application of motor-driven equipment.
- Be trained and authorized to safely energize, de-energize, ground, lockout/tagout circuits and equipment, and clear faults in accordance with established safety practices.
- Be trained in the proper care and use of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- Be trained in rendering first aid.

For further information on workplace safety visit www.osha.gov.

Equipment Inspection

- Upon receipt of the equipment inspect the packaging and equipment for shipping damage.
- Carefully unpack the equipment and check for parts that may have been damaged during shipping, missing parts, or concealed damage. If any discrepancies are discovered, it should be noted with the carrier prior to accepting the shipment, if possible. File a claim with the carrier if necessary and immediately notify your Toshiba sales representative.
- **DO NOT** install or energize equipment that has been damaged. Damaged equipment may fail during operation resulting in equipment damage and/or personal injury.
- Modification of this equipment is dangerous and must not be performed except by factory trained representatives. When modifications are required contact your Toshiba sales representative.
- Contact your Toshiba sales representative to report discrepancies or for assistance if required.

Handling and Storage

- Store in a well-ventilated covered location and preferably in the original carton if the equipment will not be used upon receipt.
- Store in a cool, clean, and dry location within the temperature range of -13 to 150 °F (-25 to 65 °C).
- Do not store the unit in places that are exposed to outside weather conditions, rapid temperature changes, high humidity, moisture, dust, corrosive gases, or metal particles.

Disposal

Do not dispose of electrical components via incineration. Contact your state environmental agency for details on disposal of electrical components and packaging in your area.

Installation and Operation Safety

The DeviceNet module is to be used with the AS1 and 9-Series ASDs only. Use on any other equipment may result in electric shock or fire.

- Turn off all input power to the ASD.
- Wait at least 15 minutes to allow the internal capacitors to fully discharge and ensure that the red Charge LED on the ASD is off.
- Tighten the terminal screws to the torque listed on page 6. Failure to do this could cause a fire.
- Apply power only after the front panel has been installed. Do not remove the front panel with power applied.
- Do not change the dip switch setting when the power is on. It could cause an electric shock, or damage the option card.

Personnel Protection

- Installation, operation, and maintenance shall be performed by **Qualified Personnel <u>Only</u>**.
- Failure to observe the following precautions may result in equipment damage, electric shock, or fire.
  - Use this device only with the ASD for which it is designed.
  - Turn off power to the ASD before installing or removing the device.
  - Do not exceed the operating specifications of the unit.
  - Keep the device free of fluids and abrasives.
  - If the device begins to emit smoke, produce a peculiar smell, or make odd noises, turn off the ASD immediately.
  - Obey all warning labels and precautions.

System Setup Requirements

- Turn off the ASD when installing and wiring this option.
- The programming setup and system configuration of the ASD may allow it to start the motor unexpectedly. Familiarity with the Auto-restart settings of the ASD is a requirement to use this product.
- Follow all warnings and precautions and do not exceed equipment ratings.

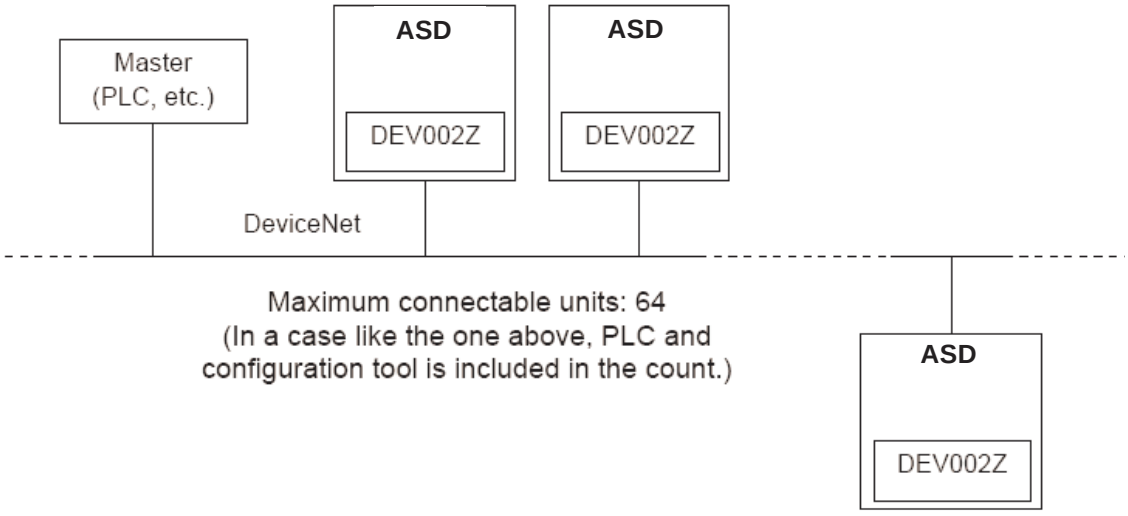
Operational and Maintenance Precautions

- Do not install the DeviceNet module if it is damaged or if it is missing any component(s).
- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before inspecting or servicing the ASD, or opening the door of the enclosure.
- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before proceeding to disconnect or connect the power wiring to the equipment.
- Allow time for the ASD capacitors to drain their charge. The capacitors of the ASD maintain a residual charge for a period of time after turning the ASD off. The required discharge time for each ASD type is indicated with a cabinet label, and the red Charge LED indicates residual charge.

  Once the ASD power has been turned off wait for at least the minimum time indicated on the enclosure-mounted label and ensure that the red Charge LED is off before opening the door of the ASD.
- Turn on the power only after attaching (or closing) the front panel. **Do Not** remove the front panel of the ASD when the power is on.
- **Do Not** attempt to disassemble, modify, or repair the DeviceNet module. Call your Toshiba sales representative for repair information.

Overview

The DeviceNet module allows the ASD to be connected to a DeviceNet network. A DeviceNet network supports a maximum of 64 nodes, including the Master unit and the configuration tool (PC running configuration software). A maximum of 62 follower devices can be connected to the network.

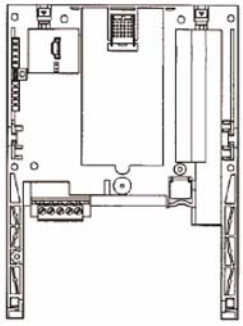


Check Accessories

The DeviceNet module card is shipped with the following items in the package. Contact your sales representative if any of these is missing.

ASD DeviceNet module (DEV002Z) – 1 card

DeviceNet open connector (connected) – 1 connector

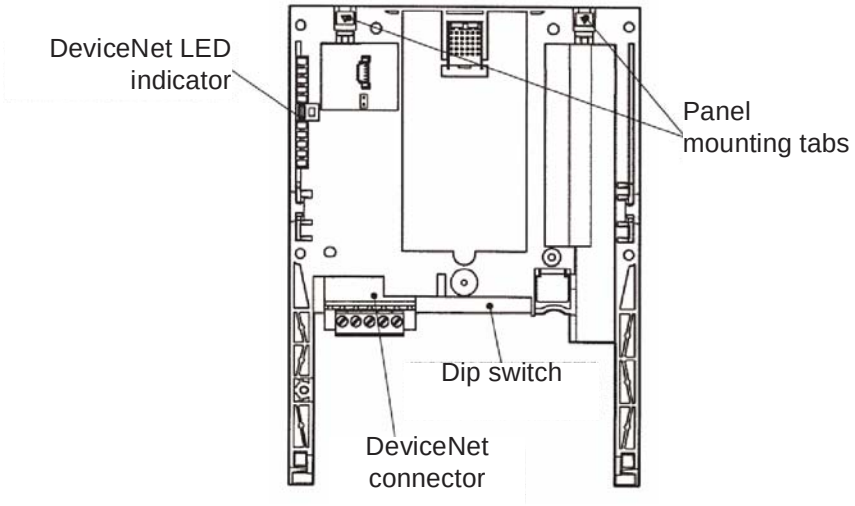


Installation and Operation Manual for DEV002Z DeviceNet option – 1 copy
Document No. 58683-000

LED Name Label – 1 label

Features

The external view of the **DeviceNet module** is shown below.



- DeviceNet connector.
- Dip switch for setting MAC address and baud rate (see Setting a MAC ID Number and a Network Baud Rate on pg. 9).
- DeviceNet LED indicator (see DeviceNet LED Indicator on pg. 10).

DeviceNet Connector

The DeviceNet connector is used to connect DeviceNet network cables to the DeviceNet module card. The wiring for each terminal on the connector is given below.

Table 1. Pinouts for DeviceNet Connector.

Color	Symbol	Signal Name
Red	V+	Network Power Supply (V+)
White	CAN_H	Communication Signal (High)
Silver	SHIELD	Shield
Blue	CAN_L	Communication Signal (Low)
Black	V-	Network Power Supply (V-)

1. Use shielded wire for the control signal wires.
2. Use wire size 22 – 16 AWG (0.3 – 1.5 mm^2).
3. Strip 0.28 in. (7 mm) of insulation off the end of the connecting wire.
4. Use a small slotted (standard) screwdriver to tighten the connector lug screws.
5. Tighten the connector lug screws. Torque the lug screws to 4.4 – 5.3 in.-lb. (0.5 – 0.6 N•m).

Installing the DeviceNet Module

Install the DeviceNet module in ASD as follows:

1. Turn off input power to the ASD and wait 15 minutes. Ensure that the red Charge LED is off.
2. Install the DeviceNet module in the ASD as shown in Figure 1, below. This illustration shows the AS1.

Note: *When this option is used in conjunction with the I/O Expansion Card option, install this option between the front panel and the I/O Card.*

a) Insert a flat-blade screwdriver into one of the two holes at the top of the front panel. Push the screwdriver down while pulling the corresponding top corner of the front panel forward to disengage the retention tab. Repeat for the other side. Remove the front panel.

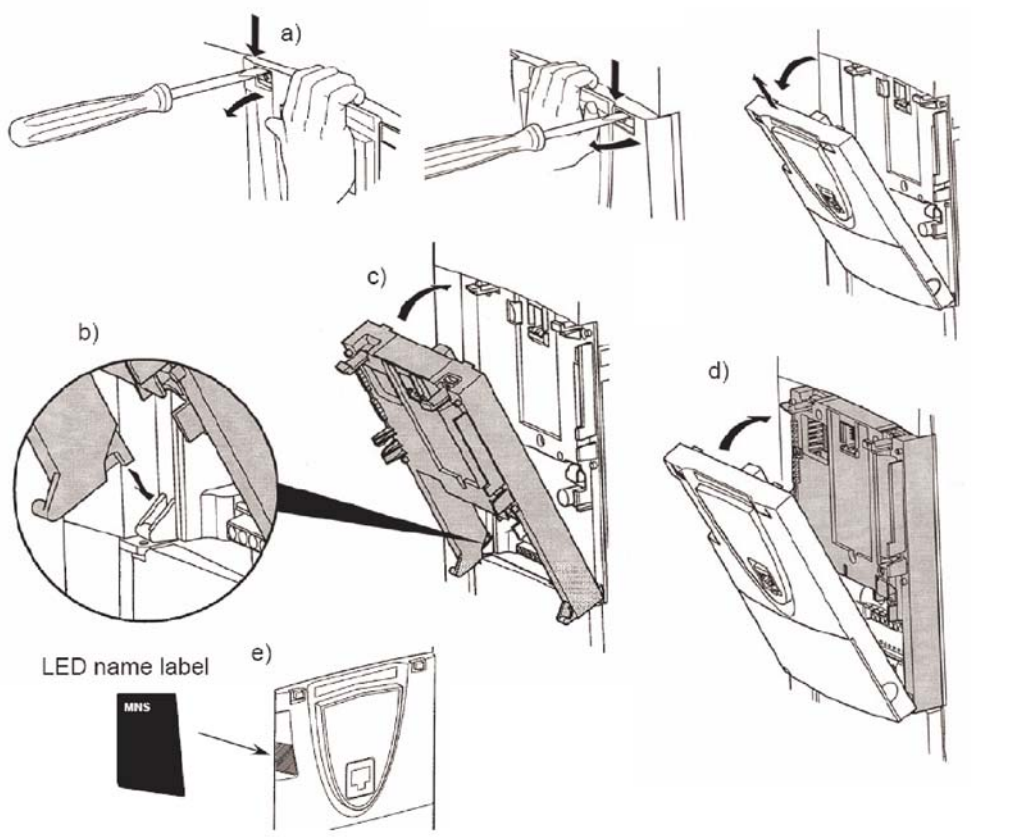
b) Install the option card by fitting the curved tabs on the bottom of the option into the slots at the bottom of the ASD. (Or I/O Expansion Card, if installed.)

c) Ensure that the option card closes over the ASD (I/O Expansion Card) alignment tabs. Press the option card closed and ensure that the retaining tabs at top of the ASD (I/O Expansion Card) are securely connected.

d) Insert the mounting tabs at the bottom of the front panel into the slots at the bottom of the ASD/option card. Press the front panel closed and ensure that the retaining tabs at top of the ASD/option card engage.

e) Affix the enclosed "LED name label" to the option LED display part of the front panel.

Figure 1. Installing the DeviceNet module card.



Network Connection

Installation

Do not short-circuit adjacent terminals of DeviceNet module while connecting the wiring.

1. Attach the DeviceNet cable to the DeviceNet connector, and plug in the connector to the DeviceNet module. Refer to DeviceNet Connector on pg. 6.

   Recommended cable – Thin branch cables: DeviceNet-specific thin cable.

2. Set the terminating resistance if needed.

   Terminating resistance specification: ¼ W – 121Ω, 1% Metal Film resistor.

3. Using the dip switch on the DeviceNet module, set a MAC ID number and a baud rate. Refer to Setting a MAC ID Number and a Network Baud Rate on pg. 9.

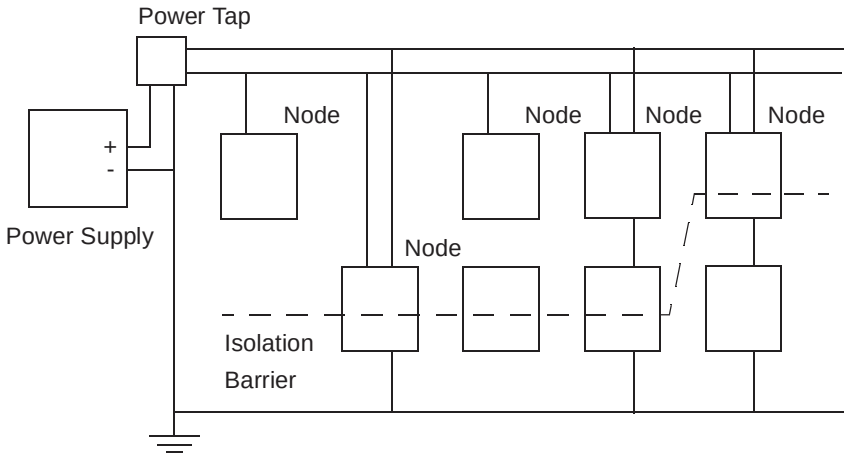
4. Once all of the parameters are set, cycle the power to the ASD for these changes to take effect.

Network Ground

Observe the following precautions when installing a DeviceNet network ground.

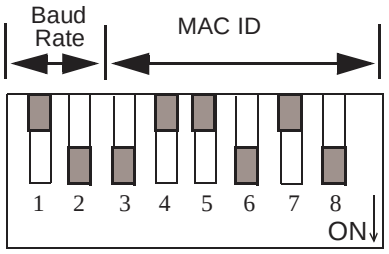
- Do not connect the G/E terminal to a power ground or any other potential noise-producing ground connection such as the E terminal of the ASD. Connect to a close, clean ground to provide RF termination of the DeviceNet cable.
- Do not make connections to unstable grounds (paint-coated screw heads, grounds that are subjected to inductive noise, etc.).

The DeviceNet network should be earth grounded at one location only to prevent ground loops. No significant current flow between V- and earth ground may occur via any device other than a power supply under normal operating conditions. This specification is from the ODVA DeviceNet specification.



Setting a MAC ID Number and a Network Baud Rate

Configure the MAC ID and network baud rate by setting the dip switch on the DeviceNet option card.



Example:
Baud Rate = 250 kbps (BIN = 01)
MAC ID = 37 (BIN = 100101)

Default values:
Baud Rate = 125 kbps
MAC ID = 1

Following are the MAC ID Switch settings for MAC addresses 0 – 63. Each MAC ID on a DeviceNet network must be unique. Duplicate ID's on the same network will result in possible buss contention.

Node Address	Switches 34 5678	Node Address	Switches 34 5678	Node Address	Switches 34 5678	Node Address	Switches 34 5678
0	00 0000	16	01 0000	32	10 0000	48	11 0000
1	00 0001	17	01 0001	33	10 0001	49	11 0001
2	00 0010	18	01 0010	34	10 0010	50	11 0010
3	00 0011	19	01 0011	35	10 0011	51	11 0011
4	00 0100	20	01 0100	36	10 0100	52	11 0100
5	00 0101	21	01 0101	37	10 0101	53	11 0101
6	00 0110	22	01 0110	38	10 0110	54	11 0110
7	00 0111	23	01 0111	39	10 0111	55	11 0111
8	00 1000	24	01 1000	40	10 1000	56	11 1000
9	00 1001	25	01 1001	41	10 1001	57	11 1001
10	00 1010	26	01 1010	42	10 1010	58	11 1010
11	00 1011	27	01 1011	43	10 1011	59	11 1011
12	00 1100	28	01 1100	44	10 1100	60	11 1100
13	00 1101	29	01 1101	45	10 1101	61	11 1101
14	00 1110	30	01 1110	46	10 1110	62	11 1110
15	00 1111	31	01 1111	47	10 1111	63	11 1111

Note: *0 = Off, 1 = On*

Table 2. Baud Rate Configuration Switch Settings.

Baud rate	SW 1	SW 2	Maximum length of main line
125 kbps	0	0	1640 ft.(500 m)
250 kbps	0	1	820 ft.(250 m)
500 kbps	1	0	328 ft.(100 m)

DeviceNet LED Indicator

The DeviceNet option card has a bicolor (red and green) LED on the upper left edge, used to indicate the Module/Network Status (MNS).

LED	Status	Item Displayed
Off	Not Powered OR Not On-line	DeviceNet module is not on–line because: • It may not be powered. • It has not completed the Dup_MAC_ID test yet.
Steady Green	Device Operational AND On-line/Connected	The DeviceNet module is connected and operating normally.
Flashes Green	Device Operational AND On-line/Not Connected OR Device On-line AND Device needs commissioning	The DeviceNet module is operating in a normal condition and is on–line but not connected because either: • The DeviceNet module has passed the Dup_MAC_ID test and is on-line but has not established connections to other nodes. • The device configuration is missing, incomplete, or incorrect.
Flashes Red	Minor Fault OR Connection Time-Out	• Recoverable fault has been detected. • One or more I/O Connections are in the Timed-Out state.
Steady Red	Critical Fault OR Critical Link Failure	• The DeviceNet module has an unrecoverable fault and may need replacing because of a failed communication device. • The DeviceNet module has detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID, or Bus–Off).
Flashes Red and Green alternately	Communication Fault AND Received an “Identify Comm Fault Request – Long Protocol” message	A specific Communication Fault indicator meaning the DeviceNet module has detected a Network Access error and is in the Communication Faulted state, and has subsequently received and accepted an “Identify Communication Faulted Request –- Long Protocol” message.

Message Size

Connection Instance	Transmitted	Received
I/O Messaging	4, 8, or 12 bytes	4, 8, or 12 bytes
Explicit Messaging	55 bytes	55 bytes

Polled I/O Messaging Connection

Table 3. Transmission response by ASD to different Received Data sizes.

Received Data Size (RDS) Compared to received_connection_size Attribute	Received Data	Connection Transmissions
RDS Smaller than Received_connection_size	Ignored by ASD	ASD Will Transmit Normally
RDS Same as Received_connection_size	Processed by ASD	ASD Will Transmit Normally
RDS Larger than Received_connection_size	Ignored by ASD	ASD Will Not Transmit

Explicit Messaging Connection

This is the maximum message length.

Communications Parameters

The ASD (including the DEV002Z) acts as a follower device on the network. Use the parameters listed below to set the communication options.

These settings can also be made by the use of configuration tools and the Electronic Data Sheet (EDS) file. The EDS file can be downloaded from the Toshiba web site:

http://www.toshiba.com/ind/downloads_main.jsp.

Parameter	Function	Adjustment Range	Default Setting
F830[1]	Communication Option (DeviceNet/ Profibus) Setting	0: Instance 20/70 1: Instance 21/71 2: Instance 100/150 3: Instance 101/151 4: Instance 102/152 5: – 6: – 7. –	0
F851	ASD Operation at Disconnect (Action to be carried out in the event of communications loss)	0: Stop and Terminate Communications 1: Do Nothing (continue programmed operation) 2: Deceleration Stop 3: Coast Stop 4: Emergency Off 5: Preset Speed (Operates at the Preset Speed operation frequency set with F852)	0
F852	Preset Speed Operation Selection	0: Disabled, 1 to 15: Preset Speed number	0
F853	Communications Option Station Address Monitor	Displays the MAC ID number assigned using the dip switch to set a decimal equivalent range of 0 to 63	0
F854	Communications Option Speed Switch Monitor DeviceNet/ CC-Link	Displays the network communication speed set with the dip switch 0: 125 kbps 1: 250 kbps 2: 500 kbps	0
F899	Network Option Reset Settings	0: Reset ASD only 1: Reset the DEV002Z and the ASD (see Notes below)	0

1 – See Assembly Object – F830 Instance Details on pg. 21 for an explanation of F830.

Note: *When Communications parameters are changed either the power to the ASD must be cycled, or F899 set to 1 and a Reset command received via the communications link, for the changes to take effect.*

Note: *When either F003 or F004 is set to Communication Input, the ASD operates without Net Ref (Frequency Link) or Net Ctrl.*

F830: Communications Option (DeviceNet/Profibus) Setting 1 — The Input/Output Instance of DeviceNet card is set up at this parameter.

The DeviceNet card supports both the standard DeviceNet AC Drive profile Instances 20/70, 21/71 and user-defined Instances 100/150, 101/151, and 102/152.

Example: F830 = 2 (Instance 100/150)

Table 4. Output Instance 100 Format.

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	DC Braking	Acc/Dec #1/#2	PI Control	Motor #1/#2	Preset Speed 4	Preset Speed 3	Preset Speed 2	Preset Speed 1
1	Command Link	Frequency Link	Reset Trip	Emergency Off	Coast to Stop (ST)	Run/Stop	Forward/ Reverse	Jog
2	Drive Reference Speed Hz (Low byte)[1]							
3	Drive Reference Speed Hz (High byte)[1]							

1 – Drive Reference Speed command value.

Frequency is specified in Hex notation with a resolution of of 0.01 Hz per unit.

Example: Set the frequency to 60 Hz. With the incremental frequency of 0.01 Hz per unit, the corresponding entry is calculated as:

60 Hz ÷ 0.01 Hz/unit = 6000 units, or 0x1770 (Hex).

Table 5. Output Instance 150 Format.

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	DC Braking	Acc/Dec #1/#2	PI Control	Motor #1/#2	(Reserved)	Alarm (FC91)	Fault	Fault FL
1	(Reserved)	Ready without ST/Run	Ready with ST/Run	Emergency Off	Coast to Stop (ST)	Run/Stop	Forward/ Reverse	Jog
2	Drive Speed Hz (Low byte)							
3	Drive Speed Hz (High byte)							

Table 6. Data Composition of Output Instance 100.

Byte	Bit	Specifications	0	1	Supplement
0	0	Preset Speed #1 [1]	Preset Speed: 0000 = Off Preset Speed 0001 to 1111 = #1– #15		The combination of 4 bits is used to select a Preset Speed from: speed operation Off, and Preset Speeds #1 to #15.
0	1	Preset Speed #2 [1]			
0	2	Preset Speed #3 [1]			
0	3	Preset Speed #4 [1]			
0	4	Motor #1/#2 (THR2 Selection)	Motor #1 (THR1)	Motor #2 (THR2)	Used to select a motor electronic-thermal protection level 0: Protection Level #1 (F600) 1: Protection Level #2 (F173)
0	5	PI Control	Normal Operation	PI Control Off	-
0	6	Acceleration/ Deceleration #1/#2 Selection	Acceleration/ Deceleration #1 (AD1)	Acceleration/ Deceleration #2 (AD2)	Used to select Acceleration/ Deceleration time 0: F009, F010 1: F500, F501

Byte	Bit	Specifications	0	1	Supplement
0	7	DC Braking	Off	Forced DC Braking	If “1” is specified, some units may display “db”
1	0	Jog Run [2]	Off	Jog Run	If “1” is specified operation is performed at the frequency specified with F260 (Jog Run Frequency)
1	1	Forward Run/ Reverse Run	Forward Run	Reverse Run	-
1	2	Run/Stop	Stop	Run	-
1	3	Coast to Stop	Ready for Operation	Coast to Stop	-
1	4	Emergency Off	Off	Emergency Off	If “1” is specified error tripping can occur
1	5	Reset	Off	Reset	Enabled only in the event of tripping
1	6	Frequency Link	Off	Priority	Enabled: Overrides the setting of F004
1	7	Command Link	Off	Priority	Enabled: Overrides the setting of F003

1 – Preset Speed operation can be performed at up to 15 different frequencies (Preset Speed operation frequencies #1 to #15) specified by combining Preset Speed bit 1 thru Preset Speed bit 4. To perform Preset Speed operation, the Command Link bit and the Run/Stop bit must be set to 1.

Example: To run the motor in the reverse direction at Preset Speed operation frequency #7
10000110 00000111 = 0x8607 (Hex).

If one of the bits for Preset Speed #1 through Preset Speed #4 is set to 1, priority is given to Preset Speed operation even though the Frequency Link bit is set to 1.

2 – Jog operation overrides Preset Speed operation when the Jog frequency is higher. Received Jog commands are ignored when the Jog frequency is lower than the Preset Speed Frequency.

Table 7. Data Composition of Output Instance 150.

Byte	Bit	Specifications	0	1	Supplement
0	0	Fault FL	No Output	Output	-
0	1	Fault	No Trip	Tripped	Both the F301 status and the trip retention status are both regarded as a tripped status
0	2	Alarm	No Alarm	Alarm Issued	-
0	3	(Reserved)	-	-	-
0	4	Motor #1/#2 (THR1/2 selection)	Motor #1 (THR1)	Motor #2 (THR2)	Indicates the motor electronic-thermal protection level selected 0: Protection level #1 (F600) 1: Protection level #2 (F173)
0	5	PI Control	PI Control Permission	PI Control Prohibition	-
0	6	Acceleration/Deceleration #1/#2 Selection	Acceleration/ Deceleration #1 (AD1)	Acceleration/ Deceleration #2 (AD2)	Indicates the acceleration/ deceleration time selected 0: F009 (Accel), F010 (Decel) 1: F500, F501
0	7	DC Braking	Off	Forced DC Braking	-
1	0	Jog run	Off	Jog Run	-
1	1	Forward Run/Reverse Run	Forward Run	Reverse Run	-

Byte	Bit	Specifications	0	1	Supplement
1	2	Run/Stop	Stop	Run	-
1	3	Coast to Stop (ST off)	ST = On	ST = Off	-
1	4	Emergency Off	No Emergency Off	Emergency Off	-
1	5	Ready for Operation ST = On	Getting Ready for Operation	Ready for Operation	ST = On, Run = On, Ready for Operation[1]
1	6	Ready for Operation	Getting Ready for Operation	Ready for Operation [1]	-
1	7	(Reserved)	-	-	-

1 – Ready for Operation: Initialization completed – Not a stop due to: a failure, alarm, Main Undervoltage, a forced stop due to F013, or a forced stop due to a momentary power failure.

F851: ASD Operation at Disconnect — This parameter allows selection of one of six possible responses to a communications loss.

0. **Stop and Terminate Communication** — The ASD decelerates the motor to a stop and displays an alarm (the leftmost LED on the LED display flashes E). Commands entered through the network are canceled, and the commands set with parameters F003 and F004 become effective. When communication is restored, the E alarm is turned off.

1. **Do Nothing** — The ASD remains in the current state until the operation is completed. The ASD displays the E alarm. Network commands will be processed once communications have been restored.

2. **Deceleration Stop** — The ASD decelerates the motor to a stop and displays the E alarm. Network commands will be processed once communications have been restored.

3. **Coast Stop** — The ASD issues a command for a frequency of 0 Hz and displays the E alarm. Network commands will be processed once communications have been restored.

4. **Emergency Off** — The error message “err8” is displayed. Commands entered through the network are not canceled. When communications are restored, the ASD must be reset to in order to clear the error message and resume normal operation.

5. **Preset Speed** — The ASD uses the Preset Speed selection referenced in F852. Refer to Preset Speed Operation Selection. Network commands will be processed once communications have been restored.

F852: Preset Speed Operation Selection — If ASD Operation at Disconnect (F851) is set to Preset Speed, the ASD will run at a preset speed display). Network commands will be processed once communications have been restored.

Example:

- F851 = Preset Speed
- F852 = 8 (Preset Speed #8)
- F287 (Preset Speed 8) = 10 (Hz)

The ASD operational response will be:

- Under normal conditions the drive will operate according to commands entered through the network.
- If network communications are disrupted, the ASD reverts to the preset frequency of 10 Hz.
- When communications is restored the drive resumes processing network commands.

DeviceNet Local/Remote Operation

Figure 2 shows how to configure the ASD for local/remote operation.

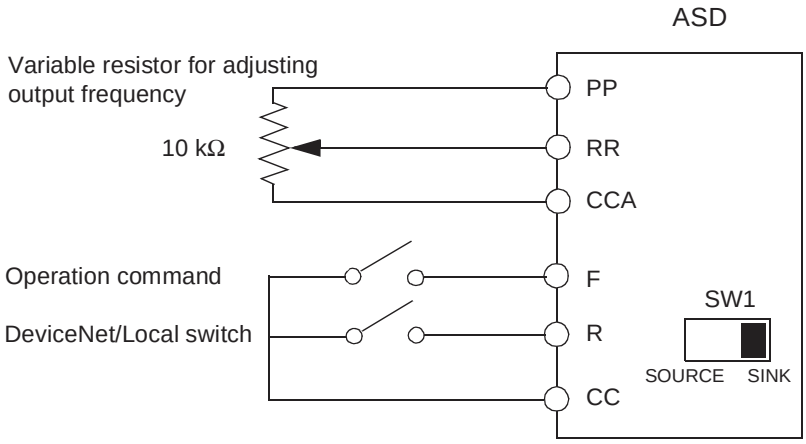
Terminal Function

F terminal: Operating command

R terminal: DeviceNet/Local switching

RR terminal: Operation frequency command

Figure 2. Wiring for Local/Remote Operation



Parameter setting:

F003 (Command Mode) = 0 (Terminal Block)

F004 (Frequency Mode 1) = 2 (RR)

F112 (Input Terminal 2 (R) Function) = 48 (Remote/Local control)

Operation

R-CC open:

The ASD functions as a follower device on DeviceNet.

R-CC closed:

F-CC: Close to Run

F-CC: Open to Stop

Output frequency is set by the RR signal input.

Object Specifications

This section contains the object specifications for all DeviceNet objects currently supported by the DeviceNet module. The objects supported are listed in the table below:

Table 8. Supported Objects.

Class Code	Object Class	Page
0x01	Identity Object	pg. 16
0x02	Message Router Object	pg. 18
0x03	DeviceNet Object	pg. 19
0x04	Assembly Object	pg. 20
0x05	Connection Object	pg. 36
0x28	Motor Data Object	pg. 39
0x29	Control Supervisor Object	pg. 40
0x2A	AC/DC Drive Object	pg. 43
0x64	Parameter Object	pg. 45

For definitions of the data types referred to in these object specifications, refer to the ODVA DeviceNet Specification. The following are some of the most prevalent data types:

BYTE — Bit string of 8-bits.

WORD — Bit string of 16-bits.

SINT — Signed 8-bit integer value.

USINT — Unsigned 8-bit integer value.

INT — Signed 16-bit integer value.

UINT — Unsigned 16-bit integer value.

UDINT— Unsigned 32-bit integer value.

Identity Object

Class code 0x01 — This object provides identification of, and general information about, the device.

Table 9. Identity Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	1
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1

Table 10. Identity Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Vendor ID	UINT	Get	Identification of vendor by number	377
2	Device Type	UINT	Get	Indication of general type of product	2 (AC Drive)
3	Product Code	UINT	Get	Identification of a particular product of an individual vendor	2
4	Revision (Major)	USINT (ARRAY)	Get	Revision of the item the Identity Object represents	(100)[1]
	Revision (Minor)	USINT (ARRAY)	Get		(1)[2]
5	Status (bits supported)	WORD	Get	Summary status of device	-
6	Serial Number	UDINT	Get	Serial number of device	-
7	Product Name	SHORT_ STRING	Get	Alphanumeric product identification	DEV002Z
8	State	USINT	Get	Present state of the device 0 = Non-existent 1 = Device Self Testing 2 = Standby 3 = Operational 4 = Major Recoverable Fault 5 = Major Unrecoverable Fault	-
10	Heartbeat Interval	USINT	Get/Set	The nominal interval between heartbeat messages in seconds	0

1 – Revision is the same level as the ASD CPU version.

2 – Minor revision is the revision of the DEV002Z software.

Table 11. Identity Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x05	Reset	N/A	Yes	Resets the device
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Identity Object Specific Services

The Identity Object provides no object specific services.

Message Router Object

Class code 0x02 — The Message Router Object provides a messaging connection point through which a Client may address a service to any object class or instance residing in the DeviceNet interface unit.

Table 12. Message Router Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	1
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1

Table 13. Message Router Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Object List	USINT (ARRAY)	Get	A list of supported objects	-
2	Number Available	UINT	Get	Maximum number of connections supported	1
3	Number Active	UINT	Get	Number of connections currently used by system components	1
4	Active Connections	UINT (ARRAY)	Get	A list of the connection IDs of the currently active connections	1

Table 14. Message Router Common Services.

Service Code	Service Name	Supported Class	Instance	Description of Service
0x0E	Get_Attribute_Single	Yes	Yes	Returns the contents of the specified attribute

Message Router Specific Services

The Message Router provides no object specific services.

DeviceNet Object

Class Code 0x03 — The DeviceNet Object provides for the configuration and status of a DeviceNet port.

Table 15. DeviceNet Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision number of this object	2
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1

Table 16. DeviceNet Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	MAC ID	USINT	Get	Node address	1[1]
2	Baud Rate	USINT	Get	Baud rate 0 = 125 kbps 1 = 250 kbps 2 = 500 kbps	0[1]
3	Bus-off Interrupt	BOOL	Get/Set	Bus–Off Interrupt	0
4	Bus-off Counter	USINT	Get/Set	Number of times CAN went to the bus-off state	0
5	Allocation Information (Allocation Choice Byte)	BYTE	Get	Master/Follower allocation state	-
	Allocation Information (Master's MAC ID)	USINT	Get	MAC ID of Master (from Allocate)	-
6	MAC ID Switch Changed	BOOL	Get	The MAC Address switch setting has changed since last power–up/reset	0
7	Baud Rate Switch Changed	BOOL	Get	Baud Rate switch setting has changed since last power–up/reset	0
8	MAC ID Switch Value	USINT	Get	Value of Node Address switch	1[1]
9	Baud Rate Switch Value	USINT	Get	Value of Baud Rate switch	0*

1 – The MAC ID and Baud Rate are set by a DIP Switch.

Table 17. DeviceNet Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Table 18. DeviceNet Object Specific Services

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x4B	Allocate_master/follower _connection_set	N/A	Yes	Requests the use of the Predefined Master/Follower Connection Set
0x4C	Release_group_2_identifier _set	N/A	Yes	Indicates that the specified connections within the Predefined Master/Follower Connection Set are no longer required and are to be released

Assembly Object

Class code 0x04 — The Assembly Object binds attributes of multiple objects, which allows data to, or from, each object to be sent or received over a single connection.

Table 19. Assembly Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	2
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	10

Table 20. Assembly Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
3	Data	BYTE (ARRAY)	Get/Set	The data contained in the assembly object (Refer to Assembly Object – F830 Instance Details on pg. 21)	-

Table 21. Assembly Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Assembly Object Specific Services

The Assembly Object for static assemblies provides no object specific services.

Assembly Object – F830 Instance Details

Instance 20/70

DeviceNet Standard data. (4 bytes, parameter F830 = 0.)

Table 22. Output Instance 20 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Fault Reset	-	Run Forward
1	-							
2	Drive Reference Speed rpm (Low byte) [1]							
3	Drive Reference Speed rpm (High byte) [1]							

1 – Drive reference Speed is set in terms of revolutions per minute in hex. For example, when the Frequency Reference is set to 1800 rpm, the hex value entered is 0x0708: 1800 = 0x0708 (Hex).

Table 23. Input Instance 70 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Running Forward	-	Faulted/ Tripped
1	-							
2	Drive Speed rpm (Low byte)							
3	Drive Speed rpm (High byte)							

Examples of Instance 20/70

Table 24. Instance 20/70 – Stop.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 70	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

Table 25. Instance 20/70 – Forward Running 1800 rpm.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0x0001
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708
Input Instance 70	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0x0004
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708

Table 26. Instance 20/70 – Fault Reset. [1]

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0x0004
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 – Fault reset triggers on 0 to 1 transition only.

Instance 21/71

DeviceNet Standard data. (4 bytes, parameter F830 = 1)

Table 27. Output Instance 21 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	Net Ref [1]	Net Ctrl [1]	-	-	Fault Reset	Run Reverse	Run Forward
1	-							
2	Drive Reference Speed rpm (Low byte)							
3	Drive Reference Speed rpm (High byte)							

Table 28. Input Instance 71 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference [2]	Ref from Net [2]	Ctrl from Net [2]	Ready	Run Reverse	Run Forward	Warning	Faulted/ Tripped
1	Drive Status [3]							
2	Drive Reference Speed rpm (Low byte)							
3	Drive Reference Speed rpm (High byte)							

1 – Bit 5 and 6 of the instance 21 byte 0 are defined as follows.
Bit 5 (Net Ctrl) — When bit 5 is set to 1, bits 0 (Run forward) and 1 (Run reverse) of byte 0 are enabled. When bit 5 is set to 0 is set, Run/Stop is dictated by the setup of the ASD parameter F003.

Bit 6 (Net Ref) — When bit 6 is set to 1, bytes 2 and 3 are enabled.
When bit 6 is set to 0 is set, Drive Reference Speed is according to setup of the ASD parameter F004.

2 – Bit 5, 6, and 7 of the instance 71 byte 0 are defined as follows.

Bit 5 (Ctrl from Net) — When Run/Stop command from DeviceNet is enabled, 1 is set.

Bit 6 (Ref from Net) — When frequency command from DeviceNet is enabled, 1 is set.

Bit 7 (At Reference) — When output frequency equals the frequency command, 1 is set.

3 – Drive Status is same as the Control Supervisor class State attribute (See pg. 40, Control Supervisor Object Instance Attributes.).

1 — Startup
2 — Not Ready
3 — Ready
5 — Stopping
7 — Enabled
6 — Fault Stop
7 — Faulted

Examples of Instance 21/71

Table 29. Instance 21/71 – Stop.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 71	1, 0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0x0310
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

Table 30. Instance 21/71 – Forward running 1800 rpm.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0x0061
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708
Input Instance 71	1, 0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	0	0x04F6
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708

Table 31. Instance 21/71 – Reverse running 1800 rpm.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0x0062
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708
Input Instance 71	1, 0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	1	0	0x04FA
	3, 2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0x0708

Table 32. Instance 21/71 – Fault reset.[1]

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0x0004
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 – Fault reset works on the transition from 0 to 1 only.

Instance 100/150

Toshiba Specific data. (4 bytes, parameter F830 = 2)

Table 33. Output Instance 100 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	DC Braking	Accel 1/ Accel 2	PI Off	THR2	Preset Speed4	Preset Speed3	Preset Speed2	Preset Speed1
1	Command Link [1]	Frequency Link [1]	Reset trip	Emergency Off	Coast (ST)	Run/Stop	Forward/ Reverse	Jog
2	Drive Reference Speed Hz (Low byte) [2]							
3	Drive Reference Speed Hz (High byte) [2]							

1 – Bit 14 and 15 of the instance 100 byte 0 are defined as follows.

Bit 14 (Frequency link) — When set to 1, bytes two and three are enabled. When set to 0, Drive Reference Speed is set to ASD parameter F004.

Bit 15 (Command link) — When set to 0, the other command does not work except bits 12 and 13, Run/Stop is according to setup of the ASD parameter F003.

2 – Drive Reference Frequency is specified in Hex notation in increments of 0.01 Hz per unit.

Example: Set the frequency to 60 Hz. With the incremental frequency resolution of 0.01 Hz per unit, the corresponding entry is calculated as: 60 Hz ÷ 0.01 Hz/unit = 6000 units = 0x1770.

Table 34. Input Instance 150 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	DC Braking	Accel 1/ Accel 2	PI Off	THR2 (VF2+tH2)	-	ALARM (FC91)	Emg. FL	-
1	-	Ready without ST/Run	Ready with ST/Run	Emergency Off	Coast (ST)	Run/Stop	Forward/ Reverse	Jog
2	Drive Speed Hz (Low byte)							
3	Drive Speed Hz (High byte)							

Examples of Instance 100/150

Table 35. Instance 100/150 – Stop.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 100	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 150	1, 0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0x4800
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

Table 36. Instance 100/150 – Forward Running 60 Hz.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 100	1, 0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0xC400
	3, 2	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770
Input Instance 150	1, 0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0x6400
	3, 2	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770

Table 37. Instance 100/150 – Reverse Running 60 Hz.

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 100	1, 0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0xC600
	3, 2	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770
Input Instance 150	1, 0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0x6600
	3, 2	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770

Table 38. Instance 100/150 – Preset Speed 1 with Forward Running (F018).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 100	1, 0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0x8401
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 150	1, 0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0x6400
	3, 2	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0x01F4

Table 39. Instance 100/150 – Fault Reset.[1]

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 100	1, 0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0x2000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 – Fault reset works on the transition from 0 to 1 only.

Instance 101/151

Toshiba Specific data. (8 bytes, parameter F830 = 3)

Table 40. Output Instance 101 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	Net Ref	Net Ctrl	-	-	Fault Reset	Run Reverse	Run Forward
1	-							
2	Drive Reference Speed rpm (Low byte)							
3	Drive Reference Speed rpm (High byte)							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Index (Low byte)							
5	Write	Index (High byte)						
6	Data (Low byte)							
7	Data (High byte)							

Table 41. Input Instance 151 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference	Ref from Net	Ctrl from Net	Ready	Running Reverse	Running Forward	Warning	Faulted/ Tripped
1	Drive Status [1]							
2	Drive Speed rpm (Low byte							
3	Drive Speed rpm (High byte)							
4	Index (Low byte)							
5	Write	Error	Index (High byte)					
6	Data (Low byte)							
7	Data (High byte)							

1 – Drive Status is same as the Control Supervisor class State attribute. Refer to pg. 40, Control Supervisor Object Instance Attributes.

1 — Startup

2 — Not Ready

3 — Ready

4 — Enabled

5 — Stopping

6 — Fault Stop

7 — Faulted

Examples of Instance 101/151

Enable access to the ASD parameter by using byte 4 to 7 of this Instance.

Set the communication number of the parameter to byte 4 and 5 (Index), and the value to byte 6 and 7 (Data).

The monitor parameter FE value becomes communication number - 0x7000 (same as bit 14 and 15 set to 0).

Table 42. Instance 101/151 – Read Parameter F003 (Command mode selection: Communication number is 0003).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 101	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0x0003
	7, 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 151 (F003 set to 0)	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0x0003
	7, 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

Table 43. Instance 101/151 – Read Parameter F268 (Initial value of UP/DOWN frequency).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 101	5, 4	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0x0268
	7, 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 151 (F268 set to 60.0 Hz)	5, 4	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0x0268
	7, 6	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770

Table 44. Instance 101/151 – Read Parameter FE04 (Voltage of DC bus).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 101	5, 4	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0x3E04
	7, 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 151 (FE04 set to 94.49%)	5, 4	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0x3E04
	7, 6	0	0	1	0	0	1	0	0	1	1	1	0	1	0	0	1	0x24E9

Table 45. Instance 101/151 – Write 60 Hz to Parameter F563 (Preset Speed 1, Communication Number 0018).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex
Output Instance 101	5, 4	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0x8018
	7, 6	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770
Input Instance 151 (OK)	5, 4	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0x8018
	7, 6	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0x1770
Input Instance 151 (NG) (Error code[1])	5, 4	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0xC018
	7, 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0x0001

1 – Error code key.
- 1 — Data out of range
- 2 — Bad address
- 3 — Read only
- 4 — Stop to modify or permission error
- 5 — All other

For bytes 0 - 3, refer to Instance 21/71 on pg. 22.

Instance 102/152

Toshiba-specific data. (12 bytes, parameter F830 = 4)

Table 46. Output Instance 102 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	F831 Command data (Low byte)							
1	F831 Command data (High byte)							
2	F832 Command data (Low byte)							
3	F832 Command data (High byte)							
4	F833 Command data (Low byte)							
5	F833 Command data (High byte)							
6	F834 Command data (Low byte)							
7	F834 Command data (High byte)							
8	F835 Command data (Low byte)							
9	F835 Command data (High byte)							
10	F836 Command data (Low byte)							
11	F836 Command data (High byte)							

Table 47. Input Instance 152 Layout.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	F841 Monitor data (Low byte)							
1	F841 Monitor data (High byte)							
2	F842 Monitor data (Low byte)							
3	F842 Monitor data (High byte)							
4	F843 Monitor data (Low byte)							
5	F843 Monitor data (High byte)							
6	F844 Monitor data (Low byte)							
7	F844 Monitor data (High byte)							
8	F845 Monitor data (Low byte)							
9	F845 Monitor data (High byte)							
10	F846 Monitor data (Low byte)							
11	F846 Monitor data (High byte)							

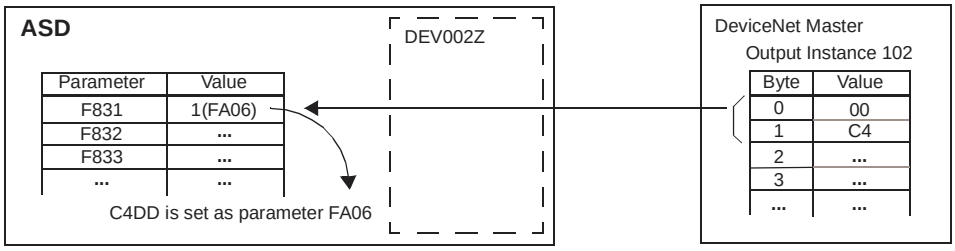
How to use Instance 102/152

The purpose of instances 102/152 is the real time adjustment and operation monitoring of the ASD via DeviceNet.

Example 1: Transmit a command with output Instance 102.

To write 0xC400 as the value of parameter FA06, set parameter F831 to 1 — FA06.

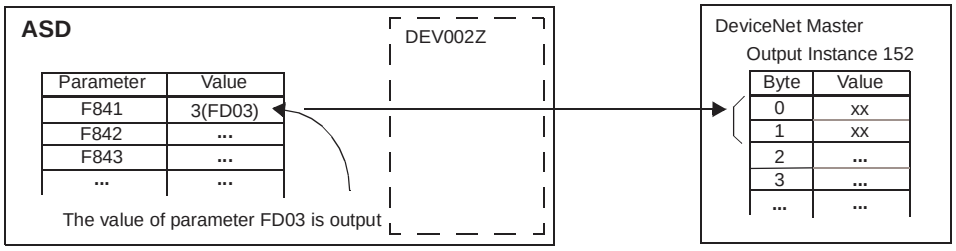
Bite 0 and 1 of the output instance 102 supports the parameter F831. If 0xC400 is entered here, 0xC400 will be written as the value of FA06.



Example 2: State monitoring by the input instance 152.

To monitor the output current, set parameter F841 to 3 — FD03.

The value of the parameter FD03 is specified as byte 0 and 1 of the input instance 152.



Direct Memory Access Settings.

F831 - F836 setup value	F841 - F846 setup value
0: No action 1: FA06 (ALCAN2 command 1) 2: FA23 (ALCAN2 command 2) 3: FA07 (ALCAN2 frequency command, 0.01 Hz) 4: FA33 (Torque command, 0.01%) 5: FA50 (Terminal output) 6: FA51 (Analog output (FM) data from comm.) 7: FA52 (Analog output (AM) data from comm.) 8: F601 (Stall prevention level, % of max.) 9: F441 (Power running torque limit 1 level, 0.01%) 10: F443 (Regenerative braking torque limit 1 level, 0.01%) 11: F460 (Speed loop proportional gain) 12: F461 (Speed loop stabilization coefficient)	0: No action 1: FD01 (ASD status 1) 2: FD00 (Output frequency, 0.01 Hz) 3: FD03 (Output current, 0.01%) 4: FD05 (Output voltage, 0.01%) 5: FC91 (ASD alarm) 6: FD22 (PID feedback value, 0.01 Hz) 7: FD06 (Input terminal status) 8: FD07 (Output terminal status) 9: FE36 (V/I input) 10: FE35 (RR input) 11: FE37 (RX input) 12: FD04 (Input voltage (DC detection), 0.01%) 13: FD16 (Speed feedback (real-time value) 14: FD18 (Torque, 0.01%) 15: FE60 (My monitor) 16: FE61 (My monitor) 17: FE62 (My monitor) 18: FE63 (My monitor) 19: F880 (Free notes) 20: FD29 (Input power, 0.01 kW) 21: FD30 (Output power, 0.01 kW) 22: FE14 (Cumulative operation time, 0.01 = 1 hour) 23: FE40 (FM terminal output monitor) 24: FE41 (AM terminal output monitor)

Assembly Instance 102/152 – Parameters F831 - F836, F841 - F846 Setup Value

The following settings are available when using F831 – F836 and F841 – F846 in Instance 102/152.

See the Serial Communication Option Manual (58720-000) for details.

FA06 — Command Word 1 from Internal Option PCB

Bit	Function	0	1	Note
0	Preset Speed1	0000 = Off 0001 – 1111 = Preset Speed #1 – #15		The combination of 4 bits is used to select a Preset Speed from: speed operation Off, and Preset Speeds #1 to #15.
1	Preset Speed2			
2	Preset Speed3			
3	Preset Speed4			
4	THR1/2	Motor 1(THR1)	Motor 2 (THR2)	THR1: F600 THR2: F173
5	PI Off	Normal	PI Off	-
6	Accel 1/Accel 2	Accel 1 (AD1)	Accel 2 (AD2)	AD1: F009, F010 AD2: F500, F501
7	DC Braking	Off	DC Braking	-
8	Jog	Off	Jog Run	-

Bit	Function	0	1	Note
9	Forward/Reverse	Forward	Reverse	-
10	Run/Stop	Stop	Run	-
11	Coast (ST)		Coast	-
12	Emergency Off	Off	Emergency Off	Recommend this bit always be Enabled
13	Reset Trip	Off	Reset	-
14	Frequency Link	Off	Priority	When Enabled, this overrides the parameter F004
15	Command Link	Off	Priority	When Enabled, this overrides the parameter F003

FA23 — Command Word 2 from Internal Option PCB

Bit	Function	0	1	Note
0	Speed/Torque	Speed Control	Torque Control	-
1	Clear kWh	Off	Clear	Clear the value of FE76, FE77
2	(Reserved)	-	-	-
3	Brake Close (BC)	Normal	Forced Close	-
4	Pre-Magnetic	Normal	On	-
5	Brake Open (B)	Brake Close	Brake Open	-
6	Brake Answer (BA)	Brake Close	Brake Open	-
7	Fast Stop	Normal	On	-
8	Accel 1/Accel 2	00: Acc./Dec. 1 01: Acc./Dec. 2 10: Acc./Dec. 3 11: Acc./Dec. 4		Combination of 2 bits: AD1: F009, F010 AD2: F500, F501 AD3: F510, F511 AD3: F514, F515
9	Accel 3/Accel 4			
10	THR 1/2	00: V/f 1 01: V/f 2 10: V/f 3 11: V/f 4		Combination of 2 bits
11	THR 3/4			
12	Torque Limit 1/2	00: Torque limit 1 01: Torque limit 2 10: Torque limit 3 11: Torque limit 4		Combination of 2 bits
13	Torque Limit 3/4			
14	Speed Gain 1/2	Gain 1	Gain 2	Gain 1: F460, F461 Gain 2: F462, F463
15	(Reserved)	-	-	-

FA07 — Frequency Reference from Internal Option PCB

The Frequency reference is stored as a Hex number in unit increments of 0.01 Hz/unit.

For example, when Frequency reference is set to 80 Hz, it is converted as follows:

80 (Hz)/0.01 (Hz/unit) = 8000 (units) or 0x1F40 (Hex).

FA33 — Torque Reference from Internal Option PCB

Torque reference is stored as a Hex value in increments of 0.01%/unit.

For example, when torque reference is set up to 50%, it is converted as follows:

50 (%)/0.01 (%/unit) = 5000 (units) = 0x1388 (Hex).

FA50 — Terminal Output Data from Communicatioin

Bit 0 – 6 of terminal output data (FA50) from communication, setting data (0 or 1) can be output to the output terminal.

Select the functional number 92 – 105 as the selection (F130 – F138, F168, F169) of the output terminal function before using it.

Bit	Output TB function name	0	1
0	Communication Data 1 (Output TB Select No.: 92, 93)	Off	On
1	Communication Data 2 (Output TB Select No.: 94, 95)		
2	Communication Data 3 (Output TB Select No.: 96, 97)		
3	Communication Data 4 (Output TB Select No.: 98, 99)		
4	Communication Data 5 (Output TB Select No.: 100, 101)		
5	Communication Data 6 (Output TB Select No.: 102, 103)		
6	Communication Data 7 (Output TB Select No.: 104, 105)		
7 – 15	-	-	-

FA51 — Analog Output (FM) Data from Communicaiton

The data set as the parameter FA51 can output to FM terminal.

The data adjustment range is 0 – 2047 (resolution: 11 bits).

Select 31 (analog output for communication) as FM terminal meter selection parameter before using it.

Refer to the **Meter Setting and Adjustment** section of the ASD instruction manual for details.

FA52 — Analog Output (AM) Data from Communication

The data set as the parameter FA52 can output to AM terminal.

The data adjustment range is 0 – 2047 (resolution: 11 bits).

Select 31 (analog output for communication) as AM terminal meter selection parameter before using it.

Refer to the **Meter Setting and Adjustment** section of the ASD instruction manual for details.

FD00 — Output Frequency (real time)

The current output frequency is read to a resolution of 0.01 Hz per Hex unit.

For example, when the output frequency is 80 Hz, 0x1F40 (Hex) is read.

Since the minimum resolution is 0.01 Hz per unit, 0x1F40 (Hex) = 8000 * 0.01 = 80 Hz.

The following parameters are calculated in a similar fashion.

- FD22 — Feedback value of PID (real time). Minimum Unit: 0.01 Hz.
- FD16 — PG feedback or Estimated speed (real time). Minimum Unit: 0.01 Hz.
- FD29 — Input power (real time). Minimum Unit: 0.01 kW.
- FD30 — Output power (real time). Minimum Unit: 0.01 kW.

FD01 — ASD Status (real time)

Bit	Function	0	1	Note
0	FL	No Output	Active Output	-
1	Emgergency	No Fault	Active Fault	The retry status and the trip retention status are also regarded as tripped
2	Alarm	No Alarm	Active Alarm	-
3	(Reserved)	-	-	-
4	THR2(VF2+tH2)	Motor 1 (THR1)	Motor 2 (THR2)	THR1: F600, THR2: F173
5	PI	PI Enable	PI Off	-
6	AD1/AD2	Accel/Decel 1 (AD1)	Accel/Decel 2 (AD2)	AD1: F009, F010 AD2: F500, F501
7	DC Braking	Off	DC Braking	-
8	Jog	Off	Jog Run	-
9	Forward/Reverse	Fwd. Run	Rev. Run	-
10	Run/Stop	Stop	Run	-
11	Coast (ST)	ST = On	ST = Off	-
12	Emergency Off	No Emg. Off	Active Emg. Off	-
13	Ready with ST/Run	Not Ready	Ready	ST = On, Run = On, Ready for operation[1]
14	Ready without ST/Run	Not Ready	Ready	-
15	(Reserved)	-	-	-

1 – Ready for Operation — Initialization completed, not a stop due to: a failure, an active alarm, Main Undervoltage, exceeding the lower frequency limit, or a momentary power failure.

FD03 — Output Current (real time)

The output current is read as 0.01% per unit in Hex.

For example, if the rated output current of the ASD is 4.8 A, a reading for 50% (2.4 A), would be 0x1388.

The minimum unit is 0.01% per unit. 5000 (Dec.) * 0.01 = 50 (%) or 0x1388 (Hex).

The following parameters are calculated the same way.

- FD05 — Output voltage (real time). Minimum Unit: 0.01% (V).
- FD04 — Voltage at DC bus (real time). Minimum Unit: 0.01% (V).
- FD18 — (Torque). Minimum Unit: 0.01% (N•m).[1]

1 – When the information for the motor connected to the ASD is input into parameters F405 – F415, the 100% torque monitor value becomes the same as the rated torque of the motor.

FE35 — Analog Input Value RR

Read the RR terminal input.

The value range is 0x0000 – 0x2710 (0 – 100.00%).

FE36 — Analog Input Value V/I

Read the V/I terminal input.

The value range is 0x0000 – 0x2710 (0 – 100.00%).

FE37 — RX Input

Read the RX terminal.

The value range is 0xD8F0 – 0x2710 (-100.00 – +100.00%).

FE60 to FE63 — My Function Monitor (1 – 4)

Refer to the **My Function Instruction Manual** (Document No. 58692).

FE14 — Cumulative Run Time

The cumulative power-on run time in hours, counted in Hex.

For example, when the cumulative run time reads, 0x12, the decimal equivalent run time is 18 hours.

0x12 (Hex) = 18 (Decimal).

FE40 — Analog Output (FM)

Read the output value of the FM terminal.

The value range is 0 – 65535 (0xFFFF).

FE41 — Analog Output (AM)

Read the output value of the AM terminal.

The value range is 0 – 65535 (0xFFFF).

FC91 — Alarm Code

Bit	Function	0	1	Note
0	Over Current Alarm	Normal	Active alarm	“C” blinking
1	ASD Overload Alarm	Normal	Active alarm	“L” blinking
2	Motor Overload Alarm	Normal	Active alarm	“L” blinking
3	Over Heat Alarm	Normal	Active alarm	“H” blinking
4	Over Voltage Alarm	Normal	Active alarm	“P” blinking
5	Under Voltage of Main Power	Normal	Active alarm	-
6	(Reserved)	-	-	-
7	Under Current Alarm	Normal	Active alarm	-
8	Over Torque Alarm	Normal	Active alarm	-
9	Dynamic Braking Resistor Overload Alarm	Normal	Active alarm	-
10	Cumulative Run-Time Alarm	Normal	Active alarm	-
11	(Reserved)	-	-	-
12	(Reserved)	-	-	-
13	(Reserved)	-	-	-

Bit	Function	0	1	Note
14	Stop after instantaneous power off	-	Dec. Active stop	Refer to F256 value
15	Stop after F013 (LL) continuance time	-	Dec. Active stop	Refer to F302 value

FD06 — Input Terminal Board Status

Bit	TB Name	Function (Parameter)	0	1
0	F	Input TB Function select 1 (F111)	Off	On
1	R	Input TB Function select 2 (F112)		
2	ST	Input TB Function select 3 (F113)		
3	RES	Input TB Function select 4 (F114)		
4	S1	Input TB Function select 5 (F115)		
5	S2	Input TB Function select 6 (F116)		
6	S3	Input TB Function select 7 (F117)		
7	S4	Input TB Function select 8 (F118)		
8	LI1	Input TB Function select 9 (F119)		
9	LI2	Input TB Function select 10 (F120)		
10	LI3	Input TB Function select 11 (F121)		
11	LI4	Input TB Function select 12 (F122)		
12	LI5	Input TB Function select 13 (F123)		
13	LI6	Input TB Function select 14 (F124)		
14	LI7	Input TB Function select 15 (F125)		
15	LI8	Input TB Function select 16 (F126)		

FD07 — Output Terminal Board Status

Bit	TB Name	Function (Parameter)	0	1
0	OUT1	Output TB Function select 1 (F130)	Off	On
1	OUT2	Output TB Function select 2 (F131)		
2	FL	Output TB Function select 3 (F132)		
3	OUT3	Output TB Function select 4 (F133)		
4	OUT4	Output TB Function select 5 (F134)		
5	R1	Output TB Function select 6 (F135)		
6	OUT5	Output TB Function select 7 (F136)		
7	OUT6	Output TB Function select 8 (F137)		
8	R2	Output TB Function select 9 (F138)		
9	R3	Output TB Function select 10 (F168)		
10	R4	Output TB Function select 11 (F169)		
11 - 15	-	-	-	-

Connection Object

Class code 0x05 — The Connection Class allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections.

Table 48. Connection Object Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	2
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	2

Table 49. Connection Object Instance Attributes.

Connection Instance ID #	Description
1	Reference on pg. 36, Explicit Messaging Connection Object Instance Attributes (Instance 1).
2	Reference on pg. 37, Poll Connection Object Instance Attributes (Instance 2).

Table 50. Explicit Messaging Connection Object Instance Attributes (Instance 1).

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	State	USINT	Get	State of the object 00 = Non-existent 01 = Configuring 02 = Waiting for connection ID 03 = Established 04 = Timed Out 05 = Deferred Delete	-
2	Instance_type	USINT	Get	Indicates connection type	0 (Explicit Message)
3	Transportclass_trigger	USINT	Get	Connection behavior	0x83 (Server Transport Class 3)
4	Transmitted_connection_id	UINT	Get	Placed in CAN ID field when transmitting	0x700 (Conn. ID dependant on MAC ID)
5	Received_connection_id	UINT	Get	CAN ID field value denoting received messages	0x602 (Conn. ID dependant on MAC ID)
6	Initial_comm_characteristics	USINT	Get	Defines Sending/Responding message groups	0x21 (Send: Gr. 3) (Resp: Gr. 3)

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
7	Transmitted_connection _size	UINT	Get	Max number of bytes transmitted across this connection	55
8	Received_connection_size	UINT	Get	Max number of bytes received across this connection	55
9	Expected_packet_rate	UINT	Get/Set	Defines timing associated with this connection	2500 (ms)
12	Watchdog_timeout_action	USINT	Get/Set	Inactivity/watchdog time-out action	1(Auto Delete)
13	Transmitted_connection _path_length	UINT	Get	Number of bytes in transmitted_connection_path attribute	0
14	Transmitted_connection _path	USINT (ARRAY)	Get	Specifies Application Object(s) whose data is to be transmitted by this connection	Empty
15	Received_connection_path _length	UINT	Get	Number of bytes in received_connection_path attribute	0
16	Received_connection_path	USINT (ARRAY)	Get	Specifies Application Object(s) whose data is to be received by this connection	Empty

Table 51. Connection Class Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x05	Reset	N/A	Yes	Used to reset all resettable connection objects
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Table 52. Poll Connection Object Instance Attributes (Instance 2).

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	State	USINT	Get	State of the object 00 = Non-existent 01 = Configuring 02 = Waiting for connection ID 03 = Established 04 = Timed Out 05 = Deferred Delete	-
2	Instance_type	USINT	Get	Indicates connection type	1 (I/O)
3	Transportclass_trigger	USINT	Get	Connection behavior	0x83 (Server Transport Class 3)

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
4	Transmitted_connection_id	UINT	Get	Placed in CAN ID field when transmitting	0x3C0 (Conn. ID dependent on device MAC ID)
5	Received_connection_id	UINT	Get	CAN ID field value denoting received messages	0x405 (Conn. ID dependent on device MAC ID)
6	Initial_comm_characteristics	USINT	Get	Defines Sending/Responding message groups	0x1 (Send: Gr. 1) (Resp.: Gr. 2)
7	Transmitted_connection _size	UINT	Get	Max number of bytes transmitted across this connection	4
8	Received_connection_size	UINT	Get	Max number of bytes received across this connection	4
9	Expected_packet_rate	UINT	Get/Set	Defines timing associated with this connection	250
12	Watchdog_timeout_action	USINT	Get	Inactivity/watchdog time-out action	0 (Timed Out)
13	Trnsmitted_connection_path _length	UINT	Get	Number of bytes in transmitted_connection_path attribute	6
14	Transmitted_connection _path	USINT (ARRAY)	Get	Specifies Application Object(s) whose data is to be transmitted by this connection	0x20 0x04 0x24 0x46 0x30 0x03 (Instance 70)
15	Received_connection_path _length	UINT	Get	Number of bytes in received_connection_path attribute	6
16	Received_connection_path	USINT (ARRAY)	Get	Specifies Application Object(s) whose data is to be received by this connection	0x20 0x04 0x24 0x14 0x30 0x03 (Instance 20)
17	Production_inhibit_time	UINT	Get	Defines minimum time between new data production	0

Table 53. Connection Class Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x05	Reset	Yes	Yes	Used to reset all resettable connection objects
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Connection Class Specific Services

The Connection Class provides no object specific services.

Motor Data Object

Class code 0x28 — This object serves as a database for the motor parameters.

Table 54. Motor Data Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision number of this object	1
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1
6	Max ID of Class Attributes	UNIT	Get	The attribute ID number of the last class attribute of the class definition implemented in the device	7
7	Max ID of Instance Attributes	UNIT	Get	The attribute ID number of the last instance attribute of the class definition implemented in the device	15

Table 55. Motor Data Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Number of Attributes	USINT	Get	Number of attributes supported	7
2	Attributes List	USINT (ARRAY)	Get	List of attributes supported	-
3	Motor Type	USINT	Get	0 - Non-standard Motor 1 - PM DC Motor 2 - FC DC Motor 3 - PM Synchronous Motor 4 - FC Synchronous Motor 5 - Switched Reluctance Motor 6 - Wound Rotor Induction Motor 7 - Squirrel Cage Induction Motor 8 - Stepper Motor 9 - Sinusoidal PM BL Motor 10 - Trapezoidal PM BL Motor	7
6	Rated Current	UINT	Get/Set	Rated Current Units: 0.1 A	-
7	Rated Voltage	UINT	Get/Set	Rated Voltage Units: V	-
8	Rated Power	UDINT	Get/Set	Power at rated frequency Units: W	-
9	Rated Frequency	UINT	Get/Set	Rated electrical frequency Units: Hz	-
12	Pole Count	UINT	Get	Number of poles in the motor	-
15	Base Speed	UINT	Get/Set	Nominal speed at rated frequency from nameplate Units: rpm	-

Table 56. Motor Data Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x0E	Get_attribute_single	N/A	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

Motor Data Object Specific Services

The Motor Data Object provides no object specific services.

Control Supervisor Object

Class code 0x29 — This object models all the management functions for devices within the DeviceNet Hierarchy of Motor Control Devices. The behavior of motor control devices is described by the Control Supervisor State Transition Diagram on pg. 42.

Table 57. Control Supervisor Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	1
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1
6	Max ID of Class Attributes	UNIT	Get	The attribute ID number of the last class attribute of the class definition implemented in the device	7
7	Max ID of Instance Attributes	UNIT	Get	The attribute ID number of the last instance attribute of the class definition implemented in the device	15

Table 58. Control Supervisor Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Number of Attributes	USINT	Get	Number of Attributes supported	11
2	Attribute List	USINT (ARRAY)	Get	List of attributes supported	-
3	Run 1	BOOL	Get/Set	See Run/Stop Event Matrix 00 = Stop 01 = Run	-
4	Run 2	BOOL	Get/Set	See Run/Stop Event Matrix 00 = Stop 01 = Run	-

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
5	Net Control	BOOL	Get/Set	Requests Run/Stop control to be local or from network 0 = Local Control 1 = Network Control Note that the status of Run/Stop control is reflected in attribute 15, CtrlFromNet	-
6	State	USINT	Get	0 = Vendor Specific 1 = Startup 2 = Not_Ready 3 = Ready 4 = Enabled 5 = Stopping 6 = Fault_Stop 7 = Faulted	-
7	Running 1	BOOL	Get	1 = (Enabled and Run1) OR (Stopping and Running1) OR (Fault_Stop and Running1) 0 = Other state	-
8	Running 2	BOOL	Get	1 = (Enabled and Run2) OR (Stopping and Running2) OR (Fault_Stop and Running2) 0 = Other state	-
9	Ready	BOOL	Get	1 = Ready OR Enabled OR Stopping 0 = Other state	-
10	Faulted	BOOL	Get	1 = Fault Occurred (latched) 0 = No Faults present	-
11	Warning	BOOL	Get	1 = Warning (not latched) 0 = No Warnings present	-
12	Fault Reset	BOOL	Get/Set	0 → 1 = Fault Reset 0 = No action	-
15	Control From Net	USINT	Get	Status of Run/Stop control source. 0 = Control is local 1 = Control is from network	-

Table 59. Control Supervisor Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x05	Reset	N/A	Yes	Used to reset all resettable connection objects
0x0E	Get_Attribute_Single	N/A	Yes	Returns the contents of the specified attribute
0x10	Set_Attribute_Single	N/A	Yes	Modifies the value of the specified attribute

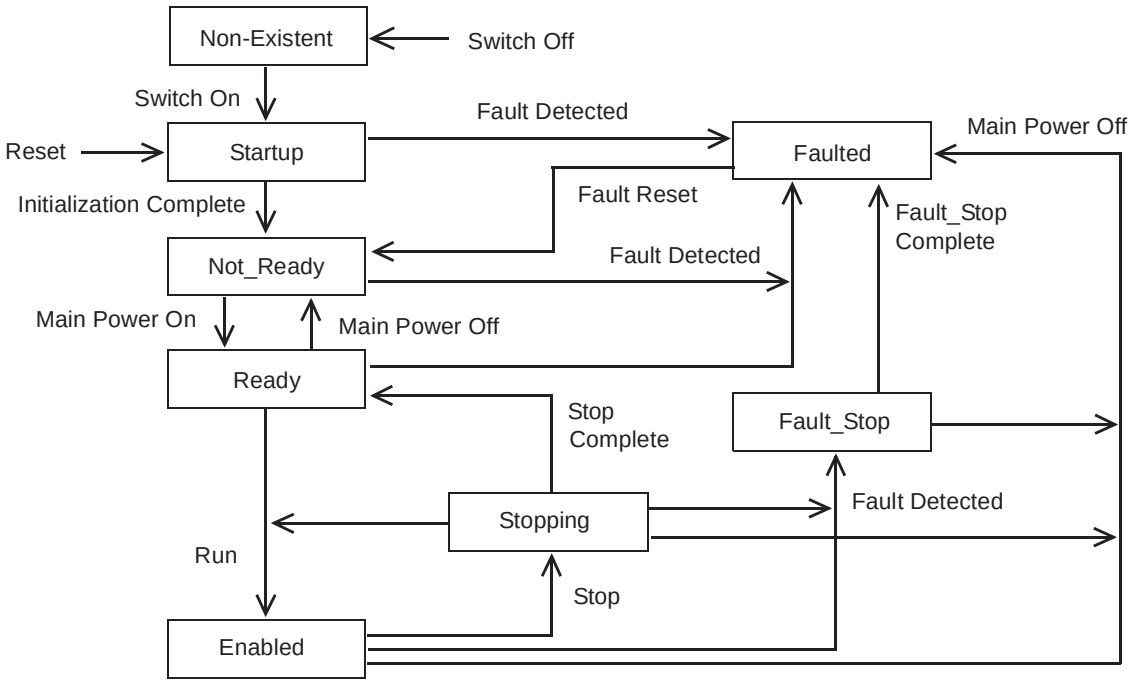
Control Supervisor Object Specific Services.

The Control Supervisor Object provides no object specific services.

Run/Stop Event Matrix

Run1	Run2	Trigger Event	Run Type
0	0	Stop	No Action
0 → 1	0	Run	Run1
0	0 → 1	Run	Run2
0 → 1	0 → 1	No Action	No Action
1	1	No Action	No Action
1 → 0	1	Run	Run2
1	1 → 0	Run	Run1

Control Supervisor State Transition Diagram



AC/DC Drive Object

Class code 0x2A — This object models the functions specific to an AC or DC Drive. e.g., speed ramp, torque control, etc.

Table 60. AC/DC Drive Object Class Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Revision	UINT	Get	Revision of this object	1
2	Max Instance	UINT	Get	Maximum instance number of an object currently created in this class level of the device	1
6	Max ID of Class Attributes	UNIT	Get	The attribute ID number of the last class attribute of the class definition implemented in the device	7
7	Max ID of Instance Attributes	UNIT	Get	The attribute ID number of the last instance attribute of the class definition implemented in the device	46

Table 61. AC/DC Drive Object Instance Attributes.

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
1	Number of Attributes	USINT	Get	Number of Attributes supported	16
2	Attribute List	USINT (ARRAY)	Get	List of Attributes supported	-
3	At Reference	BOOL	Get	Denotes if ASD **Speed Actual** (Attrib. #7) is at **Speed Reference** (Attrib. 8) in speed control mode, or if **Torque Actual** (Attrib. #11) is at **Power Actual** (Attrib. 15) in torque control mode 0 = ASD speed/torque not at reference value 1 = ASD speed/torque at reference value	-
4	Net Reference	BOOL	Get/Set	Requests torque or speed reference to be local or from network 0 = Set Reference not DeviceNet Control 1 = Set Reference at DeviceNet Control Note: The status of torque or speed reference is reflected in attribute 29, RefFromNet	-
6	Drive Mode	USINT	Get	0 = Vendor-specific mode 1 = Open loop speed (Frequency) 2 = Closed loop speed control 3 = Torque control 4 = Process control (e.g., PI) 5 = Position control	-
7	Speed Actual	INT	Get	ASD drive speed (best approximation) Units: rpm	-
8	Speed Reference	INT	Get/Set	Speed reference Units: rpm	-
9	Current Actual	INT	Get	Motor phase current Units: 100 mA	-

Attribute ID	Name	Data Type	Access Rules	Description	Default Value
10	Current Limit	INT	Get/Set	Motor phase current limit Units: 100 mA	-
11	Torque Actual	INT	Get	ASD torque Units: N•m	-
15	Power Actual	INT	Get	Torque reference Units: N•m	-
18	Acceleration Time	UINT	Get/Set	Acceleration time: Time from 0 to High Speed Limit Units: ms	-
19	Deceleration Time	UINT	Get/Set	Acceleration time: Time from 0 to High Speed Limit Units: ms	-
20	Low Speed Limit	UINT	Get/Set	Minimum speed limit Units: rpm	-
21	High Speed Limit	UINT	Get/Set	Maximum speed limit Units: rpm	-
26	Power Scale	SINT	Get	Power scaling factor	-
29	Ref From Net	BOOL	Get	Status of torque/speed reference 0 = Local torque/speed reference 1 = DeviceNet torque/speed reference	-
46	Drive Power-On Hours	DINT	Get	Total number of hours drive has had power applied Units: hours	-

Table 62. AC/DC Drive Object Common Services.

Service Code	Service Name	Supported Class	Supported Instance	Description of Service
0x0E	Get_attribute_single	Yes	Yes	Returns the contents of the specified attribute
0x10	Set_attribute_single	N/A	Yes	Modifies the value of the specified attribute

AC/DC Drive Object Specific Services

The AC/DC Drive Object provides no object specific services.

Parameter Objects

These are vendor-specific device parameters for ASD configuration and control.

Class code 0x64 — This object provides the parameter access to the ASD.

All of the ASD parameters have an Attribute ID of 3.

The Instance ID of each parameter becomes: parameter communication number + 0x4000.

Converting a Parameter Number to an Instance ID:

Example 1.

Basic parameter F003 (Command mode selection) has a Communication Number 0x0003.

0x0003 + 0x4000 = 0x4003.

The Instance ID for F003 is 0x4003.

Example 2.

Extended parameter F268 (UP/DOWN frequency default value) has a Communication Number 0x0268.

0x0268 + 0x4000 = 0x4268.

The Instance ID for F268 is 0x4268.

Example 3.

The Monitor parameter FE03 (Output current) has Communication Number 0x3E03.

0x3E03 + 0x4000 = 0x7E03.

FE03 becomes Instance ID 7E03.

Note: *The Monitor parameter can access "Get" only.*

Instance ID and Parameter Values

Set F009 (Acceleration time) to 5 sec. The incremental unit is 0.1 sec./unit.

The value in F009 is:

5 sec./0.1 sec./unit = 50 = 0x0032.

The Communication Number of Acceleration Time is 0009: 0x0032 is stored in Instance ID 4009.

For details on the function of a parameter, please refer to the instruction manual for the ASD.

EDS files

Each parameter of the ASD can be accessed and modified by using a configuration tool and an EDS file. EDS files can be downloaded from the Toshiba website at: www.toshiba.com/ind/downloads_main.jsp.

Specifications

Item	Specifications
Model number	DEV002Z
Use environment	Indoors at an altitude of 9800 ft. (3000 m) or less where the product will not be exposed to direct sunlight, corrosive or explosive gases, vapor, coarse particulates including dust, and where there is no grinding fluid or grinding oil nearby.
Ambient temperature	14 – 140 °F (-10 – 60 °C)
Storage temperature	-13 – 149 °F (-25 – 65 °C)
Relative humidity	20 – 93% (non-condensing)
Vibration	0.6 G (5.9 m/s^2) or less (10 – 55 Hz)

DEV002Z complies with the requirements of Conformance Test Software Version A-17 of the Open DeviceNet Vendor Association's (ODVA).

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