



# DeviceNet™ Option (CM05x) Technical Manual



Models: CIMR-F7\*, CIMR-G7\*, CIMR-P7\* Document Number: TM.AFD.14



## Technical References

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Refer to the following publications for further information about the Drive and DeviceNet Option Board.

- Drive User Manual  
Publication: TM.F7.01, TM.G7.01, TM.P7.01
- DeviceNet Option Board Installation Guide  
Publication: TM.AFD.14
- ODVA DeviceNet Specification  
Volume I and Volume II

## Technical Support

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Technical Support Center-  
Provide telephone assistance related to installation, start-up, programming, and troubleshooting drives and communication products. For technical phone support call 1 – 800 – YASKAWA.



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# Chapter 1

## Introducing the DeviceNet™ Network

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- Warnings and Cautions
- Introduction
- Overview
- The DeviceNet Network
- The Drive on DeviceNet
- Message Types on DeviceNet

## Warnings and Cautions

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This Section provides warnings and cautions pertinent to this product that, if not heeded, may result in personal injury, fatality, or equipment damage. Yaskawa is not responsible for consequences of ignoring these instructions.

### **WARNING**

YASKAWA manufactures component parts that can be used in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer or end user. YASKAWA accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any YASKAWA product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and to fail safely under all circumstances. All products designed to incorporate a component part manufactured by YASKAWA must be supplied to the end user with appropriate warnings and instructions as to that part's safe use and operation. Any warnings provided by YASKAWA must be promptly provided to the end user. YASKAWA offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the YASKAWA manual. **NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED.** YASKAWA assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

### **WARNING**

- Read and understand this manual before installing, operating, or servicing this Drive. All warnings, cautions, and instructions must be followed. All activity must be performed by qualified personnel. The Drive must be installed according to this manual and local codes.
- Do not connect or disconnect wiring while power is on. Do not remove covers or touch circuit boards while the power is on. Do not remove or insert the Digital Operator while power is on.
- Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. Status indicator LEDs and Digital Operator display will be extinguished when the DC bus voltage is below 50VDC. To prevent electric shock, wait at least 5 minutes after all indicators are OFF and measure the DC bus voltage level to confirm that it is at a safe level.
- Do not perform a withstand voltage test on any part of the unit. This equipment uses sensitive devices and may be damaged by high voltage.
- Drive is not suitable for circuits capable of delivering more than the specified RMS symmetrical amperes. Install adequate branch short circuit protection per applicable codes. Refer to the specification. Failure to do so may result in equipment damage and/or personal injury.
- Do not connect unapproved LC or RC interference suppression filters, capacitors, or overvoltage protection devices to the output of the Drive. Capacitors may generate peak currents that exceed Drive specifications.
- To avoid unnecessary fault displays, caused by contactors or output switches placed between Drive and motor, auxiliary contacts must be properly integrated into the control logic circuit.
- YASKAWA is not responsible for any modification of the product made by the user, doing so will void the warranty. This product must not be modified.
- Verify that Drive rated voltage matches voltage of incoming power supply before applying power.
- To meet CE directives, proper line filters and proper installation are required.

- Some drawings in this manual may be shown with protective covers or shields removed, to describe details. These must be replaced before operation.
- Observe Electrostatic Discharge Procedures when handling the Drive and Drive components to prevent ESD damage.
- The attached equipment may start unexpectedly upon application of power to the Drive. Clear all personnel from the Drive, motor and machine area prior to applying power. Secure covers, couplings, shaft keys, machine beds and all safety equipment before energizing the Drive.

## Introduction

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This manual explains the specifications and handling of the Yaskawa DeviceNet™ CM05x Option for the Yaskawa model F7, G7 and P7 Drives. Check the EPROM label to verify that the *DeviceNet™ Option (CM05x)* card is the correct card for the drive.

Drive	Kit #	Option Board #	EPROM Label Designation	Qty.
F7U	CM056	46S03318-002#	VST80003#	1
G7U	CM057	46S03318-003#	VST80004#	1
P7U	CM058	46S03318-004#	VST80005#	1
DeviceNet™ Option (CM05x) Installation Guide (IG.AFD.14.DeviceNet)				1

The DeviceNet™ Option connects the Drive to a DeviceNet™ network and facilitates the exchange of data. In this document, the word “inverter”, “ac drive” and “drive” may be used interchangeably.

To ensure proper operation of this product, read and understand this manual. For details on installation and operation of the Drive, refer to the appropriate Drive technical manual. For details on specific parameters, refer to the appropriate Drive MODBUS technical manual. All technical manuals and support files can be found on the CD that accompanied the Drive and are available for download at [www.drives.com](http://www.drives.com).

For information on DeviceNet™ contact the Open DeviceNet™ Vendor Association at [www.odva.org](http://www.odva.org).

**F7** document reference **TM.F7.01 (F7 User Manual)** or **TM.F7.02 (F7 Programming Manual)**

**G7** document reference **TM.G7.01 (G7 User Manual)** or **TM.G7.02 (G7 Programming Manual)**

**P7** document reference **TM.P7.01 (P7 User Manual)** or **TM.P7.02 (P7 Programming Manual)**

**F7 MODBUS Technical Manual** document reference **TM.F7.11**

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DeviceNet™ is a registered trademark of the Open DeviceNet™ Vendor Association.

RSNetWorx™ is a registered trademark of Rockwell Automation.

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## Overview

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This manual describes the set-up and programming of the Yaskawa DeviceNet Option Board. The DeviceNet option board will allow communication between the DeviceNet Communication Network and the Yaskawa Drive.

To connect the Drive to the DeviceNet network, the following materials will be necessary:

- DeviceNet Option Board  
Part Number: CM056, CM057, or CM058
- DeviceNet Technical Manual  
Publication: TM.AFD.14
- DeviceNet EDS Files for the Drive model from [www.drives.com](http://www.drives.com) or Yaskawa Electronic Library CD-ROM: CD.AFD7.01
- Drive User Manual  
Publication: TM.F7.01, TM.G7.01, or TM.P7.01

## The DeviceNet Network

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DeviceNet is a low-cost communications link to connect industrial devices (such as limit switches, photoelectric switches, valve manifolds, motor starters, smart motor controllers, operator interfaces, and variable frequency drives) as well as control devices (such as programmable controllers and computers) to a network. Figure 1.1 shows an example DeviceNet network.

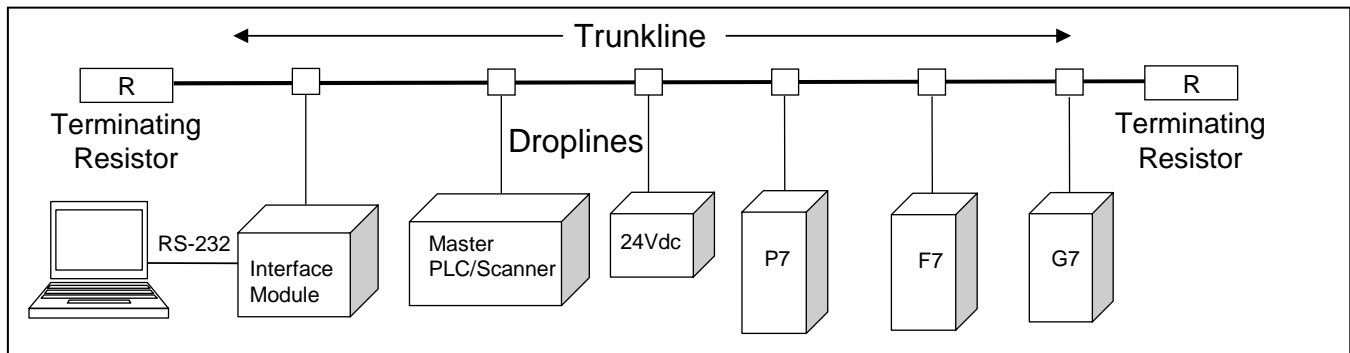


Figure 1.1 DeviceNet Network Example

DeviceNet is a simple, networking solution that reduces the cost and time to wire and install factory automation devices, while providing interchangeability of “like” components from multiple vendors.

DeviceNet is an “open device network standard”. The specifications and protocol with open - vendors are not required to purchase hardware, software, or licensing rights to connect devices to a system. Vendors who choose to participate may obtain the set of specifications from the Open DeviceNet Vendor Association (ODVA).

DeviceNet provides:

- A cost effective solution to low-level device networking
- Access to intelligence present in the devices
- Master/Slave and Peer-to-Peer capabilities (Peer-to-Peer capability is not supported by Yaskawa’s DeviceNet)

DeviceNet has two primary purposes:

- Transport of control-oriented information associated with the control/monitoring of devices
- Transport of configuration parameters which are indirectly related to system control

The list below presents a summary of the Physical/Media specific characteristics of DeviceNet:

- Trunkline-dropline configuration
- Support for up to 64 nodes
- Node removal without severing the network
- Simultaneous support for both network-powered and self-powered devices
- Use of sealed or open-type connectors
- Protection from wiring errors
- Selectable data rates of 125 Kbaud, 250 Kbaud, and 500 Kbaud
- Adjustable power configuration to meet individual application needs
- High current capability (up to 16 Amps per supply)
- Operation with off-the-shelf power supplies
- Power taps that allow the connection of several power supplies from multiple vendors that comply with DeviceNet standards

The list below summarizes additional communication features provided by DeviceNet:

- Use of Controller Area Network (CAN) technology
- Connection-based model to facilitate application to application communications
- Provisions for the typical request/response oriented network communications
- Provisions for the efficient movement of I/O data
- Fragmentation for moving larger quantities of data
- Duplicate MAC ID detection

The communication platform for the DeviceNet Network is based on the CAN (Controller Area Network) technology, which was first developed by Bosch for the automotive industry. Some of the benefits of this protocol are high noise immunity and high temperature operation. Because it uses a serial bus, it reduces signal wiring complexity and cost while providing high-speed digital control for optimum performance. These benefits make DeviceNet especially suitable for the industrial automation environment.

## DeviceNet Option Board

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Yaskawa's DeviceNet Option Board appears as one node on the network. The Option Board must be installed into each Drive that will be communicating on the DeviceNet network. The Option Board is powered from both the +24Vdc DeviceNet network power and the Drive.

When connected to the DeviceNet network, the Drive communicates on the network using a Master/Slave relationship. The Master is a device that gathers and distributes I/O data for the process controller. Slaves are devices from which the Master gathers I/O data and to which the Master distributes I/O data.

On a DeviceNet network, a Master device is said to "own" a Slave device. A Slave device can be "owned" by only one Master. A Slave device cannot initiate communication transactions unless it has been told to do so by its Master. A Master scans its Slave devices based on a scan list that it contains.

The Option Board acts as a DeviceNet Slave device. With respect to the network, the Option Board is considered to be a Group 2 Only Server.

By definition, a Group 2 Only Server device is UCMM incapable. A Group 2 Only Server uses DeviceNet's Predefined Master/Slave Connection Set to establish communications. A Group 2 Only Server can transmit and receive only those messages defined by the Predefined Master/Slave Connection Set. (Volume I of the DeviceNet Specification fully defines Group 2 Server Devices). Since the Drive acts a DeviceNet Slave device, it will respond to message commands issued by a DeviceNet Master device. With respect to the network, the Master is a Group 2 Client or a Group 2 Only Client.

## Message Types on DeviceNet

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The table below shows the message types that are defined by DeviceNet's Predefined Master/Slave Connection Set, as well as which message types are supported by the Option Board. A definition of each message type follows the table.

Message Type	DeviceNet Option Board
Bit-Strobe	NO
Change-of-State/Cyclic	NO
Polled	YES
Explicit	YES

The Bit-Strobe Command message is an I/O message that is transmitted by the Master. One Bit-Strobe Command message can be received by and acted upon by all Slave devices on the network. A Bit-Strobe Command message provides 1-bit of data to each Slave on the network. Bit-Strobe Command messages are transmitted by the Master at a set time interval.

The Bit-Strobe Response message is an I/O message that a Slave transmits back to the Master after receiving a Bit-Strobe Command message. A Bit-Strobe Response message can provide up to 8 bytes of data from a Slave device to a Master device.

The Option Board does not support Bit-Strobe messaging.

The Change-of-State/Cyclic message is transmitted by either the Master or the Slave. A Change-of-State/Cyclic message is directed towards a single, specific node. An Acknowledge message may be returned in response to this message.

The Option Board does not support Change-of-State/Cyclic messaging.

The Polled Command message is an I/O message that is transmitted by the Master. A Polled Command message is directed towards a single, specific Slave device. A Master must transmit a separate Polled Command Message for each Slave device that is to be polled. The Polled Command message can provide up to 256-bytes of data to a single Slave device. Polled Command messages are transmitted by the Master at a set time interval.

The Polled Response message is an I/O message that a Slave transmits back to the Master after receiving a Polled Command message. A Polled Response message can provide up to 256-bytes of data from a Slave device to a Master device.

The Option Board uses Polled messaging to receive Run/Stop and Speed commands from the Master and to send Status and Output information to the Master.

The Explicit Request message is a message that is transmitted by the Master. An Explicit Request message is directed towards a single, specific Slave device. Explicit Command messages are used to perform services such as reading data from the Slave device, writing data to the Slave device, and resetting the Slave device. Explicit Request messages are transmitted by the Master whenever the desired service is required.

The Explicit Response message is a message that a Slave transmits back to the Master after receiving an Explicit Request message. Explicit Response messages are used to return the results of the Explicit Request message service.

The Option Board uses Explicit messaging to read Drive data (Drive parameters, Drive runtime status), to write data (Drive parameters, Drive control commands), to save data (the ENTER command), and to reset the Drive (power-up reset, out-of-box reset).

**Notes:**

# Chapter 2

## DeviceNet Option Board Start-up Procedure

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The following procedure outlines the steps that should be taken to start up the Drive with the DeviceNet Option Board.

1. Complete the Drive Start Up procedure detailed in the Drive User Manual. This includes connecting power to the Drive, running the Drive from the operator keypad, and verifying that the Drive functions properly.
2. Remove power from the Drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the Drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
3. Remove the operator keypad and the Drive cover(s).
4. Install the DeviceNet Option Board on the Drive. See **Chapter 3** for details.
5. Set the network Baud Rate and MAC ID. See **Chapter 3** for details.
6. Connect the Option Board to the DeviceNet Network. See **Chapter 4** for details.
7. If using a DeviceNet Configuration Tool that supports EDS files, install the Drive EDS files that are provided with the DeviceNet Option Board. See **Chapter 5** for general information on EDS files. The EDS file installation procedure will depend on the Configuration Tool being used.
8. Configure the Drive parameters. These parameters include: polled network configuration, motor nameplate data, and drive application constants. See **Chapter 6** for details.

**Notes:**

# Chapter 3

## Setup and Installation

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- Option Board Hardware Components
- Option Board Setup
- Option Board Installation

## Option Board Hardware Components

### CAUTION

The DeviceNet Option Board is an electrostatic sensitive device. Personnel must follow approved methods for handling this type of equipment.

### WARNING

Hazardous voltage may cause severe injury or death. Ensure all power sources feeding the Drive are locked in the "OFF" position before installing this option board.

Figure 3.1 shows the DeviceNet Option Board. J1 connector (on back of board) is used for connection to the 2CN connector on the Drive. DIP switches are used to set up the DeviceNet network Baud Rate and the DeviceNet MAC ID. The DeviceNet terminal is used for connection of the DeviceNet network wiring. Ground wire is the ground connection to the Drive terminal board. NS is the Network Status LED and MS is the Module Status LED.

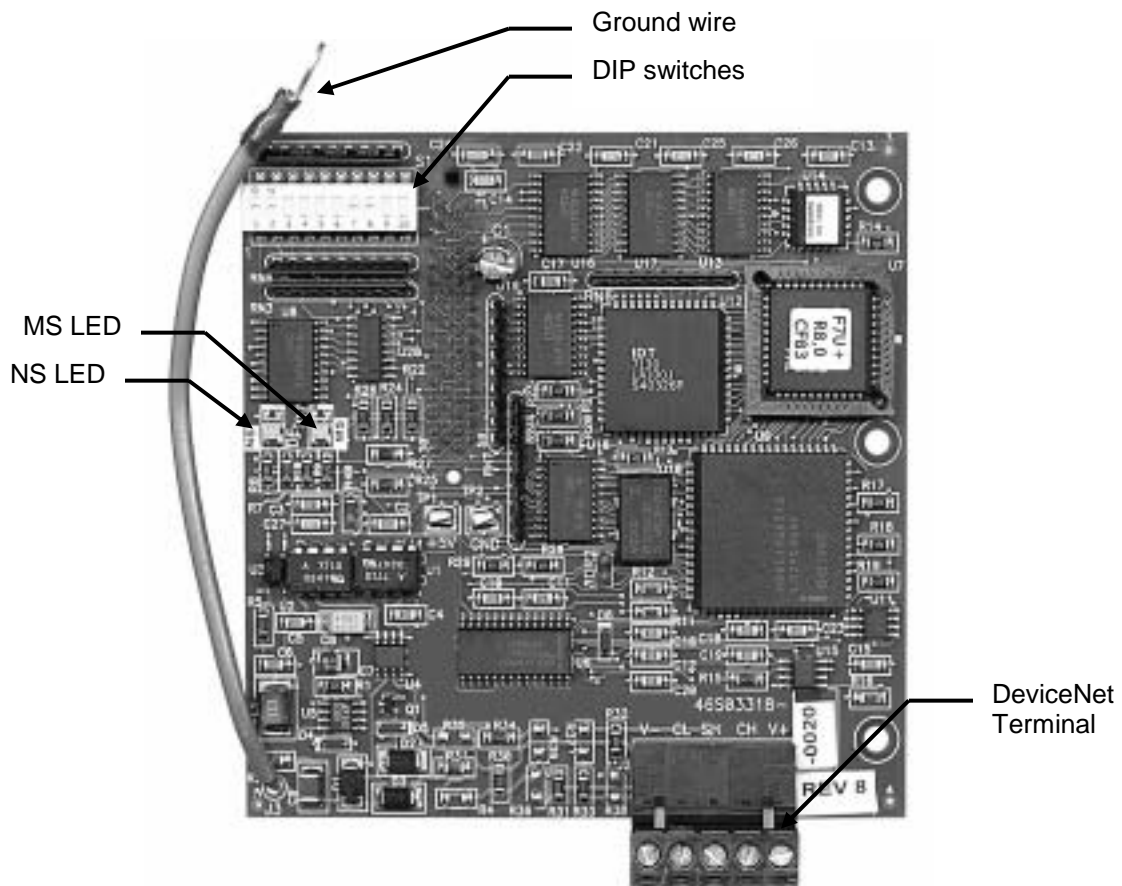


Figure 3.1 DeviceNet Option Board

## Option Board Setup

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The DeviceNet Option Board requires setup prior to operation. DIP switches must be set prior to the application of input AC power to the Drive. The states of these DIP switches are read only on power-up.

### Option Board DIP Switch Settings

The DIP switches are used to setup DeviceNet network characteristics. The DIP switch functions are defined in the following table:

DIP Switch Number	Function
1	Baud Rate, Bit 1
2	Baud Rate, Bit 0
3	Node Number, MSB
4	Node Number
5	Node Number
6	Node Number
7	Node Number
8	Node Number, LSB
9	Not Used
10	Master Idle Operation

DIP switches 1 and 2 are used to select the baud rate of the DeviceNet network. The baud rate setting of the Option Board must match the baud rate setting of the rest of the devices on the DeviceNet network. The available baud rates are defined in the following table. The cable distance between any two points in the cable system must not exceed the Maximum Cable Distance allowed for the baud rate selected. See Chapter 4 for information on calculating the Maximum Cable Distance.

DeviceNet Baud Rate (KBaud)	DIP Switch Position	
	Switch 1	Switch 2
125	Off	Off
250	Off	On
500	On	Off
	On	On

DIP switches 3 through 8 are used to setup the DeviceNet node number of the Option Board. A DeviceNet network can have up to 64 nodes. The DeviceNet node number settings are defined in the following table.

Node Number	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
0	Off	Off	Off	Off	Off	Off
1	Off	Off	Off	Off	Off	On
2	Off	Off	Off	Off	On	Off
3	Off	Off	Off	Off	On	On
4	Off	Off	Off	On	Off	Off
5	Off	Off	Off	On	Off	On
6	Off	Off	Off	On	On	Off
7	Off	Off	Off	On	On	On
8	Off	Off	On	Off	Off	Off
9	Off	Off	On	Off	Off	On
10	Off	Off	On	Off	On	Off
11	Off	Off	On	Off	On	On
12	Off	Off	On	On	Off	Off
13	Off	Off	On	On	Off	On
14	Off	Off	On	On	On	Off
15	Off	Off	On	On	On	On
16	Off	On	Off	Off	Off	Off
17	Off	On	Off	Off	Off	On
18	Off	On	Off	Off	On	Off
19	Off	On	Off	Off	On	On
20	Off	On	Off	On	Off	Off
21	Off	On	Off	On	Off	On
22	Off	On	Off	On	On	Off
23	Off	On	Off	On	On	On
24	Off	On	On	Off	Off	Off
25	Off	On	On	Off	Off	On
26	Off	On	On	Off	On	Off
27	Off	On	On	Off	On	On
28	Off	On	On	On	Off	Off
29	Off	On	On	On	Off	On
30	Off	On	On	On	On	Off
31	Off	On	On	On	On	On
32	On	Off	Off	Off	Off	Off
33	On	Off	Off	Off	Off	On
34	On	Off	Off	Off	On	Off
35	On	Off	Off	Off	On	On
36	On	Off	Off	On	Off	Off
37	On	Off	Off	On	Off	On
38	On	Off	Off	On	On	Off
39	On	Off	Off	On	On	On
40	On	Off	On	Off	Off	Off
41	On	Off	On	Off	Off	On
42	On	Off	On	Off	On	Off
43	On	Off	On	Off	On	On
44	On	Off	On	On	Off	Off
45	On	Off	On	On	Off	On
46	On	Off	On	On	On	Off
47	On	Off	On	On	On	On
48	On	On	Off	Off	Off	Off
49	On	On	Off	Off	Off	On
50	On	On	Off	Off	On	Off
51	On	On	Off	Off	On	On
52	On	On	Off	On	Off	Off
53	On	On	Off	On	Off	On
54	On	On	Off	On	On	Off
55	On	On	Off	On	On	On
56	On	On	On	Off	Off	Off
57	On	On	On	Off	Off	On
58	On	On	On	Off	On	Off
59	On	On	On	Off	On	On
60	On	On	On	On	Off	Off
61	On	On	On	On	Off	On
62	On	On	On	On	On	Off
63	On	On	On	On	On	On

Some master devices can be placed in idle mode. During idle mode, some masters do not send or receive polled messages. DIP switch 10, allows the drive to continue to operate as normal or generate an “EF0” fault to indicate that no polled messages are being received from the master.

Master Idle Operation	DIP Switch Position
	Switch 10
“EF0” disabled	Off
“EF0” enabled	On

With DIP switch 10 in the “Off” position, the “EF0” fault is disabled. When the master is placed in idle mode, the drive will continue to operate as normal based on the last polled message that was received from the master.

With DIP switch 10 in the “On” position, the “EF0” fault is enabled. When the master is placed in idle mode, the drive will generate an “EF0” fault. The drive returns to normal operation after the master is no longer in idle mode, the run command is removed, and the RESET command is issued via DeviceNet, control terminals, or the Drive Digital Operator.

# Option Board Installation

The DeviceNet Option Board installs directly on the Drive control board 2CN port.

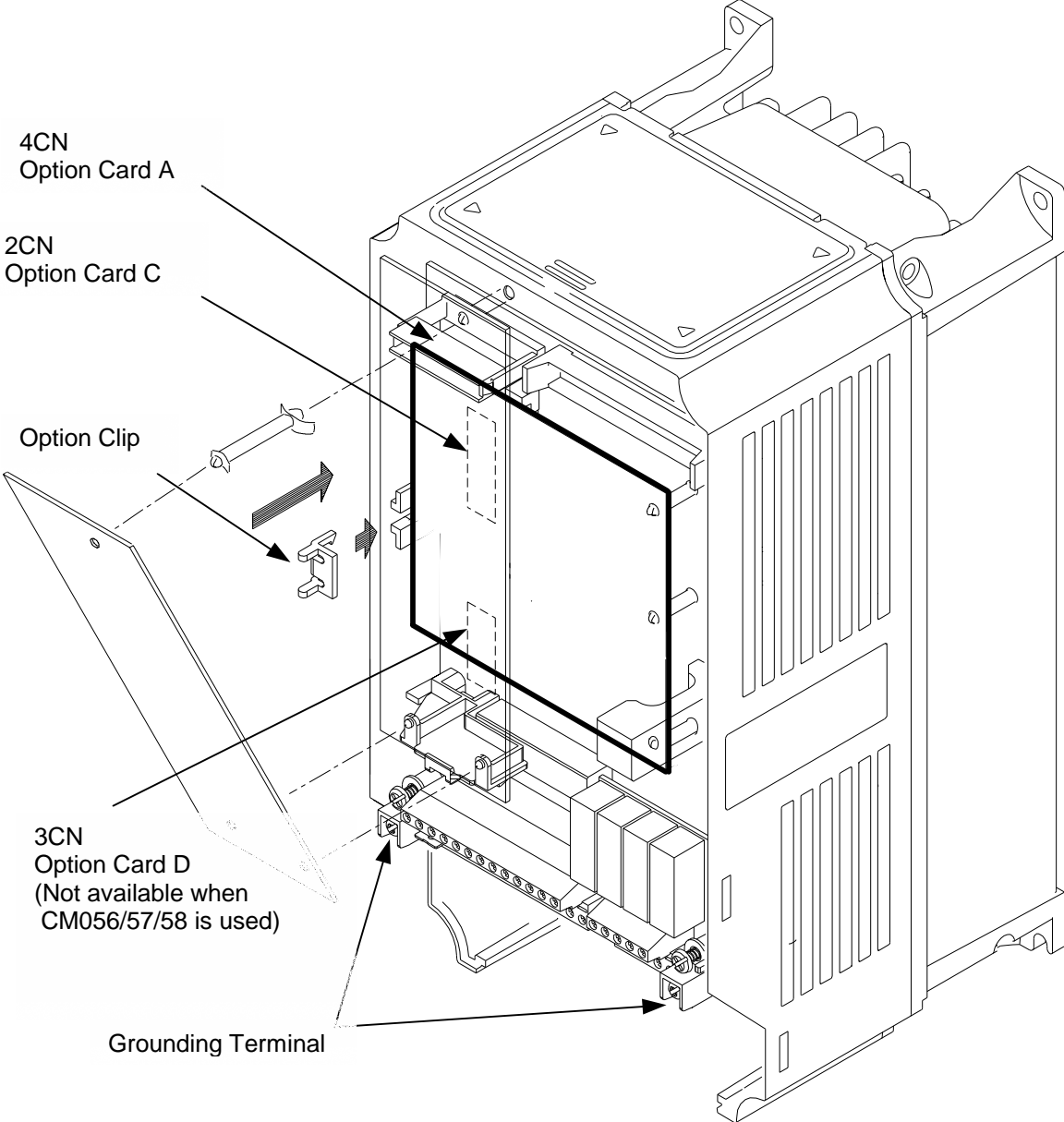


Figure 3.2 DeviceNet Option Board Installation

1. Remove power from the Drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the Drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
2. Remove the Drive's operator keypad by depressing the tab on the right side of the keypad and then pulling it out.
3. Remove the Drive's front cover(s) until the entire control card is exposed. The number of cover(s) and the removal procedure varies by drive series and capacity. Consult the Drive's technical manual for details. Remove the operator keypad by depressing the tab on the right side of the keypad and then pulling it out.
4. Remove the option board hold-down clip on the left side of the Drive case by carefully compressing the top and bottom until it becomes free of its holder and then pulling it out.
5. Align the J1 connector on the back of the *DeviceNet Option Board* with its mating 2CN connector on the front of the Drive control card. Align the three standoffs on the front of the Drive control board with the three holes on the right side of the *DeviceNet Option*. Press the DeviceNet option firmly onto the Drive 2CN connector and standoffs until the 2CN connector is fully seated and the Drive standoffs have locked into their appropriate holes.
6. Connect the option ground wire to ground terminal on the F7, G7, or P7 Drive terminal boards.
7. Connect the DeviceNet cable to the DeviceNet terminal on the Option Board according to the wire name on the *DeviceNet Option Board*.
8. The DIP switches (S1) located on the front of the DeviceNet Option Board should be properly configured. See "Option Board Setup" earlier in this chapter.
9. Replace the Drive front cover and Digital Operator.
10. Apply power to the Drive and verify that the diagnostic LEDs on the front of the DeviceNet Option Board perform the following LED check and are in their correct state.
  - MS LED ON Green for 0.25 seconds.
  - MS LED ON Red for 0.25 seconds.
  - MS LED ON Green for 0.25 seconds.
  - NS LED ON Green for 0.25 seconds.
  - NS LED ON Red for 0.25 seconds.

LED Display				Content	Cause
PWR	MS	NS	WD		
Solid Green	Solid Green	Solid Green	Flashing Green	Normal	Normal communication

**Notes:**

# Chapter 4

## DeviceNet Network Wiring

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- DeviceNet Network Topology
- Maximum Cable Distance
- Cable Specifications
- Terminating Resistor Specifications
- DeviceNet Connector

## DeviceNet Network Topology

The DeviceNet media has a linear bus topology. Terminating resistors are required on each end of the trunkline. Droplines as long as 6 meters (20 feet) each are permitted, allowing one or more nodes to be attached. DeviceNet allows branching structures only on the dropline. Figure 4.1 shows an example DeviceNet network. The thick lines in Figure 4.1 indicate a trunkline. The thin lines in Figure 4.1 indicate a dropline.

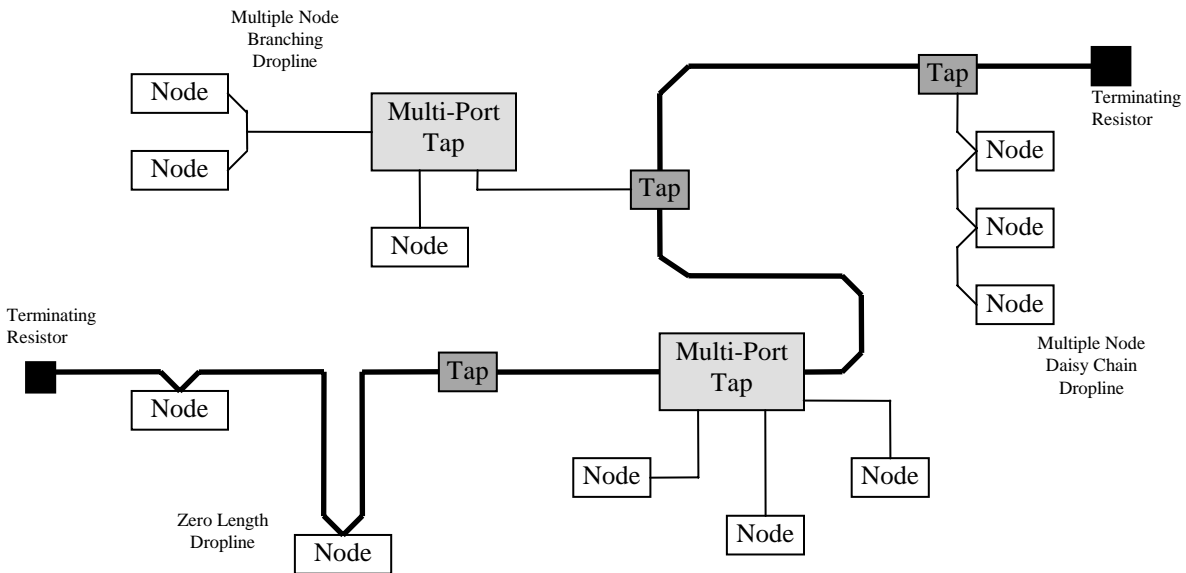


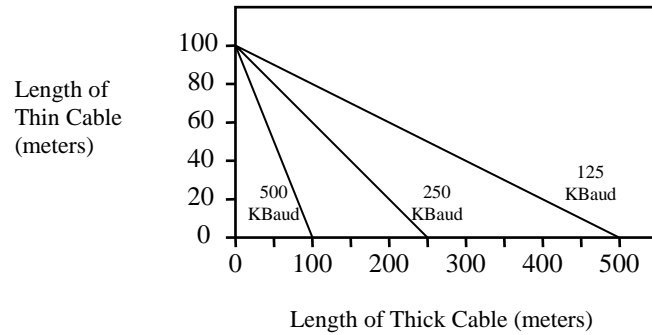
Figure 4.1 DeviceNet Topology

## Maximum Cable Distance

The total amount of trunkline allowable on the network depends upon the baud rate and the type of cable (thick or thin) used. The cable distance between any two points in the cable system must not exceed the Maximum Cable Distance allowed for the baud rate. For trunklines constructed of only one type of cable, refer to the following table to determine the Maximum Cable Distance based on the baud rate and the type of cable used. Cable distance between two points includes both trunkline cable and dropline cable length that exists between the two points.

Baud Rate	Maximum Cable Distance for 100% Thick Cable	Maximum Cable Distance for 100% Thin Cable
125 KBaud	500 meters (1640 feet)	100 meters (328 feet)
250 KBaud	250 meters (820 feet)	
500 KBaud	100 meters (328 feet)	

DeviceNet allows the use of either thick or thin cable to be used to construct trunklines. DeviceNet also allows a combination of both types of cable to be used on the same network. To determine the maximum cable distance with a mix of both thick and thin cable, use Figure 4-2.



$$\begin{aligned}
 \text{At 125 KBaud:} \quad & L_{\text{thick}} + 5.0 \times L_{\text{thin}} = 500 \text{ meters} \\
 \text{At 250 KBaud:} \quad & L_{\text{thick}} + 2.5 \times L_{\text{thin}} = 250 \text{ meters} \\
 \text{At 500 KBaud:} \quad & L_{\text{thick}} + L_{\text{thin}} = 100 \text{ meters}
 \end{aligned}$$

(where  $L_{\text{thick}}$  is the length of thick cable and  $L_{\text{thin}}$  is the length of thin cable – in meters.)

Figure 4.2 Maximum Cable Distance

Dropline length is the longest cable distance measured from the tap on the trunkline to each of the transceivers of the nodes on the dropline. The total amount of dropline allowable on the network depends upon the baud rate. Refer to the following dropline budget when determining the number and length of droplines.

Baud Rate	Drop Length	
	Maximum	Cumulative
125 KBaud	6 meters (20 ft)	156 meters (512 feet)
250 KBaud		78 meters (256 feet)
500 KBaud		39 meters (128 feet)

## Cable Specifications

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### Thick Cable

This cable consists of two shielded pairs twisted on a common axis with a drain wire in the center covered with an overall braid shield and is commonly used as trunkline when length is important.

The thick cable specified for DeviceNet network connections consists of:

- One twisted signal pair (#18): blue/white
- One twisted power pair (#15): black/red
- Separate aluminized mylar shields around power pair and signal pair
- Overall foil/braid shield with drain wire (#18): bare

### Thin Cable

Thin Cable is smaller and more flexible than Thick Cable. It is commonly used for droplines, but can also be used, for shorter distances, as trunkline.

The thin cable specified for DeviceNet network connections consists of:

- One twisted signal pair (#24): blue/white
- One twisted power pair (#22): black/red
- Separate aluminized mylar shields around power pair and signal pair
- Overall foil/braid shield with drain wire (#22): bare

### Cable Vendors

DeviceNet cables are available from various vendors. Two sources are listed below:

Belden Wire & Cable Company				
Part #	Pair	AWG	Insulation	Outer Jacket
3082A thick	Data	18	Datalene	Lt. Gray PVC
	Power	15	PVC/Nylon	
3084A thin	Data	24	Datalene	Lt. Gray PVC
	Power	22	PVC/Nylon	
3083A thick	Data	18	Datalene	Yellow CPE
	Power	15	PVC/Nylon	
3085A Thin	Data	24	Datalene	Yellow CPE
	Power	22	PVC/Nylon	

Berk-Tek				
Part #	Pair	AWG	Insulation	Outer Jacket
210051 thick	Data	18	FPE/HDPE	Lt. Gray PVC
	Power	15	PVC/Nylon	
210144 thin	Data	24	FPE/HDPE	Lt. Gray PVC
	Power	22	PVC/Nylon	

## Terminating Resistor Specifications

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DeviceNet requires a terminating resistor to be installed at each end of the trunk. The resistor requirements are:

- 121 ohm
- 1% Metal Film
- 1/4 Watt

**IMPORTANT:** Terminating resistors should not be installed at the end of a dropline, only at the two ends of the trunkline.

## DeviceNet Connector

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The DeviceNet Option Board uses an open style, pluggable, screw connector that conforms with the DeviceNet specification. The male connector is resident on the Option Board. One mating female connector is supplied with each DeviceNet Option Board. Figure 4.3 shows the pinout, orientation, and placement of the male connector on the DeviceNet Option Board.

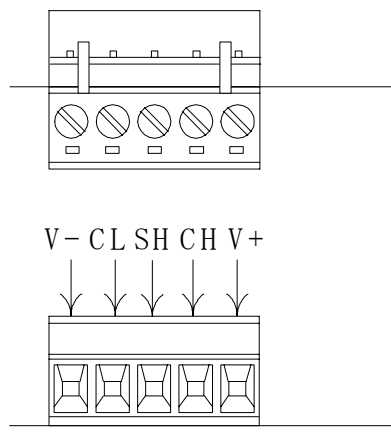


Figure 4.3 DeviceNet Connector

The following table illustrates the pinouts and wire insulation colors for the DeviceNet Option Board.

Pin	Label	Definition	Wire Color
1	V-	Common	Black
2	CL	CAN Data Signal Low	Blue
3	SH	Shield/Drain Connection	Bare
4	CH	CAN Data Signal High	White
5	V+	+24 VDC	Red

**Notes:**

# Chapter 5

## DeviceNet EDS Files

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- EDS Files in General
- EDS Files for the Drive

## EDS Files in General

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A CD-ROM (CD.AFD7.01) containing Electronic Data Sheet (EDS) files for the Drive is included with each DeviceNet Option Board. Alternatively, the EDS files can be downloaded from [www.drives.com](http://www.drives.com). The EDS files are used together with a DeviceNet Network Configuration tool, i.e. Rockwell Software RSNetWorx™.

DeviceNet Network Configuration tools are used to configure all nodes on a DeviceNet network. Network Configuration tools provide the ability to upload data from a device and download data to a device. The EDS files provide the Network Configuration tool with the following information:

- Description of each device parameter
- Maximum and Minimum values for each device parameter
- Default values for each device parameter
- Read / Write access for each device parameter
- Help Information for each device parameter
- Vendor ID of the device
- Device Type of the device
- Product Code of the device
- Revision of the device

Each device on the network has the following values assigned to it:

1. Vendor ID
2. Device Type
3. Product Code
4. Revision
5. Serial Number

The Network Configuration tool will read these values from the device. When using EDS files, the tool will compare the values of Vendor ID, Device Type, Product Code, and Revision that were read from the device to the values in the EDS file. They must match.

**Note:** References to EDS parameter numbers and respective functions could change with Drive firmware changes.

## EDS Files for the Drive

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All DeviceNet Option Boards will have a Vendor ID equal to 37. All AC Drive products will have a Device Type equal to 2. The Drive Product Codes depend on the Drive model. The Product Codes for the Drive are given in the following table. The Revision can be found on the Option Board processor label of the EPROM, component U7.

Input Voltage 3-Phase	CIMR-F7U, CIMR-G7U, Or CIMR-P7U	Product Code F7 / CM056	Product Code G7 / CM057	Product Code P7 / CM058
208 - 230Vac	20P4	28084 (0x6DB4)	34084 (0x8524)	40084 (0x9C94)
	20P7	28087 (0x6DB7)	34087 (0x8527)	40087 (0x9C97)
	21P5	28185 (0x6E19)	34185 (0x8589)	40185 (0x9CF9)
	22P2	28282 (0x6E7a)	34282 (0x85EA)	40282 (0x9D5A)
	23P7	28387 (0x6EE3)	34387 (0x8653)	40387 (0x9DC3)
	25P5	28585 (0x6FA9)	34585 (0x8719)	40585 (0x9E89)
	27P5	28785 (0x7071)	34785 (0x87E1)	40785 (0x9F51)
	2011	28011 (0x6D6B)	34011 (0x84DB)	40011 (0x9C46)
	2015	28015 (0x6D6F)	34015 (0x84DF)	40015 (0x9C4F)
	2018	28018 (0x6D72)	34018 (0x84E2)	40018 (0x9C52)
	2022	28022 (0x6D76)	34022 (0x84E6)	40022 (0x9C56)
	2030	28030 (0x6D7E)	34030 (0x84EE)	40030 (0x9C5E)
	2037	28037 (0x6D85)	34037 (0x84F5)	40037 (0x9C65)
	2045	28045 (0x6D8D)	34045 (0x84FD)	40045 (0x9C6D)
	2055	28055 (0x6D97)	34055 (0x8507)	40055 (0x9C77)
	2075	28075 (0x6DAB)	34075 (0x851B)	40075 (0x9C86)
	2090	28090 (0x6DBA)	34090 (0x852A)	40090 (0x9C9A)
	2110	28110 (0x6DCE)	34110 (0x853E)	40110 (0x9CAE)
480Vac	40P4	30084 (0x7584)	36084 (0x8CF4)	42084 (0xA464)
	40P7	30087 (0x7587)	36087 (0x8CF7)	42087 (0xA467)
	41P5	30185 (0x75E9)	36185 (0x8D59)	42185 (0xA4C9)
	42P2	30282 (0x764A)	36282 (0x8DBA)	42282 (0xA52A)
	43P7	30387 (0x76B3)	36387 (0x8E23)	42387 (0xA593)
	44P0	30480 (0x7710)	36480 (0x8E80)	42480 (0xA5F0)
	45P5	30585 (0x7779)	36485 (0x8E85)	42585 (0xA659)
	47P5	30785 (0x7841)	36785 (0x8FB1)	42785 (0xA721)
	4011	30011 (0x753B)	36011 (0x8CAB)	42011 (0xA41B)
	4015	30015 (0x753F)	36015 (0x8CAF)	42015 (0xA41F)
	4018	30018 (0x7542)	36018 (0x8CB2)	42018 (0xA422)
	4022	30022 (0x7546)	36022 (0x8CB6)	42022 (0xA426)
	4030	30030 (0x754E)	36030 (0x8CBE)	42030 (0xA42E)
	4037	30037 (0x7555)	36037 (0x8CC5)	42037 (0xA435)
	4045	30045 (0x755D)	36045 (0x8CCD)	42045 (0xA43D)
	4055	30055 (0x7567)	36055 (0x8CD7)	42055 (0xA447)
	4075	30075 (0x7576)	36075 (0x8CEB)	42075 (0xA45B)
	4090	30090 (0x758A)	36090 (0x8CFA)	42090 (0xA46A)
	4110	30110 (0x759E)	36110 (0x8D0E)	42110 (0xA47E)
	4132	30132 (0x75B4)	36132 (0x8D24)	42132 (0xA494)
	4160	30160 (0x75D0)	36160 (0x8D40)	42160 (0xA4B0)
	4185	30185 (0x75E9)	36185 (0x8D59)	42185 (0xA4C9)
4220	30220 (0x760C)	36220 (0x8D7C)	42220 (0xA4EC)	
4300	30300 (0x765C)	38300 (0x959C)	42300 (0xA53C)	

The EDS files provided with the Drive DeviceNet Option Board allow the DeviceNet configuration tool to access various groups of parameters within the Drive. The following parameter groups are defined in the Drive DeviceNet EDS files:

- DN: Motor Data
- DN: Control Data
- DN: AC Drive Data
- DN: Polled Config
- A Parameters
- B Parameters
- C Parameters
- D Parameters
- E Parameters
- F Parameters
- H Parameters
- L Parameters
- N Parameters
- O Parameters
- T Parameters
- U1 Parameters
- U2 Parameters
- U3 Parameters
- Status
- ACCEPT/ENTER
- Serial Number

The DN: Motor Data parameter group is used to configure the Drive for the motor that will be used with it. The parameters in this group include motor type, motor rated current, motor rated voltage, motor rated frequency, motor maximum speed, and motor base speed. These parameters must be set to the values shown on the motor nameplate. A list of DN: Motor Data can be found in Appendix A. See Chapter 6 for more information on how to configure this data.

The DN: Control Data parameter group provides control information (running forward, running reverse, Drive fault, network run/stop enable) from the Drive. A list of DN: Control Data can be found in Appendix A.

The DN: AC Drive Data parameter group provides Drive configuration and status parameters related to Drive mode, actual speed, actual current, current limit, input voltage, acceleration time, deceleration time, and network frequency enable. A list of DN: AC Drive Data can be found in Appendix A.

The DN: Polled Config parameter group is used to configure the DeviceNet Polled Connection. The parameters in this group determine the content of the information that is passed to and from the Drive during polled operation. The information that is passed to the Drive from the Master device is setup with the Polled Consuming Assembly parameter. The information that is passed from the Drive to the Master device is setup with the Polled Producing Assembly parameter. A list of DeviceNet Polled Config data can be found in Appendix A. More information on setting up the DeviceNet Polled Connection can be found in Chapter 6.

The A, B, C, D, E, F, H, L, N, O, and T, Parameter groups are used to access the Drive Application parameters. The Drive Application parameters are used to setup the programmable features of the Drive. These programmable features include initialization, sequencing, braking, speed search, PID control, acceleration/deceleration, torque control, V/F pattern, motor setup, digital and analog I/O, motor and drive protective features, etc. For a complete description of each of the Drive application parameters, see the Drive User Manual and Drive Programming Manual.

The U1, U2, and U3 Monitor groups and the Status parameter group can be used to evaluate the runtime status of the DRIVE. The diagnostic data available includes Run/Stop status, Frequency Output, Current Output, Fault status, etc. All parameters in these groups are read-only. A list of Drive status parameters can be found in Appendix A.

The ACCEPT/ENTER parameter group contains only two parameters, the ACCEPT and ENTER parameters.

If the value of '0' is written to the ACCEPT parameter, the Drive will save the current values of the all Drive parameters (A1-00 through o2-14) into RAM memory on the Drive. Values saved in RAM memory will **not** be retained in case of power loss to the Drive.

If the value of '0' is written to the ENTER parameter, the Drive will save the current values of the all Drive parameters (A1-00 through o2-14) into EEPROM memory on the Drive. Values saved in EEPROM memory will be retained in case of power loss to the Drive. See Chapter 7 for more information on Drive memory and the ACCEPT and ENTER commands.

### CAUTION

Use the ENTER Command only when necessary!

The life of the EEPROM on the Drive will support a finite number of operations.

This means that the ENTER command can only be used a maximum of 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (CPF04) requiring the Drive control board to be replaced.

### CAUTION

The DeviceNet Network parameters do not require the use of the ENTER Command, and are automatically stored in EEPROM memory. The life of the EEPROM on the DeviceNet Option Board will support a finite number of operations. This means that the DeviceNet Network parameters can only be changed a maximum of 100,000 times.

After the specified number of operations, the EEPROM may fault, requiring the DeviceNet Option Board to be replaced.

The Serial Number parameter group is provided for information purposes only. Serial Number is read-only.

# Chapter 6

## Configuration of DeviceNet and Drive Parameters

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- Polled Configuration
- Motor Nameplate Configuration
- Drive Application Parameters Configuration

# Polled Configuration

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The Drive DeviceNet Polled connection must be configured before receiving commands from a Master device. The two parameters that must be configured are:

- Polled Consuming Assembly
- Polled Producing Assembly

The PCA and PPA parameters can be accessed in various ways. If your configuration tool uses the EDS files for configuration, the PCA and PPA parameters can be accessed from the “DN: Polled Config” parameter group. If your configuration tool uses an alternate form of configuration, a DeviceNet path may be required. The following table shows both the EDS locations and the DeviceNet path for the PCA and PPA. Please refer to Appendix A for further details on DeviceNet path information.

Polled Parameter	EDS Param #	DeviceNet Path
Polled Consuming Assembly	28	Class5 / Instance2 / Attribute101
Polled Producing Assembly	29	Class5 / Instance2 / Attribute100

The PCA and PPA values may be changed at any time, whether the Drive is running or stopped. However, it is not recommended that these values be changed while the Drive is running.

## CAUTION

The Drive should be stopped before changing PCA and PPA values.  
Cycle the power to the Drive after changing the PCA and PPA values.

The Polled Consuming Assembly (PCA) parameter determines the format of the data that is transmitted from the Master device to the Drive. The PCA data is transmitted from the Master device to a Drive with a Poll Command message. The PCA data is used to control the operation of the Drive. One of the assemblies from the following table must be selected. See Appendix B for details of the assemblies.

Assembly Number	Assembly Definition	# of Data Bytes	Execution Time
20 * <sup>1</sup>	Basic Speed Command This assembly provides: run forward, fault reset, and speed reference in RPM.	4	x msec
21	Extended Speed Command This assembly provides: run forward, run reverse, fault reset, network control enable, network reference enable, and speed reference in RPM.	4	x msec
22	Basic Speed/Torque Command This assembly provides: run forward, fault reset, speed reference in RPM, and torque reference in N-m.	6	x msec
23	Extended Speed/Torque Command This assembly provides: run forward, run reverse, fault reset, network control enable, network reference enable, speed reference in RPM, and torque reference in N-m.	6	x msec
120 * <sup>2</sup>	Speed Command 1 Assembly provides: run forward, run reverse, multi-function inputs, external fault, fault reset, and speed reference in Hz.	4	x msec
121 * <sup>2</sup>	Torque Command 1 This assembly provides: run forward, run reverse, multi-function inputs, external fault, fault reset, and torque reference in % of rated torque.	4	x msec
122 * <sup>2</sup>	Speed Command 2 This assembly provides: run forward, run reverse, multi-function inputs, external fault, fault reset, speed reference in Hz, network reference selection, and network control selection.	6	x msec
123 * <sup>2</sup>	Torque Command 2 This assembly provides: run forward, run reverse, multi-function inputs, external fault, fault reset, torque reference in % of rated torque, network reference selection, and network control selection.	6	x msec
124 * <sup>2</sup>	Speed Command 3 This assembly provides: run forward, run reverse, multi-function inputs, speed reference in Hz, and access to Drive parameters.	8	x msec
125 * <sup>2</sup>	Torque Command 3 This assembly provides: run forward, run reverse, multi-function inputs, and torque reference in % of rated torque, and access to Drive parameters.	8	x msec
126 * <sup>2</sup>	Speed and Torque Command This assembly provides: run forward, run reverse, multi-function inputs, speed reference in Hz, torque reference in % of rated torque, and torque compensation in % of rated torque.	8	x msec

\*<sup>1</sup> Assembly 20 is the default Polled Consuming Assembly.

\*<sup>2</sup> Yaskawa specific Polled Consuming Assembly.

The Polled Producing Assembly (PPA) parameter determines the format of the data that is transmitted from the Drive to the Master device. The PPA data is transmitted from the Drive to the Master device with a Polled Response message. The PPA data is used to return the status of the Drive to the Master device. One of the assemblies from the following table must be selected. See Appendix B details of the assemblies.

Assembly Number	Assembly Definition	# of Data Bytes	Execution Time
70* <sup>1</sup>	Basic Speed Status This assembly provides: Drive fault, running forward, and output speed in RPM.	4	x msec
71	Extended Speed Status This assembly provides: Drive fault, Drive warning, running forward, running reverse, Drive ready, network control enabled, network reference enabled, at reference, Drive state, and output speed in RPM.	4	x msec
72	Basic Speed/Torque Status This assembly provides: Drive fault, running forward, output speed in RPM, and output torque in N-m.	6	x msec
73	Extended Speed/Torque Status This assembly provides: Drive fault, Drive warning, running forward, running reverse, Drive ready, network control enabled, network reference enabled, at reference, Drive state, output speed in RPM, and output torque in N-m.	6	x msec
130 * <sup>2</sup>	Speed Status 1 This assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, during ride-thru, local/remote, motor selection, zero servo complete, and output speed in Hz.	4	x msec
131 * <sup>2</sup>	Current Status 1 This assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, during ride-thru, local/remote, motor selection, zero servo complete, and output current in Amps.	4	x msec
132 * <sup>2</sup>	Current & Speed Status This assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, during ride-thru, local/remote, motor selection, zero servo complete, output current in Amps, and output speed in Hz.	6	x msec
134 * <sup>2</sup>	Speed Status 2 This assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, motor speed in Hz, and access to Drive parameters.	8	x msec
135 * <sup>2</sup>	Torque Status 2 Assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, output torque in % of rated torque, and access to Drive parameters.	8	x msec
136 * <sup>2</sup>	Speed and Torque Status This assembly provides: running, at zero speed, Drive reversing, fault reset, at speed, Drive ready, Drive alarm, Drive fault, output torque in % of rated torque, motor speed in Hz, and frequency reference in Hz.	8	x msec

\*<sup>1</sup> Assembly 70 is the default Polled Producing Assembly.

\*<sup>2</sup> Yaskawa specific Polled Producing Assembly.

## Motor Nameplate Configuration

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The Drive Motor Data must be configured before receiving commands from a Master device. The Drive uses the Motor parameters to scale the speed commands from the Master device for the motor that is being used. The Motor parameters are in the EDS parameter group “DN: Motor Data”. The Motor parameters that must be configured are shown in the following table along with their respective EDS location and DeviceNet path.

Motor Parameter	EDS Param #	DeviceNet Path
Motor Type	1	Class40 / Instance1 / Attribute3
Motor Rated Current	2	Class40 / Instance1 / Attribute6
Motor Rated Voltage	3	Class40 / Instance1 / Attribute7
Motor Rated Frequency	4	Class40 / Instance1 / Attribute9
Motor Maximum Speed	5	Class40 / Instance1 / Attribute11
Motor Base Speed	6	Class40 / Instance1 / Attribute15

Usually, the required motor data can be found on the motor nameplate.

## Drive Application Parameters Configuration

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The specific application of the Drive will determine whether any of the remaining Drive application parameters (other than those mentioned in this chapter) need to be configured. These Drive parameters can be accessed via DeviceNet through the DeviceNet configuration tool, i.e. Rockwell Software RSNNetWorx™, with the Drive’s EDS file. Details on the Drive EDS can be found in Chapter 5. See the Drive User Manual for details of Drive parameters.

**Notes:**

# Chapter 7

## Drive Operation on DeviceNet

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This chapter will explain some additional requirements of the Drive on DeviceNet. This chapter will also provide information on the various methods that can be used to control the operation and speed of the Drive on DeviceNet.

- Data Storage of the DeviceNet Option Board
- ACCEPT Command
- ENTER Command
- Run/Stop Selection
- Frequency Reference Selection
- Run/Stop Control
- Frequency Reference Control
- Torque Reference Control
- Acceleration and Deceleration Times
- EF0 Fault Parameters
- Reset the Drive to Power-Up Conditions
- Reset the Drive to Factory Conditions

## Data Storage of the DeviceNet Option Board

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The Drive with a DeviceNet Option Board stores data in four locations:

- Active RAM memory on the Drive
- Inactive RAM memory on the Drive
- EEPROM memory on the Drive
- EEPROM memory on the DeviceNet Option Board

Data held in RAM memory, both Active and Inactive, is “Volatile”. Data held in Volatile memory will be lost when power is removed from the Drive.

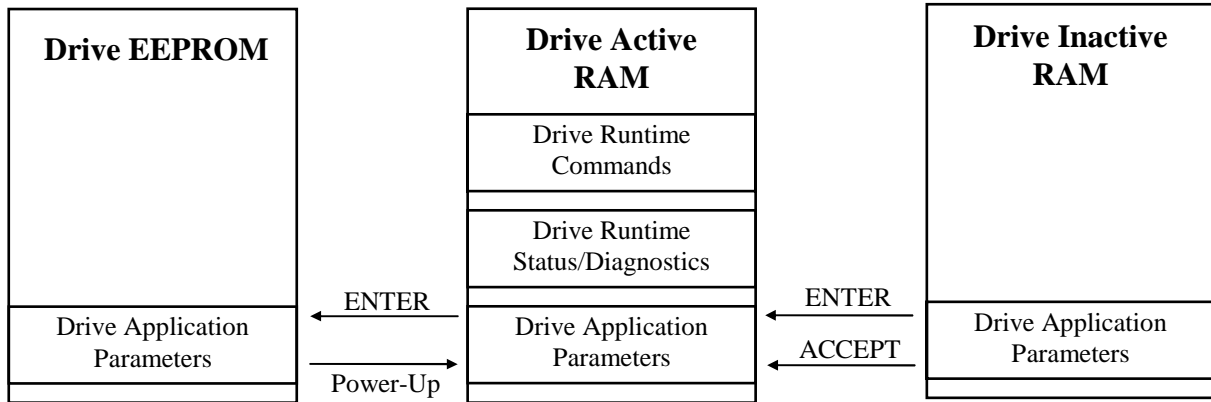
Data held in Drive EEPROM and Interface EEPROM memory is “Non-Volatile”. Data held in Non-Volatile memory will be retained when power is removed from the Drive.

The following table shows the memory locations used for the data available over the DeviceNet network.

Data Type	Memory Type
Drive Runtime Commands Run/Stop Frequency Reference	Drive RAM
Drive Runtime Status and Diagnostics Run/Stop Status Frequency Output Current Output Fault Diagnostics	Drive RAM
Drive Application Parameters A1-00 through o3-02	Drive EEPROM & Drive RAM
DeviceNet Network Parameters Polled Consuming Assembly Polled Producing Assembly Motor Nameplate Data	Option Board EEPROM

The Drive Application Parameters are held both in Drive EEPROM and Drive RAM. On power-up, the Drive Application Parameters that are stored in Drive EEPROM memory are transferred to Drive RAM memory.

If Drive Application Parameters are changed via DeviceNet, the new data will be placed into Drive Inactive RAM memory. At this point, the new data will not be activated or retained if a Drive power loss occurs. In order for the new data to be retained, the 'ACCEPT' command must be executed. When the 'ACCEPT' command is executed, the new data is transferred into Active RAM memory. In order for the new data to be retained, the 'ENTER' command must be executed. When the 'ENTER' command is executed, all of the Drive Application Parameters in Drive RAM memory are transferred into Drive EEPROM memory.



Some Parameter Data registers may be written to while the Drive is running. These parameters are called run operative parameters. For a list of these parameters, refer to the Drive User Manual.

All other Parameter Data registers may only be written to when the Drive is stopped. These are called non-run operative parameters.

If new data is written to any parameter serially, and is not followed by an 'ENTER' command, a "Busy Write Protected" message will flash on the Digital Operator display if an attempt is then made to change a parameter using the Digital Operator.

# ACCEPT Command

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The ACCEPT Command needs to be issued to activate the new data. The ACCEPT Command can be accomplished in either of the following ways:

1. Perform a SET service on Accept Command  
The value '0' should be SET to the ACCEPT Command attribute.  
CM056 (F7 Drive) – EDS Parameter 468  
CM057 (G7 Drive) – EDS Parameter 452  
CM058 (P7 Drive) – EDS Parameter 313
2. Perform a SET service on Yaskawa Class 100, Instance 1, Attribute 254  
The value '0' should be SET to the ACCEPT Command attribute.

The Basic Device Configuration mode can be used to perform an ACCEPT service with the following Yaskawa Drive Classes.

1. Perform an ACCEPT service (32h) with the Yaskawa Class 100, Instance 1
2. Perform an ACCEPT service (32h) with the Yaskawa Class 103, Instance 1
3. Perform an ACCEPT service (32h) with the Yaskawa Class 104, Instance 1
4. Perform an ACCEPT service (32h) with the Yaskawa Class 105, Instance 1
5. Perform an ACCEPT service (32h) with the Yaskawa Class 106, Instance 1
6. Perform an ACCEPT service (32h) with the Yaskawa Class 107, Instance 1
7. Perform an ACCEPT service (32h) with the Yaskawa Class 108, Instance 1
8. Perform an ACCEPT service (32h) with the Yaskawa Class 109, Instance 1
9. Perform an ACCEPT service (32h) with the Yaskawa Class 110, Instance 1
10. Perform an ACCEPT service (32h) with the Yaskawa Class 111, Instance 1

# ENTER Command

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The ENTER Command needs to be issued to save the new data to the EEPROM. The ENTER Command can be accomplished in either of the following ways:

1. Perform a SET service on Enter Command  
The value '0' should be SET to the ACCEPT Command attribute.  
CM056 (F7 Drive) – EDS Parameter 469  
CM057 (G7 Drive) – EDS Parameter 453  
CM058 (P7 Drive) – EDS Parameter 314
2. Perform a SET service on Yaskawa Class 64 hex, Instance 1 hex, Attribute 255 hex  
The value '0' should be SET to the ENTER Command attribute.

The Basic Device Configuration mode can be used to perform an ENTER service with the following Yaskawa Drive Classes.

1. Perform an ENTER service (32h) with the Yaskawa Class 100, Instance 1
2. Perform an ENTER service (32h) with the Yaskawa Class 103, Instance 1
3. Perform an ENTER service (32h) with the Yaskawa Class 104, Instance 1
4. Perform an ENTER service (32h) with the Yaskawa Class 105, Instance 1
5. Perform an ENTER service (32h) with the Yaskawa Class 106, Instance 1
6. Perform an ENTER service (32h) with the Yaskawa Class 107, Instance 1
7. Perform an ENTER service (32h) with the Yaskawa Class 108, Instance 1
8. Perform an ENTER service (32h) with the Yaskawa Class 109, Instance 1
9. Perform an ENTER service (32h) with the Yaskawa Class 110, Instance 1
10. Perform an ENTER service (32h) with the Yaskawa Class 111, Instance 1

## CAUTION

Use the ENTER Command only when necessary!

The life of the EEPROM on the Drive will support a finite number of operations.

This means that the ENTER command can only be used a maximum of 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (CPF04) requiring the Drive control board to be replaced.

## CAUTION

The DeviceNet Network parameters do not require the use of the ENTER Command, and are automatically stored in EEPROM memory. The life of the EEPROM on the DeviceNet Interface will support a finite number of operations. This means that the DeviceNet Network parameters can only be changed a maximum of 100,000 times.

After the specified number of operations, the EEPROM may fault, requiring the DeviceNet Option Board to be replaced.

## Run/Stop Selection

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The Drive can be configured to receive operation signals (Run, Stop, Forward, Reverse, and Multi-Function Inputs) from the DeviceNet network, the external Drive terminals, or the Digital Operator.

There are two settings that determine the method of Run/Stop Control:

- Drive Parameter b1-02 setting
- Network Run/Stop Control setting
- Default Network Control

### Drive Parameter b1-02 Setting

The Drive Parameter b1-02 setting can be accessed in various ways:

1. Parameter b1-02  
If this attribute equals '0', run/stop control is from the Digital Operator  
If this attribute equals '1', run/stop control is from the external terminals  
If this attribute equals '2', run/stop control is from serial communications  
If this attribute equals '3', run/stop control is from an option PC board (DeviceNet)
2. Yaskawa Class 104, Instance 1, Attribute 2  
If this attribute equals '0', run/stop control is from the Digital Operator  
If this attribute equals '1', run/stop control is from the external terminals  
If this attribute equals '2', run/stop control is from serial communications  
If this attribute equals '3', run/stop control is from an option PC board (DeviceNet)

### Network Run/Stop Control Setting

The Network Control setting can be 'Enabled' or 'Disabled'. The power-up setting is determined by the setting of parameter b1-02. The setting can be changed any time after power-up via the DeviceNet network.

When Network Control is set to '1', Drive parameter b1-02 is set to '3' (option PC board) followed by an ACCEPT command, and run/stop control is from the DeviceNet network. If Network Control is set to '0', Drive parameter b1-02 is set to the contents of the Default Control setting, EDS Parameter 13, followed by an ACCEPT command.

While the Drive is running, if an attempt is made to change from network control, DeviceNet will give a "Dnet Error: Privilege Violation" error and will not allow write access to memory. The same happens if an attempt is made to change from non-network control to network control. The Drive must be stopped before control may be changed to or from network control.

The Network Control setting can be accessed in various ways:

1. Assembly Class 4, Instance 21, Attribute 3, Bit 5.  
If Bit 5 is a '1', Network Run/Stop Control is enabled.  
If Bit 5 is a '0', Network Run/Stop Control is disabled.
2. Assembly Class 4, Instance 23, Attribute 3, Bit 5.  
If Bit 5 is a '1', Network Run/Stop Control is enabled.  
If Bit 5 is a '0', Network Run/Stop Control is disabled.
3. Assembly Class 4, Instance 122, Byte 5  
If byte 5 is a '0', run/stop control is from the Digital Operator.  
If byte 5 is a '1', run/stop control is from the external terminals.  
If byte 5 is a '2', run/stop control is from serial communications.  
If byte 5 is a '3', run/stop control is from an option PC board (DeviceNet).
4. Assembly Class 4, Instance 123, Byte 5  
If byte 5 is a "0", run/stop control is from the Digital Operator.  
If byte 5 is a '1', run/stop control is from the external terminals.  
If byte 5 is a '2', run/stop control is from serial communications.  
If byte 5 is a '3', run/stop control is from an option PC board (DeviceNet).
5. Control Supervisor Class 41, Instance 1, Attribute 5  
If this attribute equals '1', Network Run/Stop Control is enabled.  
If this attribute equals '0', Network Run/Stop Control is disabled.

## Frequency Reference Selection

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The Drive can be configured to receive frequency reference commands from the DeviceNet network, the external Drive terminals, or the Digital Operator.

There are two settings that determine the method of Frequency Reference Control:

- Drive Parameter b1-01 setting
- Network Frequency Reference setting
- Default Network Reference

### Drive Parameter b1-01 Setting

The Drive Parameter b1-01 setting can be accessed in various ways:

1. Parameter b1-01  
If this attribute equals '0', frequency reference control is from the Digital Operator  
If this attribute equals '1', frequency reference control is from the external terminals  
If this attribute equals '2', frequency reference control is from serial communications  
If this attribute equals '3', frequency reference control is from an option PC board (DeviceNet)
2. Yaskawa Class 104, Instance 1, Attribute 1  
If this attribute equals '0', frequency reference control is from the Digital Operator  
If this attribute equals '1', frequency reference control is from the external terminals  
If this attribute equals '2', frequency reference control is from serial communications  
If this attribute equals '3', frequency reference control is from an option PC board (DeviceNet)

### Network Frequency Reference Setting

The Network Reference setting can be 'Enabled' or 'Disabled'. The power-up setting is determined by the setting of parameter b1-01. The setting can be changed any time after power-up via the DeviceNet network.

When Network Reference is set to '1', Drive parameter b1-01 is set to '3' (option PC board) followed by an ACCEPT command, and run/stop control is from the DeviceNet network. If Network Reference is set to '0', Drive parameter b1-01 is set to the contents of the Default Reference setting, EDS Parameter 26, followed by an ACCEPT command.

While the Drive is running, if an attempt is made to change from network reference, DeviceNet will give a "Dnet Error: Privilege Violation" error and will not allow write access to memory. The same happens if an attempt is made to change from non-network reference to network reference. The Drive must be stopped before control may be changed to or from network reference.

The Network Reference setting can be accessed in various ways:

1. Assembly Class 4, Instance 21, Attribute 3, Bit 6.  
If Bit 6 is a '1', Network Run/Stop Control is enabled.  
If Bit 6 is a '0', Network Run/Stop Control is disabled.
2. Assembly Class 4, Instance 23, Attribute 3, Bit 6.  
If Bit 6 is a '1', Network Run/Stop Control is enabled.  
If Bit 6 is a '0', Network Run/Stop Control is disabled.
3. Assembly Class 4, Instance 122, Byte 4  
If byte 4 equals '0', frequency reference control is from the Digital Operator.  
If byte 4 equals '1', frequency reference control is from the external terminals.  
If byte 4 equals '2', frequency reference control is from serial communications.  
If byte 4 equals '3', frequency reference control is from an option PC board.
4. Assembly Class 4, Instance 123, Byte 4  
If byte 4 equals '0', frequency reference control is from the Digital Operator.  
If byte 4 equals '1', frequency reference control is from the external terminals.  
If byte 4 equals '2', frequency reference control is from serial communications.  
If byte 4 equals '3', frequency reference control is from an option PC board.
5. AC Drive Class 42, Instance 1, Attribute 4  
If this attribute equals '1', Network Frequency Control is enabled.  
If this attribute equals '0', Network Frequency Control is disabled.

## Run/Stop Control

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When controlling the operation of the Drive from the DeviceNet network, operational commands (Run, Stop, Forward, Reverse, and Multi-Function Inputs) can be accessed in various ways:

1. Assembly 20 (Class 4, Instance 20, Attribute 3)  
Byte 0 of this assembly provides Run Forward and Fault Reset control. See Appendix B.
2. Assembly 21 (Class 4, Instance 21, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Fault Reset control. See Appendix B.
3. Assembly 22 (Class 4, Instance 22, Attribute 3)  
Byte 0 of this assembly provides Run Forward and Fault Reset control. See Appendix B.
4. Assembly 23 (Class 4, Instance 23, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Fault Reset control. See Appendix B.
5. Assembly 120 (Class 4, Instance 120, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. See Appendix B.
6. Assembly 121 (Class 4, Instance 121, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. See Appendix B.
7. Assembly 122 (Class 4, Instance 122, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
8. Assembly 123 (Class 4, Instance 123, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
9. Assembly 124 (Class 4, Instance 124, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. See Appendix B.
10. Assembly 125 (Class 4, Instance 125, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. See Appendix B.
11. Assembly 126 (Class 4, Instance 126, Attribute 3)  
Byte 0 of this assembly provides Run Forward, Run Reverse, and Multi-function Input control. See Appendix B.
12. Control Supervisor Class 41, Instance 1, Attribute 3  
This attribute provides Run Forward control. See Appendix A.
13. Control Supervisor Class 41, Instance 1, Attribute 4  
This attribute provides Run Reverse control. See Appendix A.
14. Control Supervisor Class 41, Instance 1, Attribute 12  
This attribute provides Fault Reset control. See Appendix A.
15. Yaskawa Command Class 100, Instance 1, Attribute 1  
This attribute provides Run Forward, Run Reverse, Multi-Function Input control, External Fault and Fault Reset control. See Appendix A.

If the Drive operation is being controlled with Polled I/O messages, then Assembly 20, 21, 22, 23, 121, 122, 123, 124, 125 or 126 are the only methods available from the list above.

Methods 1, 2, 3, 4, 11, 12 and 13 conform to the DeviceNet AC Drive Device Profile. See Chapter 8 for more information.

## Frequency Reference Control

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When controlling the speed of the Drive from the DeviceNet network, frequency reference can be accessed in various ways:

1. Assembly 20 (Class 4, Instance 20, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in RPM. See Appendix B.
2. Assembly 21 (Class 4, Instance 21, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in RPM. See Appendix B.
3. Assembly 22 (Class 4, Instance 22, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in RPM. See Appendix B.
4. Assembly 23 (Class 4, Instance 23, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in RPM. See Appendix B.
5. Assembly 120 (Class 4, Instance 120, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in Hz. See Appendix B.
6. Assembly 122 (Class 4, Instance 122, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in Hz. See Appendix B.
7. Assembly 124 (Class 4, Instance 124, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in Hz. See Appendix B.
8. Assembly 126 (Class 4, Instance 126, Attribute 3)  
Bytes 2 and 3 of this assembly provide speed control in Hz. See Appendix B.
9. AC Drive Class 42, Instance 1, Attribute 8  
This attribute provides speed control in RPM. See Appendix A.
10. Yaskawa Command Class 100, Instance 1, Attribute 2  
This attribute provides speed control in Hz. See Appendix A.

If the Drive speed is being controlled with Polled I/O messages, then Assembly 20, 21, 22, 23, 120, 122, 124 or 126 are the only methods available from the list above.

Methods 1, 2, 3, 4 and 8 conform to the DeviceNet AC Drive Device Profile. See Chapter 8 for more information.

## Torque Reference Control

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In the F7 and G7 Drive, Flux Vector Control mode (A1-02=3) allows the Drive to be in Torque Control. When the reference source is controlled from the DeviceNet Option Board (b1-01=3), the torque reference to the Drive may be set via DeviceNet. When controlling the torque of the Drive from the DeviceNet network, torque reference can be accessed in various ways:

1. Assembly 22 (Class 4, Instance 22, Attribute 3)  
Bytes 4 and 5 of this assembly provide torque control in  $N\text{-m} \cdot (2^{\text{torque\_scale}})$ . See Appendix B.
2. Assembly 23 (Class 4, Instance 23, Attribute 3)  
Bytes 4 and 5 of this assembly provide torque control in  $N\text{-m} \cdot (2^{\text{torque\_scale}})$ . See Appendix B.
3. Assembly 121 (Class 4, Instance 121, Attribute 3)  
Bytes 2 and 3 of this assembly provide torque control in % of rated. See Appendix B.
4. Assembly 122 (Class 4, Instance 122, Attribute 3)  
Bytes 2 and 3 of this assembly provide torque control in % of rated. See Appendix B.
5. Assembly 125 (Class 4, Instance 125, Attribute 3)  
Bytes 4 and 5 of this assembly provide torque control in % of rated. See Appendix B.
6. Assembly 126 (Class 4, Instance 126, Attribute 3)  
Bytes 4 and 5 of this assembly provide torque control in % of rated. See Appendix B.
7. AC Drive Class 42, Instance 1, Attribute 12  
This attribute provides torque control in  $N\text{-m} \cdot (2^{\text{torque\_scale}})$ . See Appendix A.
8. Yaskawa Command Class 100, Instance 1, Attribute 3  
This attribute provides torque control in % of rated. See Appendix A.

The default torque\_scale value is 0, which means the units are in  $N\text{-m} \cdot (2^0)$  or N-m. If Torque Reference or Actual Torque values are scaled too small to obtain an accurate reading, adjust the torque\_scale to obtain a readable value.

The torque\_scale can be accessed in various ways:

1. EDS Parameter 25  
The range is -9 to 0. The value is a unit less integer.
2. AC Drive Class 42, Instance 1, Attribute 24  
The range is -9 to 0. The value is a unit less integer, but must be entered as a one byte hex number.  
Example: -9 must be entered as F7h

If the Drive speed is being controlled with Polled I/O messages, then Assembly 22, 23, 121, 122, 124, or 126 are the only methods available from the list above.

Methods 1, 2, and 6 conform to the DeviceNet AC Drive Device Profile. See Chapter 8 for more information.

## Speed Control Versus Torque Control

In the F7 and G7 Drives, Flux Vector Control Mode (A1-02 = 3) allows parameter d5-01 to determine whether the Drive is controlled by speed or by torque. In this case, some attributes take on a dual purpose.

The Drive Parameter d5-01 setting can be accessed in various ways:

1. Parameter d5-01  
If this attribute equals '0', the Drive is speed controlled by:  
Yaskawa Command Class 100, Instance 1, Attribute 2 provides Speed Reference. Yaskawa Command Class 100, Instance 1, Attribute 3 provides Torque Limit.  
If this attribute equals '1', the Drive is torque controlled by:  
Yaskawa Command Class 100, Instance 1, Attribute 2 provides Speed Limit.  
Yaskawa Command Class 100, Instance 1, Attribute 3 provides Torque Reference.
2. Yaskawa Class 106, Instance 1, Attribute 27  
If this attribute equals '0', the Drive is speed controlled by:  
Yaskawa Command Class 100, Instance 1, Attribute 2 provides Speed Reference. Yaskawa Command Class 100, Instance 1, Attribute 3 provides Torque Limit.  
If this attribute equals '1', the Drive is torque controlled by:  
Yaskawa Command Class 100, Instance 1, Attribute 2 provides Speed Limit.  
Yaskawa Command Class 100, Instance 1, Attribute 3 provides Torque Reference.

If reoccurring Overspeed (OS), PG Open (PGO), and Speed Deviation (DEV) faults are experienced, re-adjust speed and torque command settings to ensure these values are appropriate for the application and within Drive parameter limits. Refer to Drive User Manual for detailed instruction on operating the Drive in torque control mode.

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## Acceleration and Deceleration Times

The Drive Acceleration Time 1 (C1-01) and Deceleration Time 1 (C1-02) parameters and can be accessed in various ways:

1. Parameters C1-01 and C1-02  
The units for entry are seconds.
2. EDS Parameters 23 and 24  
The units for entry are msec/16 ( 625 msec/16 = 10.0 seconds )
3. AC Drive Class 42, Instance 1, Attributes 18 and 19  
The units for entry are msec/16 ( 625 msec/16 = 10.0 seconds )
4. Yaskawa Class 105, Instance 1, Attributes 1 and 2  
The units for entry are seconds.

Methods 2 and 3 conform to the DeviceNet AC Drive Device Profile. See Chapter 8 for more information.

## EF0 Fault Parameters

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An “EF0” fault enunciates DeviceNet network communication failures (see Chapter 9 for an explanation of these failures). The following parameters are used to determine conditions necessary to generate an “EF0” and the Drive action upon occurrence of an “EF0” fault. For “EF0” to be enabled, Drive parameter b1-02 must be set to option PC board control, setting ‘3’.

The “EF0” Detection Selection, parameter F6-02, determines the Drive state in which detection will occur and can be accessed in various ways:

### Parameters F6-02

If this attribute equals ‘0’, an “EF0” is always detected

If this attribute equals ‘1’, an “EF0” is detected while the Drive is running

The “EF0” Fault Action, parameter F9-03, determines the Drive action upon occurrence of the fault and can be accessed in various ways:

### Parameters F6-03

If this attribute equals ‘0’, the Drive ramps to a stop when an “EF0” is detected

If this attribute equals ‘1’, the Drive coasts to a stop when an “EF0” is detected

If this attribute equals ‘2’, the Drive performs a fast-stop when an “EF0” is detected

If this attribute equals ‘3’, the Drive alarms when an “EF0” is detected

## Reset the Drive to Power-Up Conditions

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The Drive can be reset to power-up conditions over the DeviceNet network. A power-up reset will reset the Drive and the DeviceNet interface to power-up conditions. A Drive Power-Up Reset can be performed in any of the following ways:

1. Perform a RESET service (05h) with the Control Supervisor Class 41, Instance 1. This RESET service does not require any additional argument data.
2. Perform a RESET service (05h) with the Identity Class 1, Instance 1. This RESET service requires an additional 1-byte argument. This argument should be set to a value of ‘0’ for a power-up reset.

With the DeviceNet Manager software, the Basic Device Configuration mode can be used to perform a RESET service.

### **CAUTION**

The Drive should be stopped before performing the Power-Up RESET service.

## Reset the Drive to Factory Conditions

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The Drive can be reset to factory conditions over the DeviceNet network. A factory reset will perform a 2-wire reset on the Drive and return the DeviceNet Network parameters to their default values. A Drive Factory Reset can be performed in the following way:

- Perform a RESET service (05h) with the Identity Class 1, Instance 1  
This RESET service requires an additional 1-byte argument. This argument should be set to a value of '1' for a factory reset.

With the DeviceNet Manager software, the Basic Device Configuration mode can be used to perform a RESET service.

### **CAUTION**

The Drive should be stopped before performing the Factory RESET service.

**Notes:**

# Chapter 8

## DeviceNet Profiles

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- DeviceNet Device Profiles
- AC Drive Profile
- Yaskawa Drive and the AC Drive Profile

## DeviceNet Device Profiles

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A DeviceNet Device Profile provides the specification for the way in which a particular type of device communicates on the DeviceNet network. The goal of device profiles is to provide interoperability and interchangeability of like devices from different vendors.

To provide interoperability and promote interchangeability by like devices, there must be a core standard for each device type. Like devices must:

- Exhibit the same behavior
- Produce and/or consume the same basic set of I/O data
- Contain the same set of configurable parameters
- Access the configurable parameters in the same manner from the network

A device profile contains:

- The format of the I/O data for the device
- Definitions of the configurable parameters for the device
- Definitions of how configurable parameters affect the device's behavior
- A specification of how the network accesses configurable parameters

Device profiles are published in Volume II of the DeviceNet Specification.

## AC Drive Profile

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The AC Drive Profile uses assemblies to transfer I/O data. The AC Drive Profile defines the following list of Assemblies:

Assembly	Required or Optional	I/O Type*	Name
20	Required	Output (Output from the Master/PLC)	Basic Speed Command
21	Optional		Extended Speed Command
22	Optional		Basic Speed and Torque Command
23	Optional		Extended Speed and Torque Command
24	Optional		Basic Process Control Command
25	Optional		Extended Process Control Command
70	Required	Input (Input to the Master/PLC)	Basic Speed Status
71	Optional		Extended Speed Status
72	Optional		Basic Speed and Torque Status
73	Optional		Extended Speed and Torque Status
74	Optional		Basic Process Control Status
75	Optional		Extended Process Control Status

The data format of each of the assemblies listed above is defined in the AC Drive Profile. The drive behavior relevant to each of the assemblies is defined in the AC Drive Profile. Notice that some of the assemblies are required and some are optional.

The AC Drive Profile dictates that an AC Drive device must support the following DeviceNet Object Classes:

- **Motor Class**  
This class defines motor data for the motor that is connected to the drive. Instance 1, Attributes 3, 6, and 7 are required. All other attributes are optional.
- **Control Supervisor Class**  
This class manages drive functions, operational states and control. Instance 1, Attributes 3, 7, 10, and 12 are required. All other attributes are optional.
- **AC Drive Class**  
This class provides access to drive configuration parameters. Instance 1, Attributes 4, 6, 7, and 8 are required. All other attributes are optional.

If an application uses only the required assemblies and attributes from the AC Drive Profile, interchangeability between devices, which comply with the AC Drive Profile is guaranteed.

The Yaskawa Drive DeviceNet Option Board conforms to the AC Drive Profile. A listing of the attributes of the Motor Class, Control Supervisor Class, and AC Drive Class can be found in Appendix A. A listing of the Common Services provided by each of these classes can be found in Appendix C. For a description of the behavior elicited by each of these classes, please consult the DeviceNet Specification, Volume II.

**Notes:**

# Chapter 9

## Diagnostics and Troubleshooting

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- Network and Module Status LEDs at Power-Up
- Network Status LED
- Module Status LED
- DeviceNet Error Codes
- Drive Fault Codes

## Network and Module Status LEDs at Power-Up

An LED test is performed at power-up. The following sequence should be observed:

- Module Status LED on GREEN for 0.25 seconds.
- Module Status LED on RED for 0.25 seconds.
- Module Status LED on GREEN for 0.25 seconds.
- Network Status LED on GREEN for 0.25 seconds.
- Network Status LED on RED for 0.25 seconds.

## Network Status LED

The Network Status LED is located along the left edge of the Drive DeviceNet Option Board. The Network Status LED is labeled “NS”. This bi-color (green/red) LED indicates the status of the communication link. The following table defines the Network Status LED states.

LED state	Device State	Description
OFF	Not powered / Not On-line	Device is not on-line: <ul style="list-style-type: none"> <li>• The device has not completed the duplicate MAC ID (node address) check</li> <li>• The device may not be powered, look at the Module Status LED.</li> </ul>
Flashing GREEN	On-line and <u>not</u> Connected	Device is on-line, but has no connections in the established state: <ul style="list-style-type: none"> <li>• The device has passed the duplicate MAC ID (node address) check, but has no established connections to other nodes.</li> <li>• For a Group 2 Only device (such as the Drive), it means that this device is <u>not</u> allocated to a Master device.</li> <li>• For a UCMM capable device, it means that the device has no established connections.</li> </ul>
Solid GREEN	On-line and Connected	Device is on-line and has connections in the established state: <ul style="list-style-type: none"> <li>• For a Group 2 Only (such as the Drive), device it means that the device <u>is</u> allocated to a Master</li> <li>• For a UCMM capable device, it means that the device has 1 or more established connections.</li> </ul>
Flashing RED	Connection Time-Out	One or more of the I/O Connections are in the Timed-Out state. In the case of the Drive DeviceNet Option Board, the Master device has probably stopped polling the Drive Option Board.
Solid RED	Critical Link Failure	Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network: <ul style="list-style-type: none"> <li>• A duplicate MAC ID (node address) error was detected.</li> <li>• A bus-off condition exists.</li> </ul>
Note: The flash rate for the LED is approximately 1 flash per second. The LED is ON for approximately 0.5 seconds and OFF for approximately 0.5 seconds.		

## Module Status LED

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The Module Status LED is located along the left edge of the Drive DeviceNet Option Board. The Module Status LED is labeled “MS”. This bi-color (green/red) LED indicates whether or not the device has power and is operating properly. The following table defines the Module Status LED states.

LED state	Device State	Description
OFF	No Power	There is no power applied to the device.
Flashing GREEN	Device is in Standby	The device needs commissioning due to missing, incomplete, or incorrect configuration parameters.
Solid GREEN	Device Operational	The device is operating in a normal condition.
Flashing RED	Minor Fault	The device has a recoverable fault active.
Solid RED	Unrecoverable Fault	The device has an unrecoverable fault active.

Note: The flash rate for the LED is approximately 1 flash per second. The LED is ON for approximately 0.5 seconds and OFF for approximately 0.5 seconds.

## DeviceNet Error Codes

The following table lists the DeviceNet Error Codes that can be transmitted across the network by any device.

Error Code (in hex)	Error Name	Description
00h - 01h	Reserved	Reserved by DeviceNet.
02h	Resources Unavailable	Resources needed for the object to perform the requested service were unavailable.
03h - 07h	Reserved	Reserved by DeviceNet.
08h	Service Not Supported	The requested service was not implemented or was not defined for the Object/Class/Attribute.
09h	Invalid Attribute Value	Attribute data value was invalid or out-of-range.
0Ah	Reserved	Reserved by DeviceNet.
0Bh	Already in Mode/State	The object is already in the mode / state being requested by the service.
0Ch	Object State Conflict	The object cannot perform the requested service in its current mode / state.
0Dh	Reserved	Reserved by DeviceNet.
0Eh	Attribute Not Settable	A request to modify a non-modifiable attribute was received.
0Fh	Privilege Violation	A permission / Privilege check has failed.
10h	Device State Conflict	The device's current mode / state prohibits the execution of the requested service.
11h	Reply Data Too Large	The data transmitted in the response message is larger than was expected.
12h	Reserved	Reserved by DeviceNet.
13h	Not Enough Data	The service did not supply enough data to perform the specified operation.
14h	Attribute Not Supported	The attribute specified in the request is not supported.
15h	Too Much Data	The service supplied more data than was expected.
16h	Object Does Not Exist	The object specified does not exist in the device.
17h	Reserved	Reserved by DeviceNet.
18h	No Stored Attribute Data	The attribute data of this object was not saved prior to the requested service.
19h	Store Operation Failure	The attribute data of this object was not saved due to a failure during the attempt.
1Ah - 1Eh	Reserved	Reserved by DeviceNet.
1Fh	Vendor Specific Error	A vendor specific error has been encountered. -illegal data value has been written to a parameter -write to non-run operative parameter while running -board timed out while waiting for drive response
20h	Invalid Parameter	A parameter associated with the request was invalid.
21h - CFh	Future	Reserved by DeviceNet.
D0h - FFh	Reserved	Reserved by DeviceNet.

## Drive Fault Codes

The Drive can have a drive failure, such as undervoltage, overload, external fault, etc. When a Drive fault occurs, it can be classified as an alarm, a minor fault, or a major fault. The Drive reacts differently with each type of failure. An alarm displays a warning indication; however, operation continues. Minor faults allow continued operation, and a contact will close only if one of the multi-function outputs is set up as a minor fault contact. The major faults cause the motor to coast-to-stop and activate the fault contact output at terminals MA, MB, MC.

The Drive monitors U2-01 (current fault), U2-02 (last fault), and U3-01 through U3-04 (four most recent faults) display a fault code representing the drive failure. The following table indicates the abbreviation displayed on the digital operator and the hexadecimal code viewed in drive parameters: U2-01, U2-02, and U3-01 when a specific drive failure occurs. The table also indicates whether the drive failure is an A=alarm, m=minor fault, or M=major fault.

Drive Failure	Digital Operator Display	Code (in hex)	Alarm, minor fault, or Major
DC Bus Fuse Open	FU	1	M
DC Bus Undervoltage	UV1	2	A
Control Power Supply Undervoltage	UV2	3	A
MC Answerback	UV3	4	A
Short Circuit	SC	5	M
Ground Fault	GF	6	M
Overcurrent	oC	7	M
Overvoltage	oV	8	M
Heatsink Overtemperature	oH	9	M
Drive Overheat	oH1	A	M
Motor Overload	oL1	B	M
Drive Overload	oL2	C	M
Overtorque 1	oL3	D	M
Overtorque 2	oL4	E	M
Dynamic Braking Transistor	RR	F	M
Dynamic Braking Resistor	RH	10	M
External Fault 3	EF3	11	M
External Fault 4	EF4	12	m
External Fault 5	EF5	13	m
External Fault 6	EF6	14	m
External Fault 7	EF7	15	m
External Fault 8	EF8	16	m
Reserved	-	17	-
Overspeed	oS	18	M
Speed Deviation	DEV	19	m
PG Open (F7 and G7 only)	PGo	1A	M
Input Phase Loss	PF	1B	M
Output Phase Loss	LF	1C	M
DCCT Fault	CF	1D	M
Operator Disconnected	OPR	1E	m
EEPROM R/W Error	ERR	1F	m
Reserved	-	20	-
Modbus Com Error	CE	21	M
Option Com Error	BUS	22	m
Control Fault	CF	25	M
Zero Servo Fault (F7 and G7 only)	SVE	26	M
Option External Fault	EF0	27	M

Drive Failure	Digital Operator Display	Code (in hex)	Alarm, minor fault, or Major
Reserved	-	28 - 82	-
Baseblock Circuit Fault	CPF02	83	M
EEPROM Fault	CPF03	84	M
Internal A/D Fault	CPF04	85	M
External A/D Fault	CPF05	86	M
Option Error	CPF06	87	M
Reserved	-	88 - 90	-
A/D Converter Fault	CPF20	91	M
Option CPU Error	CPF21	92	M
Option Type Error	CPF22	93	M
DP-RAM Error	CPF23	94	M

Note: Further detail on Drive failures can be found in Drive User Manual.

## “EF0” Fault

An “EF0” fault annunciates network communication failures. There are four conditions in which an “EF0” fault occurs.

The DeviceNet Option Board requires +24 Vdc network power. If the DeviceNet option board loses the +24 Vdc power connection, an “EF0” fault will be generated.

After a polled connection has been established between the master and the drive, the master transmits polled command messages at a set time interval. The DeviceNet Option Board also has a set time interval, in which to receive polled messages from the master. If the Option Board does not receive a polled message from the master within that specified time interval, a timeout will occur and an “EF0” fault will be generated.

Some master devices can be placed in idle mode. In idle mode, some masters do not send or receive polled messages. Setting S1 switch 10 to the ‘on’ position (see Chapter 3) enables Master Idle Operation. If the master is then placed in idle mode, an “EF0” will be generated.

An “EF0” will be generated if manually activated by the user in either of the following ways:

1. Assembly 120 (Class 4, Instance 120, Attribute 3)  
Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
2. Assembly 121 (Class 4, Instance 121, Attribute 3)  
Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
3. Assembly 122 (Class 4, Instance 122, Attribute 3)  
Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
4. Assembly 123 (Class 4, Instance 123, Attribute 3)  
Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.
5. Assembly 126 (Class 4, Instance 123, Attribute 3)  
Byte 1 of this assembly provides External Fault and Fault Reset control. See Appendix B.

# Appendix A

## DeviceNet Object Paths

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- Identity Class
- DeviceNet Class
- Assembly Class
- Connection Class
- Motor Class
- Control Supervisor Class
- AC Drive Class
- Drive Command Class
- Drive Status Class
- Drive U Parameters Class

## Identity Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
1/0/1	GET	uint	2	Identity Object Revision	The DeviceNet specification revision of the Identity Object.
1/0/6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
1/0/7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
1/1/1	GET	uint	2	Vendor ID Number	The Yaskawa (formerly Magnetek) vendor ID is 37.
1/1/2	GET	uint	2	Device Type	The AC Drive device type is 2.
1/1/3	GET	uint	2	Product Code	The Drive product code depends on the Drive model. See Chapter 5 for a list of product codes by Drive model.
1/1/4	GET	structure	1	Vendor Product Revision	The Option Board software major and minor revision.
1/1/5	GET	word	2	Device Status	Bit 0 Owned by a master Bit 1 Reserved Bit 2 Configured Bit 8 Minor/recoverable fault Bit 9 Minor/unrecoverable fault Bit 10 Major/recoverable fault Bit 11 Major/unrecoverable fault
1/1/6	GET	uint	4	Serial Number	Serial number of the Drive.
1/1/7	GET	string	-	Product Name	This string will consist of the Drive model number. See Chapter 5.
1/1/8	GET	uint	1	State	0 Non-existent 1 Device Self Treseting 2 Standby 3 Operational 4 Major Recoverable Fault 5 Major Unrecoverable Fault
1/1/100	GET/SET	dword	4	Serial Number Password	Access limited to Yaskawa factory use.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DeviceNet Option Board.

## DeviceNet Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
3 / 0 / 1	GET	uint	2	DeviceNet Object Revision	The DeviceNet specification revision of the DeviceNet Object.
3 / 1 / 5	GET	word	2	Allocation Choice Byte	This byte indicates which master/slave connections are active. BIT 0 Explicit BIT 1 Polled BIT 2 Bit-Strobe BIT 3 Reserved BIT 4 Change-of-State BIT 5 Cyclic BIT 6 Acknowledge Suppression BIT 7 Reserved

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DeviceNet Option Board.

# Assembly Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
4 / 0 / 1	GET	uint	2	Assembly Object Revision	The DeviceNet specification revision of the Assembly Object.
4 / 0 / 2	GET	uint	2	Max Instance in this Class	135
4 / 0 / 6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
4 / 0 / 7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
4 / 20 / 3	SET	structure	4	Basic Speed Command	See Appendix B.
4 / 21 / 3	SET	structure	4	Extended Speed Command	See Appendix B.
4 / 22 / 3	SET	structure	6	Basic Speed and Torque Command	(F7 and G7 only). See Appendix B.
4 / 23 / 3	SET	structure	6	Extended Speed and Torque Command	(F7 and G7 only). See Appendix B.
4 / 24 / 3	-	structure	6	Basic Process Control Command	-
4 / 25 / 3	-	structure	6	Extended Process Control Command	-
4 / 70 / 3	GET	structure	4	Basic Speed Status	See Appendix B.
4 / 71 / 3	GET	structure	4	Extended Speed Status	See Appendix B.
4 / 72 / 3	GET	structure	6	Basic Speed and Torque Status	(F7 and G7 only). See Appendix B.
4 / 73 / 3	GET	structure	6	Extended Speed and Torque Status	(F7 and G7 only). See Appendix B.
4 / 74 / 3	-	structure	6	Basic Process Control Status	-
4 / 75 / 3	-	structure	6	Extended Process Control Status	-
4 / 120 / 3	SET	structure	4	Yaskawa Speed Command 1	See Appendix B.
4 / 121 / 3	SET	structure	4	Yaskawa Torque Command 1	(F7 and G7 only). See Appendix B.
4 / 122 / 3	SET	structure	6	Yaskawa Speed Command 2	See Appendix B.
4 / 123 / 3	SET	structure	6	Yaskawa Torque Command 2	(F7 and G7 only). See Appendix B.
4 / 124 / 3	SET	structure	8	Yaskawa Speed Command 3	See Appendix B.
4 / 125 / 3	SET	structure	8	Yaskawa Torque Command 3	(F7 and G7 only). See Appendix B.
4 / 126 / 3	SET	structure	8	Yaskawa Speed and Torque Command 1	See Appendix B.
4 / 130 / 3	GET	structure	4	Yaskawa Speed Status 1	See Appendix B.
4 / 131 / 3	GET	structure	4	Yaskawa Current Status 1	See Appendix B.
4 / 132 / 3	GET	structure	6	Yaskawa Current & Speed Status 1	See Appendix B.
4 / 134 / 3	GET	structure	8	Yaskawa Speed Status 2	See Appendix B.
4 / 135 / 3	GET	structure	8	Yaskawa Current Status 2	See Appendix B.
4 / 136 / 3	GET	structure	8	Yaskawa Speed and Torque Status 1	(F7 and G7 only). See Appendix B.

\* Assemblies 20, 21, 22, 23, 24, 25, 70, 71, 72, 73, 74 and 75 are compliant with the AC Drive Profile. Assemblies 20 and 70 are required.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive Option Board.

## Connection Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
5/0/1	GET	uint	2	Connection Object Revision	The DeviceNet specification revision of the Connection Object.
5/1/1	GET	usint	1	State	0 Non-existent 1 Configuring 2 Waiting for Connection ID 3 Established 4 Timed Out
5/1/2	GET	usint	1	Instance Type	0 = Explicit Message Connection.
5/1/3	GET	usint	1	Transport Class Trigger	See DeviceNet Specification.
5/1/4	GET	uint	2	Produced Connection ID	See DeviceNet Specification.
5/1/5	GET	uint	2	Consumed Connection ID	See DeviceNet Specification.
5/1/6	GET	usint	1	Initial Communication Characteristics	See DeviceNet Specification.
5/1/7	GET	uint	2	Produced Connection Size	See DeviceNet Specification.
5/1/8	GET	uint	2	Consumed Connection Size	See DeviceNet Specification.
5/1/9	GET/SET	uint	2	Expected Packet Rate	See DeviceNet Specification.
5/1/10	-	-	-	-	Not Defined.
5/1/11	-	-	-	-	Not Defined.
5/1/12	GET	usint	1	Timeout Action	See DeviceNet Specification.
5/1/13	GET	uint	2	Produced Connection Path Length	See DeviceNet Specification.
5/1/14	GET	array	6	Produced Connection Path	See DeviceNet Specification.
5/1/15	GET	uint	2	Consumed Connection Path Length	See DeviceNet Specification.
5/1/16	GET	array	6	Consumed Connection Path	See DeviceNet Specification.
5/1/17	GET	uint	2	Production Inhibit Time	See DeviceNet Specification.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive DeviceNet Option Board.

## Connection Class (continued)

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
5/2/1	GET	usint	1	State	0 Non-existent 1 Configuring 2 Waiting for Connection ID 3 Established 4 Timed Out
5/2/2	GET	usint	1	Instance Type	1 = Polled I/O Message Connection.
5/2/3	GET	usint	1	Transport Class Trigger	See DeviceNet Specification.
5/2/4	GET	uint	2	Produced Connection ID	See DeviceNet Specification.
5/2/5	GET	uint	2	Consumed Connection ID	See DeviceNet Specification.
5/2/6	GET	usint	1	Initial Communication Characteristics	See DeviceNet Specification.
5/2/7	GET	uint	2	Produced Connection Size	See DeviceNet Specification.
5/2/8	GET	uint	2	Consumed Connection Size	See DeviceNet Specification.
5/2/9	GET/SET	uint	2	Expected Packet Rate	See DeviceNet Specification.
5/2/10	-	-	-	-	Not Defined.
5/2/11	-	-	-	-	Not Defined.
5/2/12	GET	usint	1	Timeout Action	See DeviceNet Specification.
5/2/13	GET	uint	2	Produced Connection Path Length	See DeviceNet Specification.
5/2/14	GET	structure	6	Produced Connection Path	See DeviceNet Specification.
5/2/15	GET	uint	2	Consumed Connection Path Length	See DeviceNet Specification.
5/2/16	GET	structure	6	Consumed Connection Path	See DeviceNet Specification.
5/2/17	GET	uint	2	Production Inhibit Time	See DeviceNet Specification.
5/2/100	GET/SET	usint	1	Produced Connection Path	20, 21, 23, 120, 121, 123, 124, 125, 126 See Chapter 7 (70 default).
5/2/101	GET/SET	usint	1	Consumed Connection Path	70, 71, 72, 73, 130, 131, 132, 134, 135, 136 See Chapter 7 (20 default).

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive DeviceNet Option Board.

## Motor Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes																						
40/0/1	GET	uint	2	Motor Object Revision	The DeviceNet specification revision of the Motor Object.																						
40/0/6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.																						
40/0/7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.																						
40/1/1	GET	usint	1	Number of Motor Attributes Supported	7																						
40/1/2	-	array	-	Motor Attribute List	-																						
40/1/3	GET/SET	usint	1	Motor Type	<table border="1"> <tr><td>0</td><td>Non-standard motor</td></tr> <tr><td>1</td><td>PM DC Motor</td></tr> <tr><td>2</td><td>FC DC Motor</td></tr> <tr><td>3</td><td>PM Synchronous Motor</td></tr> <tr><td>4</td><td>FC synchronous Motor</td></tr> <tr><td>5</td><td>Switched Reluctance Motor</td></tr> <tr><td>6</td><td>Wound Rotor Induction Motor (default)</td></tr> <tr><td>7</td><td>Squirrel Cage Induction Motor</td></tr> <tr><td>8</td><td>Stepper Motor</td></tr> <tr><td>9</td><td>Sinusoidal PM BL Motor</td></tr> <tr><td>10</td><td>Trapezoidal PM BL Motor</td></tr> </table>	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 (default)	7	Squirrel Cage Induction Motor	8	Stepper Motor	9	Sinusoidal PM BL Motor	10	Trapezoidal PM BL Motor
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 (default)																										
7	Squirrel Cage Induction Motor																										
8	Stepper Motor																										
9	Sinusoidal PM BL Motor																										
10	Trapezoidal PM BL Motor																										
40/1/4	-	string	-	Motor Catalog Number	Motor Manufacturer's Catalog Number.																						
40/1/5	-	string	-	Motor Manufacturer	Motor Manufacturer's Name.																						
40/1/6	GET/SET	uint	2	Motor Rated Current	Units: 0.1 Amps NOTE: This setting is not the same as Drive parameter E2-01 (Path 107 / 1 / 15). The setting of 40 / 1 / 6 does not effect Drive operation (Drive model dependent default).																						
40/1/7	GET/SET	uint	2	Motor Rated Voltage	Units: Volts (230 or 460 Volts default)																						
40/1/8	-	udint	4	Motor Rated Power	Units: Watts																						
40/1/9	GET/SET	uint	2	Motor Rated Frequency	Units: Hz (60 Hz default)																						
40/1/10	-	uint	2	Motor Rated Temperature	Units: degrees C																						
40/1/11	GET/SET	uint	2	Motor Maximum Speed	Units: RPM (1800 RPM default)																						
40/1/12	-	uint	2	Motor Pole Count	Number of poles of the motor																						
40/1/13	-	udint	4	Motor Torque Constant	Units: 0.001 X Nm/A																						
40/1/14	-	udint	4	Motor Rotor Inertia	Units: 10 <sup>-6</sup> X kg*m <sup>2</sup>																						
40/1/15	GET/SET	uint	2	Motor Base Speed	Units: RPM (1750 RPM default)																						
40/1/19	-	usint	1	Service Factor	Units: %																						

\* The Motor Class is required for compliance with the AC Drive Profile. Instance 1, Attributes 3, 6 and 7 are required. All other attributes are optional.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive DeviceNet Option Board.

## Control Supervisor Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
41 / 0 / 1	GET	uint	2	Control Supervisor Object Revision	The DeviceNet specification revision of this Object.
41 / 0 / 6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
41 / 0 / 7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
41 / 1 / 1	GET	usint	1	Number of Control Attributes Supported	13
41 / 1 / 2	-	array	-	Control Supervisor Attribute List	-
41 / 1 / 3	GET/SET	bool	1	Run 1	1 Run forward command
41 / 1 / 4	GET/SET	bool	1	Run 2	1 Run reverse command
41 / 1 / 5	GET/SET	bool	1	Network Control Enable	0 Control from Local Option Board 1 Control from DeviceNet
41 / 1 / 6	GET	usint	1	State	0 Vendor Specific 1 Startup 2 Not Ready 3 Ready 4 Enabled 5 Stopping 6 Fault Stop 7 Faulted
41 / 1 / 7	GET	bool	1	Running 1	1 Drive is running in the forward direction
41 / 1 / 8	GET	bool	1	Running 2	1 Drive is running in the reverse direction
41 / 1 / 9	GET	bool	1	Ready	1 Drive is ready for operation
41 / 1 / 10	GET	bool	1	Faulted	1 Drive fault is active
41 / 1 / 11	GET	bool	1	Warning	1 Drive warning is active
41 / 1 / 12	GET/SET	bool	1	Fault Reset	1 Fault reset command
41 / 1 / 13	-	uint	2	Fault Code	See DeviceNet Specification.
41 / 1 / 14	-	uint	2	Warning Code	See DeviceNet Specification.
41 / 1 / 15	GET	bool	1	Network Control Enable Status	0 Control from Local Option Board 1 Control from DeviceNet
41 / 1 / 16	-	usint	1	DeviceNet Fault Mode	See DeviceNet Specification.
41 / 1 / 17	-	bool	1	Forced Fault	See DeviceNet Specification.
41 / 1 / 18	-	bool	1	Forced Fault Status	See DeviceNet Specification.
41 / 1 / 100	GET/SET	uint	2	Default Network Control (b1-02)	0 Digital Operator 1 Terminals (default) 2 Modbus Serial Communication 3 Option Board (DeviceNet)

\* The Control Supervisor Class is required for compliance with the AC Drive Profile. Instance 1, Attributes 3, 7, 10 and 12 are required.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive DeviceNet Option Board.

## AC Drive Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
42/0/1	GET	uint	2	AC Drive Object Revision	The DeviceNet specification revision of the AC Drive Object.
42/0/2	GET	uint	2	Max Instance in this Class	1
42/0/6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
42/0/7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
42/1/1	GET	usint	1	# of AC Drive Attributes Supported	23
42/1/2	-	structure	-	AC Drive Attribute List	-
42/1/3	GET	bool	1	At Reference	Drive is at set frequency.
42/1/4	GET/SET	bool	1	Network Speed Reference Enable	0 Speed Reference from Local Option Board 1 Speed Reference from DeviceNet
42/1/5	-	bool	1	Network Process Reference Enable	0 Process Reference not from DeviceNet 1 Process Reference from DeviceNet
42/1/6	GET	usint	1	Drive Mode	0 Vendor Specific 1 Open Loop Speed (F7 and G7 only). 2 Closed Loop Speed (F7 and G7 only).
42/1/7	GET	int	2	Drive Actual Speed	Units: RPM / 2 <sup>Speed_Scale</sup>
42/1/8	GET/SET	int	2	Drive Speed Reference	Units: RPM / 2 <sup>Speed_Scale</sup>
42/1/9	GET	int	2	Drive Actual Current	Units: 0.1 Amps / 2 <sup>Current_Scale</sup>
42/1/10	GET	int	2	Drive Current Limit	Units: 0.1 Amps / 2 <sup>Current_Scale</sup>
42/1/11	GET	int	2	Drive Actual Torque	Units: Nm / 2 <sup>Torque_Scale</sup> (F7 and G7 only).
42/1/12	GET/SET	int	2	Drive Torque Reference	Units: Nm / 2 <sup>Torque_Scale</sup> (F7 and G7 only).
42/1/13	-	int	2	Drive Actual Process Control Value	Units: % / 2 <sup>Process_Scale</sup>
42/1/14	-	int	2	Drive Process Control Setpoint	Units: % / 2 <sup>Process_Scale</sup>
42/1/15	GET	int	2	Drive Actual Power	Units: Watts / 2 <sup>Power_Scale</sup> For the Drive, Power_Scale is fixed at 4. Therefore, the units for power are <u>Watts/16</u> . To convert from <u>Watts</u> to <u>Watts/16</u> you must divide by 16. For example: 80.0 Watts = 5 Watts/16.
42/1/16	GET	int	2	Drive Input Voltage	Units: Volts / 2 <sup>Voltage_Scale</sup>

\* The AC Drive Class is required for compliance with the AC Drive Profile. Instance 1, Attributes 4, 6, 7 and 8 are required. All other attributes are optional.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

## AC Drive Class (continued)

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
42 / 1 / 17	GET	int	2	Drive Output Voltage	Units: Volts / 2 <sup>Voltage_Scale</sup>
42 / 1 / 18	GET	uint	2	Drive Acceleration Time	Units: msec / 2 <sup>Time_Scale</sup> For the Drive, Time_Scale is fixed at 4. Therefore, the units for acceleration are msec/16. To convert from msec to msec/16 you must divide by 16. For example: 10.0 sec = 10000 msec = 625 msec/16
42 / 1 / 19	GET	uint	2	Drive Deceleration Time	Units: msec / 2 <sup>Time_Scale</sup> For the Drive, Time_Scale is fixed at 4. Therefore, the units for acceleration are msec/16. To convert from msec to msec/16 you must divide by 16. For example: 10.0 sec = 10000 msec = 625 msec/16
42 / 1 / 20		uint	2	Drive Minimum Speed Limit	Units: RPM / 2 <sup>Speed_Scale</sup>
42 / 1 / 21		uint	2	Drive Maximum Speed Limit	Units: RPM / 2 <sup>Speed_Scale</sup>
42 / 1 / 22	GET	sint	1	Speed Scale Factor	0
42 / 1 / 23	GET	sint	1	Current Scale Factor	0
42 / 1 / 24	GET/SET	sint	1	Torque Scale Factor	0 (F7 and G7 only).
42 / 1 / 25		sint	1	Process Scale Factor	0
42 / 1 / 26	GET	sint	1	Power Scale Factor	4
42 / 1 / 27	GET	sint	1	Voltage Scale Factor	0
42 / 1 / 28	GET	sint	1	Time Scale Factor	4
42 / 1 / 29	GET	bool	1	Network Reference Enable Status	0 Speed Reference from Local Option Board 1 Speed Reference from DeviceNet
42 / 1 / 30		bool	1	Network Process Reference Enable Status	0 Process Reference not from DeviceNet 1 Process Reference from DeviceNet
42 / 1 / 100	GET/SET	bool	1	Reference Source (b1-01)	0 Digital Operator 1 Terminals (default) 2 Modbus Serial Communication 3 Option Board (DeviceNet)

\* The AC Drive Class is required for compliance with the AC Drive Profile. Instance 1, Attributes 4, 6, 7 and 8 are required. All other attributes are optional.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the Drive DeviceNet Option Board.

## Yaskawa Command Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
100/0/1	GET	uint	2	Yaskawa Object Revision	The DeviceNet specification revision of the Yaskawa Object.
100/0/2	GET	uint	2	Max Instance in this Class	1
100/0/6		uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented
100/0/7		uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented
100/1/1	GET/SET	uint	2	Operation Command	Bit 0 Forward Run/Stop Bit 1 Reverse Run/Stop Bit 2 Terminal S3 Function Bit 3 Terminal S4 Function Bit 4 Terminal S5 Function Bit 5 Terminal S6 Function Bit 6 Terminal S7 Function Bit 7 Terminal S8 Function (F7 and G7 only) Bit 8 External Fault Bit 9 Fault Reset
100/1/2	GET/SET	uint	2	Frequency Reference	0.01 Hz
100/1/3	GET/SET	uint	2	Torque Reference	0.1 % Flux Vector mode only (F7 and G7 only)
100/1/4	GET/SET	uint	2	Torque Compensation	0.1 % Flux Vector mode only (F7 and G7 only)
100/1/5				Reserved for Future Use	
100/1/6	GET/SET	uint	2	Analog Output FM Setting	Terminal FM -10V/-660 ~ +10V/+660
100/1/7	GET/SET	uint	2	Analog Output AM Setting	Terminal AM -10V/-660 ~ +10V/+660
100/1/8	GET/SET	uint	2	Digital Output Setting	Bit 0 Close Multi-function Output Terminal M1-M2 Bit 1 Close Multi-function Output Terminal M3-M4 Bit 2 Close Multi-function Output Terminal M5-M6 (F7 and G7 only) Bit 3 Not Used Bit 4 Not Used Bit 5 Not Used Bit 6 Enable Fault Contact Bit 7 Close Fault Contact (effective only when bit 6 = 1)

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

\* Drive products may provide additional inputs and outputs than are supported through DeviceNet.  
Example: G7 models have 12 digital inputs and 8 digital outputs are supported through DeviceNet.

## Yaskawa Command Class (continued)

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
100 / 1 / 9				Reserved for Future Use	
100 / 1 / 10				Reserved for Future Use	
100 / 1 / 11				Reserved for Future Use	
100 / 1 / 12				Reserved for Future Use	
100 / 1 / 13				Reserved for Future Use	
100 / 1 / 14				Reserved for Future Use	
100 / 1 / 15				Reserved for Future Use	
100 / 1 / 16				Reserved for Future Use	
100 / 1 / 17	GET/SET	uint	2	Run/Stop Command	Access through Modbus Block Transfer.
100 / 1 / 251	GET/SET	uint	2	Explicit Retry Time	
100 / 1 / 252	GET/SET	uint	2	Explicit Modbus Timeout	
100 / 1 / 253	GET/SET	uint	2	Polled Modbus Timeout	
100 / 1 / 254	GET/SET	uint	2	ACCEPT Command	Writing this parameter to the Drive will save the current values of all Drive parameters (A1-00 through 03-02) to RAM memory on the Drive. Values saved in RAM memory will not be retained in case of power loss to the Drive.
100 / 1 / 255	GET/SET	uint	2	ENTER Command	Writing this parameter to the Drive will save the current values of all Drive parameters (A1-00 through 03-02) to the EEPROM memory on the Drive. Values saved in EEPROM memory will be retained in case of power loss to the Drive.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

## Yaskawa Drive Status Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
101/0/1	GET	uint	2	Yaskawa Object Revision	The DeviceNet specification revision of the Yaskawa Object.
101/0/2	GET	uint	2	Max Instance in this Class	1
101/0/6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
101/0/7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
101/1/1	GET	uint	2	Inverter Status	
101/1/2	GET	uint	2	Motor Speed	Monitor U1-05 (F7 and G7 only).
101/1/3	GET	uint	2	Torque Reference	Monitor U1-09 (F7 and G7 only).
101/1/4	GET	uint	2	PG Count	(F7 and G7 only).
101/1/5	GET	uint	2	Speed Reference	Monitor U1-01.
101/1/6	GET	uint	2	Output Frequency	Monitor U1-02.
101/1/7	GET	uint	2	Output Current	Monitor U1-03.
101/1/8	GET	uint	2	Analog Input Terminal A2 Input Level	Monitor U1-16.
101/1/9	GET	uint	2	DC Bus Voltage	Monitor U1-07.
101/1/10	GET	uint	2	Fault Content 1	
101/1/11	GET	uint	2	Fault Content 2	
101/1/12	GET	uint	2	Fault Content 3	
101/1/13	GET	uint	2	Analog Input Terminal A3 Input Level	Monitor U1-17.
101/1/14	GET	uint	2	DI - Input Terminal Status	Monitor U1-10.
101/1/15	GET	uint	2	Analog Input Terminal A1 Input Level	Monitor U1-15.
101/1/16	GET	uint	2	PG Count Channel 2	(F7 and G7 only).
101/1/17	GET	uint	2	Operator Status	
101/1/18	GET	uint	2	OPE#	
101/1/19	GET	uint	2	CPF Content 1	
101/1/20	GET	uint	2	CPF Content 2	
101/1/21	GET	uint	2	Minor Fault Content 1	
101/1/22	GET	uint	2	Minor Fault Content 2	

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

# Yaskawa DRIVE U Parameter Class

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
102/0/1	GET	uint	2	Yaskawa Object Revision	The DeviceNet specification revision of the Yaskawa Object.
102/0/2	GET	uint	2	Max Instance in this Class	1
102/0/6	-	uint	2	Max Class Attribute Number	The number of the last Class Attribute Implemented.
102/0/7	-	uint	2	Max Instance Attribute Number	The number of the last Instance Attribute Implemented.
102/1/1	GET	uint	2	Frequency Reference	U1-01 Speed Reference in Hz X 100 (6000 = 60.0 Hz).
102/1/2	GET	uint	2	Output Frequency	U1-02 See Drive Users Manual.
102/1/3	GET	uint	2	Output Current	U1-03 See Drive Users Manual.
102/1/4	GET	uint	2	Control Method	U1-04 See Drive Users Manual.
102/1/5	GET	uint	2	Motor Speed	U1-05 See Drive Users Manual (F7 and G7 only).
102/1/6	GET	uint	2	Output Voltage	U1-06 See Drive Users Manual.
102/1/7	GET	uint	2	DC Bus Voltage	U1-07 See Drive Users Manual.
102/1/8	GET	uint	2	Output Power	U1-08 See Drive Users Manual.
102/1/9	GET	uint	2	Torque Reference	U1-09 See Drive Users Manual (F7 and G7 only).
102/1/10	GET	uint	2	Input Terminal Status	U1-10 See Drive Users Manual.
102/1/11	GET	uint	2	Output Terminal Status	U1-11 See Drive Users Manual.
102/1/12	GET	uint	2	Operation Status	U1-12 See Drive Users Manual.
102/1/13	GET	uint	2	Elapsed Time	U1-13 See Drive Users Manual.
102/1/14	GET	uint	2	Software No. (FLASH ID No.)	U1-14 See Drive Users Manual.
102/1/15	GET	uint	2	Control Circuit Terminal A1 Input Level	U1-15 See Drive Users Manual.
102/1/16	GET	uint	2	Control Circuit Terminal A2 Input Level	U1-16 See Drive Users Manual.
102/1/17	GET	uint	2	Control Circuit Terminal A3 Input Level	U1-17 See Drive Users Manual (F7 and G7 only).
102/1/18	GET	uint	2	Motor Secondary Current (Iq)	U1-18 See Drive Users Manual.
102/1/19	GET	uint	2	Motor Excitation Current (Id)	U1-19 See Drive Users Manual (F7 and G7 only).
102/1/20	GET	uint	2	Output Frequency after Soft-start	U1-20 See Drive Users Manual.
102/1/21	GET	uint	2	Automatic Speed Regulator (ASR) Input	U1-21 See Drive Users Manual (F7 and G7 only).
102/1/22	GET	uint	2	Automatic Speed Regulator (ASR) Output	U1-22 See Drive Users Manual (F7 and G7 only).
102/1/23	GET	uint	2	Speed Deviation Regulator Input	U1-23 See Drive Users Manual (F7 and G7 only).
102/1/24	GET	uint	2	PID Feedback Amount	U1-24 See Drive Users Manual.
102/1/25	GET	uint	2	DI-16H2 Input Status	U1-25 See Drive Users Manual (F7 and G7 only).
102/1/26	GET	uint	2	Output Voltage Reference Vq	U1-26 See Drive Users Manual (F7 and G7 only).
102/1/27	GET	uint	2	Output Voltage Reference Vd	U1-27 See Drive Users Manual (F7 and G7 only).
102/1/28	GET	uint	2	Software No. CPU	U1-28 See Drive Users Manual.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

## Yaskawa DRIVE U Parameter Class (continued)

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
102/1/28	GET	uint	2	KWh Lower 4 Digits	U1-29 See Drive Users Manual.
102/1/29	GET	uint	2	KWh Upper 5 Digits	U1-30 See Drive Users Manual.
102/1/30	GET	uint	2	ACR(q) Output	U1-32 See Drive Users Manual (F7 and G7 only).
102/1/31	GET	uint	2	ACR(d) Output	U1-33 See Drive Users Manual (F7 and G7 only).
102/1/32	GET	uint	2	OPE Fault	U1-34 See Drive Users Manual.
102/1/33	GET	uint	2	Zero Servo Pulse Count	U1-35 See Drive Users Manual (F7 and G7 only).
102/1/34	GET	uint	2	PID Input	U1-36 See Drive Users Manual.
102/1/35	GET	uint	2	PID Output	U1-37 See Drive Users Manual.
102/1/36	GET	uint	2	PID Setpoint	U1-38 See Drive Users Manual.
102/1/37	GET	uint	2	Modbus Communication Error Code	U1-39 See Drive Users Manual.
102/1/38	GET	uint	2	Heatsink Fan Operation Time	U1-40 See Drive Users Manual.
102/1/39	GET	uint	2	ASR Output without Filter	U1-44 See Drive Users Manual (F7 and G7 only).
102/1/40	GET	uint	2	Feed Forward Control Output	U1-45 See Drive Users Manual (F7 and G7 only).
102/1/41	GET	uint	2	Current Fault	U2-01 See Drive Users Manual.
102/1/42	GET	uint	2	Last Fault	U2-02 See Drive Users Manual.
102/1/43	GET	uint	2	Frequency Ref. at Fault	U2-03 See Drive Users Manual.
102/1/44	GET	uint	2	Output Frequency at Fault	U2-04 See Drive Users Manual.
102/1/45	GET	uint	2	Output Current at Fault	U2-05 See Drive Users Manual.
102/1/46	GET	uint	2	Motor Speed at Fault	U2-06 See Drive Users Manual.
102/1/47	GET	uint	2	Output Voltage at Fault	U2-07 See Drive Users Manual.
102/1/48	GET	uint	2	DC Bus Voltage at Fault	U2-08 See Drive Users Manual.
102/1/49	GET	uint	2	Output kWatts at Fault	U2-09 See Drive Users Manual.
102/1/50	GET	uint	2	Torque Reference at Fault	U2-10 See Drive Users Manual. (F7 and G7 only).
102/1/51	GET	uint	2	Input Terminal Status at Fault	U2-11 See Drive Users Manual.
102/1/52	GET	uint	2	Output Terminal Status at Fault	U2-12 See Drive Users Manual.
102/1/53	GET	uint	2	Drive Status at Fault	U2-13 See Drive Users Manual.
102/1/54	GET	uint	2	Elapsed Time at Fault	U2-14 See Drive Users Manual.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

## Yaskawa DRIVE U Parameter Class (continued)

DeviceNet Path*	DeviceNet Services	DeviceNet Data Type	# of Bytes	Description	Notes
102/1/55	GET	uint	2	Last Fault	U3-01 See Drive Users Manual.
102/1/56	GET	uint	2	Fault Message 2	U3-02 See Drive Users Manual.
102/1/57	GET	uint	2	Fault Message 3	U3-03 See Drive Users Manual.
102/1/58	GET	uint	2	Fault Message 4	U3-04 See Drive Users Manual.
102/1/59	GET	uint	2	Elapsed Time 1	U3-05 See Drive Users Manual.
102/1/60	GET	uint	2	Elapsed Time 2	U3-06 See Drive Users Manual.
102/1/61	GET	uint	2	Elapsed Time 3	U3-07 See Drive Users Manual.
102/1/62	GET	uint	2	Elapsed Time 4	U3-08 See Drive Users Manual.
102/1/63	GET	uint	2	Fault Message 5	U3-09 See Drive Users Manual.
102/1/64	GET	uint	2	Fault Message 6	U3-10 See Drive Users Manual.
102/1/65	GET	uint	2	Fault Message 7	U3-11 See Drive Users Manual.
102/1/66	GET	uint	2	Fault Message 8	U3-12 See Drive Users Manual.
102/1/67	GET	uint	2	Fault Message 9	U3-13 See Drive Users Manual.
102/1/68	GET	uint	2	Fault Message 10	U3-14 See Drive Users Manual.
102/1/69	GET	uint	2	Elapsed Time 5	U3-15 See Drive Users Manual.
102/1/70	GET	uint	2	Elapsed Time 6	U3-16 See Drive Users Manual.
102/1/71	GET	uint	2	Elapsed Time 7	U3-17 See Drive Users Manual.
102/1/72	GET	uint	2	Elapsed Time 8	U3-18 See Drive Users Manual.
102/1/73	GET	uint	2	Elapsed Time 9	U3-19 See Drive Users Manual.
102/1/74	GET	uint	2	Elapsed Time 10	U3-20 See Drive Users Manual.

\* The DeviceNet Path is given in the format: *Class ID / Instance ID / Attribute ID*.

\* Attributes shown in GREY are not supported by the DRIVE DeviceNet Option Board.

# Appendix B

## Drive Assemblies

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- Output Assemblies – Polled Consuming Assembly
- Input Assemblies – Polled Producing Assembly

## Output Assemblies – Polled Consuming Assembly

Output Assemblies – Polled Consuming Assembly											
Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
20 Basic Speed Command	4 bytes	0	-	-	-	-	-	Fault Reset	-	Run Forward	
		1	-	-	-	-	-	-	-	-	
		2	Speed Reference in RPM (Low Byte)								
		3	Speed Reference in RPM (High Byte)								
21 Extended Speed Command	4 bytes	0	-	Network Reference	Network Control	-	-	Fault Reset	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	-	-	
		2	Speed Reference in RPM (Low Byte)								
		3	Speed Reference in RPM (High Byte)								
22 Basic Speed/ Torque Command	6 bytes	0	-	-	-	-	-	Fault Reset	-	Run Forward	
		1	-	-	-	-	-	-	-	-	
		2	Speed Reference in RPM (Low Byte)								
		3	Speed Reference in RPM (High Byte)								
		4	Torque Reference in N-m*(2 <sup>torque_scale</sup> ) (Low Byte) *3								
5	Torque Reference in N-m*(2 <sup>torque_scale</sup> ) (High Byte) *3										
23 Extended Speed/ Torque Command	6 bytes	0	-	Network Reference	Network Control	-	-	Fault Reset	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	-	-	
		2	Speed Reference in RPM (Low Byte)								
		3	Speed Reference in RPM (High Byte)								
		4	Torque Reference in N-m*(2 <sup>torque_scale</sup> ) (Low Byte) *3								
5	Torque Reference in N-m*(2 <sup>torque_scale</sup> ) (High Byte) *3										

Output Assemblies – Polled Consuming Assembly (continued)											
Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
120 *4 Speed Command 1	4 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Speed Reference in Hz X 100 (Low Byte) *2								
121 *4 Torque Command 1	4 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Torque Reference % of rated X 10 (Low Byte) *3								
122 *4 Speed Command 2	6 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Speed Reference in Hz X 100 (Low Byte) *2								
123 *4 Torque Command 2	6 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Torque Reference % of rated X 10 (Low Byte) *3								
		3	Torque Reference % of rated X 10 (High Byte) *3								
		4	Network Reference (b1-01)								
		5	Network Control (b1-02)								
		0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Torque Reference % of rated X 10 (Low Byte) *3								
		3	Torque Reference % of rated X 10 (High Byte) *3								
		4	Network Reference (b1-01)								
		5	Network Control (b1-02)								

### Output Assemblies – Polled Consuming Assembly (continued)

Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
124 *4 Speed Command 3	8 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	Service Code (Read, Write)								
		2	Class Number to Read/Write								
		3	Attribute Number to Read/Write								
		4	Data (Low Byte)								
		5	Data (High Byte)								
		6	Speed Reference in Hz X 100 (Low Byte) *2								
		7	Speed Reference in Hz X 100 (High Byte) *2								
125 *4 Torque Command 3	8 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	Service Code (Read, Write)								
		2	Class Number to Read/Write								
		3	Attribute Number to Read/Write								
		4	Data (Low Byte)								
		5	Data (High Byte)								
		6	Torque Reference % of rated X 10 (Low Byte) *3								
		7	Torque Reference % of rated X 10 (High Byte) *3								
126 *4 Speed and Torque Command 1	8 bytes	0	Terminal S8 Function *3	Terminal S7 Function	Terminal S6 Function	Terminal S5 Function	Terminal S4 Function	Terminal S3 Function	Run Reverse	Run Forward	
		1	-	-	-	-	-	-	Fault Reset	External Fault	
		2	Speed Reference in Hz X 100 (Low Byte) *2								
		3	Speed Reference in Hz X 100 (High Byte) *2								
		4	Torque Reference % of rated X 10 (Low Byte) *3								
		5	Torque Reference % of rated X 10 (High Byte) *3								
		6	Torque Compensation % of rated X 10 (Low Byte)								
		7	Torque Compensation % of rated X 10 (High Byte)								

## Input Assemblies – Polled Producing Assembly

Input Assemblies – Polled Producing Assembly											
Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
70 Basic Speed Status	4 bytes	0	-	-	-	-	-	Running Forward	-	Drive Fault	
		1	-	-	-	-	-	-	-	-	
		2	Output Speed in RPM (Low Byte)								
		3	Output Speed in RPM (High Byte)								
71 Extended Speed Status	4 bytes	0	At Reference	Reference from DNet	Control from DNet	Drive Ready	Running Reverse	Running Forward	Drive Alarm	Drive Fault	
		1	Drive State								
		2	Output Speed in RPM (Low Byte)								
		3	Output Speed in RPM (High Byte)								
72 Basic Speed/Torque Status	6 bytes	0	-	-	-	-	-	Running Forward	-	Drive Fault	
		1	-	-	-	-	-	-	-	-	
		2	Output Speed in RPM (Low Byte)								
		3	Output Speed in RPM (High Byte)								
		4	Output Torque N-m x (2 <sup>torque_scale</sup> ) (Low Byte) *3								
		5	Output Torque N-m x (2 <sup>torque_scale</sup> ) (High Byte) *3								
73 Extended Speed/Torque Status	6 bytes	0	At Reference	Reference from DNet	Control from DNet	Drive Ready	Running Reverse	Running Forward	Drive Alarm	Drive Fault	
		1	Drive State								
		2	Output Speed in RPM (Low Byte)								
		3	Output Speed in RPM (High Byte)								
		4	Output Torque N-m x (2 <sup>torque_scale</sup> ) (Low Byte) *3								
		5	Output Torque N-m x (2 <sup>torque_scale</sup> ) (High Byte) *3								

**Input Assemblies – Polled Producing Assembly (continued)**

Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
<b>130</b> *4	4 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running	
		1	Zero Servo Complete *3	Motor Selection *3	Term M5-M6 Output *3	Term M3-M4 Output	Term M1-M2 Output	Local/Remote	During Ride-Thru		
		2			Output Speed in Hz x 100 (Low Byte) *2						
		3			Output Speed in Hz x 100 (High Byte) *2						
<b>131</b> *4	4 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running	
		1	Zero Servo Complete *3	Motor Selection *3	Term M5-M6 Output *3	Term M3-M4 Output	Term M1-M2 Output	Local/Remote	During Ride-Thru		
		2			Output Current in Amps x 100 (Low Byte) *1						
		3			Output Current in Amps x 100 (High Byte) *1						
<b>132</b> *4	6 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running	
		1	Zero Servo Complete *3	Motor Selection *3	Term M5-M6 Output *3	Term M3-M4 Output	Term M1-M2 Output	Local/Remote	During Ride-Thru		
		2			Output Current in Amps x 100 (Low Byte) *1						
		3			Output Current in Amps x 100 (High Byte) *1						
		4			Output Speed in Hz x 100 (Low Byte) *2						
		5			Output Speed in Hz x 100 (High Byte) *2						
<b>134</b> *4	8 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running	
		1			Service Code (Read, Written)						
		2			Class Number to Read/Written						
		3			Attribute Number to Read/Written						
		4			Data (Low Byte)						
		5			Data (High Byte)						
		6			Output Speed in Hz x 100 (Low Byte) *2						
		7			Output Speed in Hz x 100 (High Byte) *2						

### Input Assemblies – Polled Producing Assembly (continued)

Assembly	# of Bytes	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0		
135 *4  Current Status 2	8 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running		
		1	Service Code (Read, Written)									
		2	Class Number to Read/Written									
		3	Attribute Number to Read/Written									
		4	Data (Low Byte)									
		5	Data (High Byte)									
		6	Output Current in Amps x 100 (Low Byte) *1									
		7	Output Current in Amps x 100 (High Byte) *1									
136 *4  Torque and Speed Status	8 bytes	0	Drive Fault	Drive Alarm	Drive Ready	At Speed	Fault Reset Active	Drive Reversing	At Zero Speed	Running		
		1	Zero Servo Complete *3	Motor Selection *3	Term M5-M6 Output *3	Term M3-M4 Output	Term M1-M2 Output	Local/Remote	During Ride-Thru			
		2	Output Torque % x 10 (Low Byte)									
		3	Output Torque % x 10 (High Byte)									
		4	Motor Speed in Hz x 100 (Low Byte)									
		5	Motor Speed in Hz x 100 (High Byte)									
		6	Speed Reference in Hz x 100 (Low Byte)									
		7	Speed Reference in Hz x 100 (High Byte)									

**Notes:**

\*1 Output Current is given in Amps X 100 (For example 1000 = 10.00 Amps) for models F7U/G7U/P7U -20P4 to -27P5 and -40P4 to -47P5.  
 Output Current is given in Amps X 10 (For example 100 = 10.0 Amps) for models F7U/G7U/P7U -2011 to -2110 and -4011 to -4300.  
 This value is based on the drive capacity model.

\*2 Speed Reference and Output Speed are given in Hz X 100 (For example 2000 = 20.00 Hz)

\*3 F7 and G7 Drives only.

\*4 Yaskawa specific Polled Consuming or Polled Producing Assembly.

**Notes:**

# Appendix C

## DeviceNet Object Services

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- Identity Class
- DeviceNet Class
- Assembly Class
- Connection Class
- Motor Class
- Control Supervisor Class
- AC Drive Class
- Yaskawa Drive Command Class
- Yaskawa Drive Status Class
- Yaskawa Drive Monitor Class
- Yaskawa Drive Parameter Class

## Identity Class

Service Code (in hex)	Implemented		Service Name	Description	
	Class	Instance			
05h	no	yes	Reset	The Reset Service has one parameter of type USINT. The type of Reset that is performed depends on the value of this parameter. The possible values are:	
				0	This type of reset will emulate cycling power to the Drive.
				1	This type of reset will reset the Drive to out-of-the-box factory conditions. The Drive will be initialized for 2-wire control.
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.	
10h	no	yes	Set Attribute Single	Modifies an attribute value.	

## DeviceNet Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.

## Assembly Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.
10h	no	yes	Set Attribute Single	Modifies an attribute value.

## Connection Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.
10h	no	yes	Set Attribute Single	Modifies an attribute value.

## Motor Class

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Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.
10h	no	yes	Set Attribute Single	Modifies an attribute value.

## Control Supervisor Class

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Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
05h	no	yes	Reset	This type of reset will emulate cycling power to the Drive.
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.
10h	no	yes	Set Attribute Single	Modifies an attribute value.

## AC Drive Class

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Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute
10h	no	yes	Set Attribute Single	Modifies an attribute value.

## Yaskawa Drive Command Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute.
10h	no	yes	Set Attribute Single	Modifies an attribute value.
32h	no	yes	ENTER Command	The ENTER Command service will save the current values of all Drive parameters (A1-00 through o3-02) to the EEPROM memory on the Drive. Values saved in EEPROM memory will be retained in case of power loss to the Drive. This is a Vendor Specific service.
33h	yes	yes	ACCEPT Command	The ACCEPT Command service will save the current values of all Drive parameters (A1-00 through o3-02) to the Active RAM memory on the Drive. Values saved in Active RAM memory will not be retained in case of power loss to the Drive. This is a Vendor Specific service.

## Yaskawa Drive Status Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute

## Yaskawa Drive Monitor Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute

## Yaskawa Drive Parameter Class

Service Code (in hex)	Implemented		Service Name	Description
	Class	Instance		
0Eh	yes	yes	Get Attribute Single	Returns the contents of an attribute
10h	no	yes	Set Attribute Single	Modifies an attribute value.
32h	no	yes	ENTER Command	The ENTER Command service will save the current values of all Drive parameters (A1-00 through o3-02) to the EEPROM memory on the Drive. Values saved in EEPROM memory will be retained in case of power loss to the Drive. This is a Vendor Specific service.
33h	yes	yes	ACCEPT Command	The ACCEPT Command service will save the current values of all Drive parameters (A1-00 through o3-02) to the Active RAM memory on the Drive. Values saved in Active RAM memory will not be retained in case of power loss to the Drive. This is a Vendor Specific service.

**Notes:**

# Appendix D

## Product Specifications

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DeviceNet Option Board	
Ambient Temperature	-10 to +45 degrees C (+14 to +113 degrees F)
Storage Temperature	-20 to +60 degrees C (-4 to +140 degrees F)
Relative Humidity	90% non-condensing
Altitude	3300 feet
Vibration	1G at less than 20 Hz, 0.2 G at 20-50 Hz
Input Power	Voltage: 11 - 25 Vdc Current: 40 mA maximum

**Notes:**

# Appendix E

## Spare Parts List

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Description	Source	Part Number
DeviceNet Option Board	Yaskawa	CM056, CM057, CM058
DeviceNet Mating Connector	Yaskawa	05P00060-0474
	Beau	860505
DeviceNet Installation Guide	Yaskawa	IG.AFD.14
DeviceNet Technical Manual	Yaskawa	TM.AFD.14
Yaskawa Electronic Library CD-ROM	Yaskawa	CD.AFD7.01

**Notes:**



# DeviceNet™ Option (CM05x)



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