

# CM013 V7 DeviceNet™ Option Technical Manual



Document Number: TM.V7.16  
Models: CIMR-V7AM\* (software versions 8340 and 8350 only)

# Warnings and Cautions

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## 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 the 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.
- The 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 the rated voltage of the drive matches the voltage of the 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.

## CAUTION

- When using this kit, it is strongly recommended that no connections be made to the V7 Drive's DC Bus terminals (+1 and -) on models CIMR-V7AMxxxx, where xxxx is 25P5, 27P5, 45P5, or 47P5. A (+1 to +2) connection for a DC reactor is allowed.

## CAUTION

- Make sure that the V7AM software version is either 8340 or 8350. Check parameter n179 for current software revision.

# Introduction

This manual explains the specifications and handling of the Yaskawa *CM013 V7 DeviceNet Option* for the Yaskawa V7 drives with software ID 8340 or 8350 only. The *V7 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 user and/or programming manual. All technical manuals and EDS and support files can be found on the CD that came with the drive. They are also available for download at [www.yaskawa.com](http://www.yaskawa.com). Refer to the web site for the most recent information.

For information on DeviceNet contact the Open DeviceNet Vendors Organization at [www.odva.org](http://www.odva.org).

- **DriveWizard™ version 6.1 or later** with a custom database is required for DriveWizard to operate with this option. Install DriveWizard with the “Custom” install option checked and the appropriate databases selected.

*V7 and V74X Drive User Manual* document reference **TM.V7.01**

*V7 DeviceNet™ Option Kit* document reference **IG.V7.16**

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DriveWizard™ is a trademark of Yaskawa.

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# Chapter 1 Installation

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*This section describes how to install and set up the V7 DeviceNet Option.*

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# Installation Check Sheet

The following is a quick reference check list to install and configure the *V7 DeviceNet Option*. Make a copy of this page and check off  each item as it is completed. For detailed information please refer to the detailed sections that follow.

1.  **Unpack and Inspect.**  
Unpack the *V7 DeviceNet Option* and verify that all components are present and undamaged.  
Refer to the “**Unpack and Inspect**” section of this manual.
2.  **Verify Drive Operation:**  
Refer to the “**Verify Drive Operation**” section of this manual for details.
3.  **Install the *V7 DeviceNet Option* on the drive:**  
Refer to the “**Prepare the V7 Drive**” section of this manual for details.  
Refer to the “**Attach the Motor and Power Leads**” section of this manual for details.  
Refer to the “**Mount the V7 DeviceNet Option**” section of this manual for details.
4.  **Connect the *V7 DeviceNet Option* to the DeviceNet communication network:**  
Refer to the “**Connect to the V7 DeviceNet Option**” section of this manual.
5.  **Set the *V7 DeviceNet Option* network address and Baud Rate:**  
Refer to the “**Configure the V7 DeviceNet Option**” section of this manual for details.
6.  **Apply power to the drive and check diagnostic and operation LED status:**  
Refer to the “**Power-up Diagnostic LED Test Sequence**” section of this manual for details.  
Refer to the “**DeviceNet Operation LED Status**” section of this manual for details.

 **WARNING!**

Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

7.  **Verify that the drive is on the network:**  
Refer to the “**Verify that the Drive is on the Network**” section of this manual for details.  
  
Refer to the documentation included with the DeviceNet configuration utility supplied with the DeviceNet Master controller.  
Verify that the drive appears on the DeviceNet network at the correct node address.
8.  **Install the appropriate EDS file if desired.**  
Refer to the “**EDS Files**” section of this manual.
9.  **Configure the drive on the network.**  
Refer to the “**Configure the Drive on the Network**” section of this manual.
10.  **Configure the scanner.**  
Refer to the “**Configure the Scanner**” section of this manual.
11.  **Set the V7 Drive Parameters:**  
Refer to the “**Configure the V7 Drive**” section of this manual for details.  
Set parameters n003, n004 and n035 to their appropriate values.

 **CAUTION**

When using this kit, it is strongly recommended that no connections be made to the V7 Drive's DC Bus terminals (+1 and -) on models CIMR-V7AMxxxx, where xxxx is 25P5, 27P5, 45P5, or 47P5. A (+1 to +2) connection for a DC reactor is allowed.

 **CAUTION**

Make sure that the V7AM software version is either 8340 or 8350. Check parameter n179 for current software revision.

# Unpack and Inspect

Prior to unpacking, check the package label and verify that the product received matches the product ordered. Unpack the option and verify that the following items are included in the product package and are undamaged.

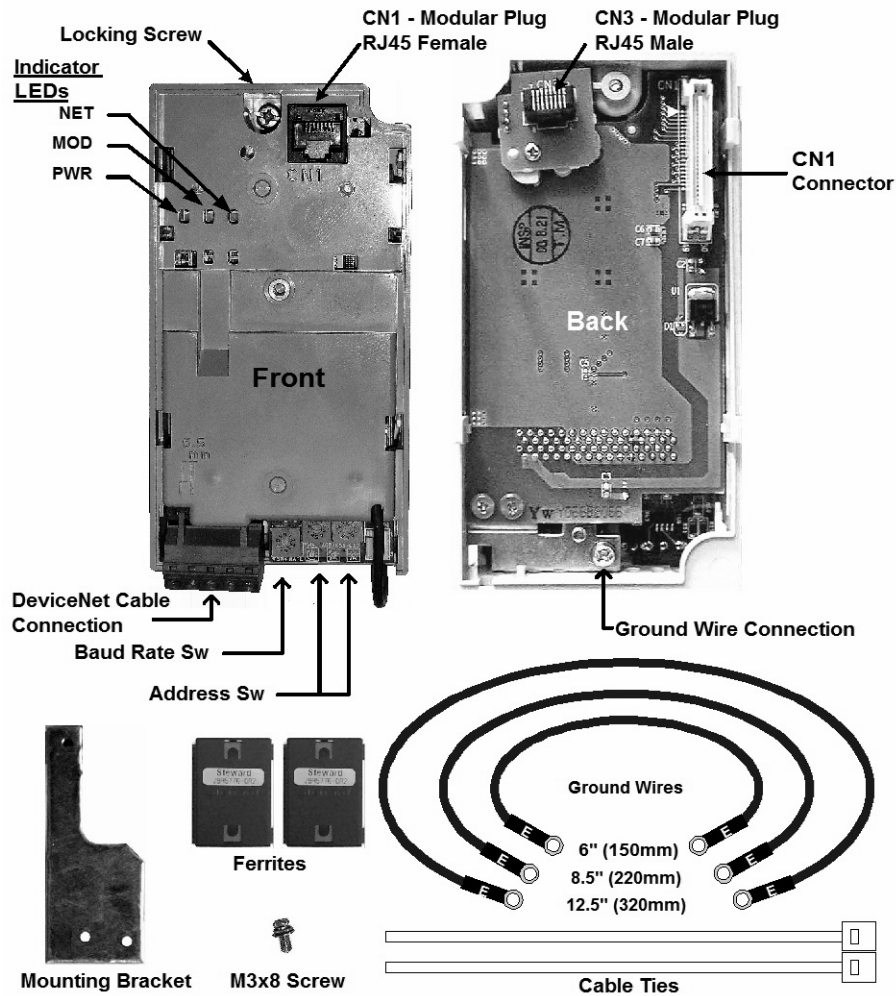


Fig 1.1 – V7 DeviceNet Option

Table 1.1 – Parts List	
Kit Parts	Qty.
V7 DeviceNet Option (CM013)	1
Option Mounting Bracket	1
Mounting Bracket Screw	1
Ferrite (Power & Motor Leads) (Steward 28A5776-0A2)	2
Cable Ties (UWS-0137)	2
6" Ground Wire (150 mm)	1
8.5" Ground Wire (220 mm)	1
12.5" Ground Wire (320 mm)	1
Installation Guide (IG.V7.16)	1



# Installation and Wiring

## ◆ Verify Drive Operation

Connect power to the drive and verify that the drive functions properly. This includes running the drive from the operator keypad. Refer to the *V7 and V74X Drives Technical Manual, TM.V7.01*, for information on connecting and operating the drive.

## ◆ Prepare the V7 Drive

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.

**⚠ WARNING!**

Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

2. Remove the operator and terminal cover retaining screw.
3. Remove the operator keypad.
4. Remove the terminal cover by lifting out the cover.
5. Remove the CN2 cover from the V7 drive housing. Carefully snip the 3 tabs connecting the CN2 cover to the V7 housing and remove the cover.
6. Attach the mounting bracket. Align the mounting bracket as shown in the figure to the right. Secure the mounting bracket to the V7 drive housing using the M3x8 screw provided.
7. Wire the V7 drive I/O, power and motor terminals prior to mounting the *V7 DeviceNet Option*, as the option will obscure the terminals when mounted.

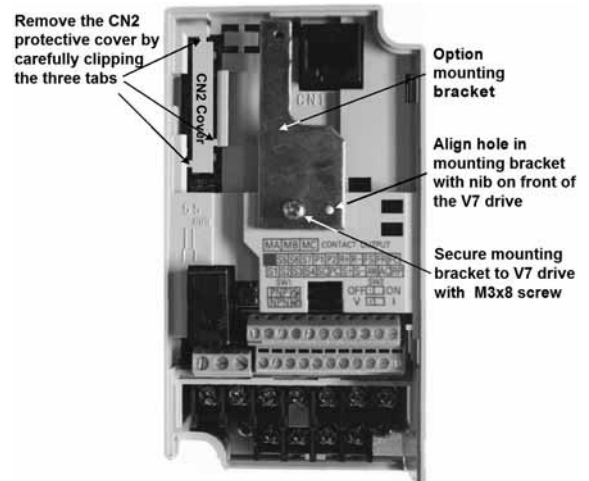


Fig 1.2 – Prepare the V7 Drive

## ◆ Attach Motor and Power Lead Ferrites

Attach the provided ferrites (Steward 28A5776-0A2) to the V7 drive motor and power leads as close to the V7 drive terminals as possible (typically within 1 foot). Secure the ferrites to the motor and power leads with the provided cable ties.

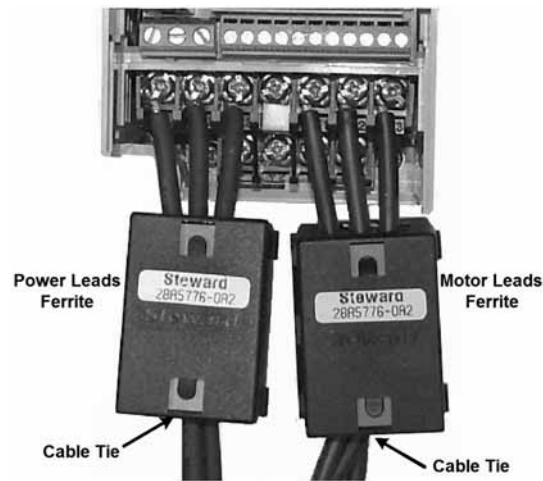


Fig 1.3 – Attach Ferrites

## ◆ Mount the V7 DeviceNet Option

1. Connect a ground wire of appropriate length from those provided to the ground connection on the back of the V7 DeviceNet Option.
2. Align the CN1 connector on the back of the option with its mating CN2 connector on the front of the V7 drive.
3. Simultaneously align connector CN3 (male RJ-45) on the back of the option with connector CN1 (female RJ-45) on the front of the V7 drive.
4. Align the tabs on the option with their corresponding slots on the front of the V7 drive.
5. Press the option and the V7 drive together until the tabs lock into their associated slots.
6. Secure the option to the V7 drive by tightening the locking screw at the top-center of the option.
7. Connect the ground wire to the ground screw on the V7 drive.

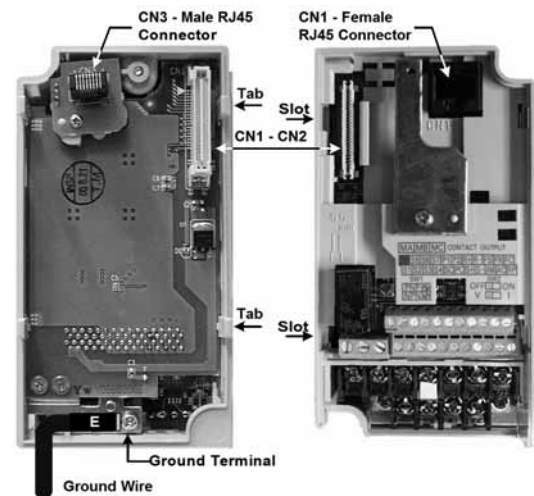


Fig 1.4 – Mount the V7 DeviceNet Option

## ◆ Connect to the V7 DeviceNet Option

Connect the DeviceNet network cable to the DeviceNet connector as shown. If the drive is the last device on a network segment make sure to install the terminating resistor (120Ω 1% metal film 1/4W) between the two CAN connections, 2 (Blue) and 4 (White).

Terminal	Color	Name	Wire Color	Description
1	Black	V-	Black	Network common
2	Blue	CAN_L	Blue	CAN Data Low
3	Green	Shield	Green	Cable Shield
4	White	CAN_H	White	CAN Data High
5	Red	V+	Red	+24VDC

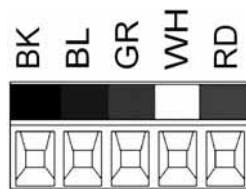


Fig 1.5 – DeviceNet Connector

## Configure the V7 DeviceNet Option

### ◆ Set the DeviceNet Option Card Baud Rate

Set the drive baud rate by selecting the appropriate **Baud Rate Sw** setting. Settings of 3 through 8 will load the previously stored baud rate. A setting of 9 will enable **Auto Baud**. The factory default setting is 3.

Setting	Description
0	125 kbps
1	250 kbps
2	500 kbps
3 ~ 8	NVRAM (Last stored baud rate) (3 = default setting)
9	Auto Sense

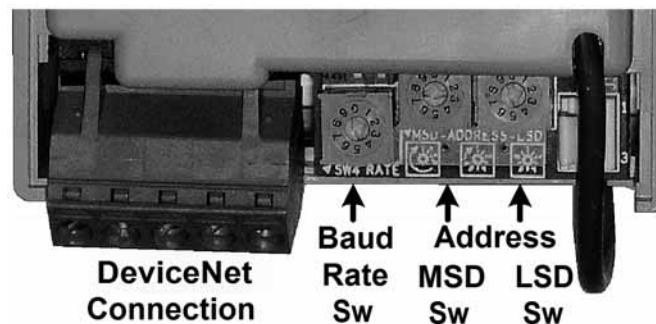


Fig 1.6 – DeviceNet Option Card

## ◆ Set the DeviceNet Option Card MAC ID

Set the drive MAC address by selecting the appropriate settings of the address **MSD** and **LSD** switches. The **MSD** switch sets the MAC address's tens digit while the **LSD** switch sets the ones digit. Valid MAC addresses are 0 through 63 although addresses of 0, 1, 62 and 63 are typically reserved.

- Settings of 0 ~ 63: The MAC address will be selected from the **MSD** & **LSD** switch settings.
- Settings of 64 ~ 99: The MAC address will be set to the last saved MAC address. The CM013 comes from the factory with the MAC address switches set to 63 and the MAC address last saved to 63 (for use with some vendors' faulted or automatic device recovery features)
- For use with ADR-enabled controllers/scanners, power off the drive and set the MAC ID rotary switches to 63. Power cycle the drive ON and OFF. Change the MAC ID rotary switch setting to 64. Power the drive ON. The MAC ID will be set at 63 and can be reset through the DeviceNet network.

The drive must be power cycled to accept a new switch setting.

## LED Status

### ◆ Power-Up Diagnostic LED Status

A power-up diagnostic test is performed each time the device is powered up and after the initial boot sequence. The initial boot sequence may take several seconds. After the LEDs have gone through the DeviceNet diagnostic LED sequence, the *V7 DeviceNet Option* is successfully initialized. The LEDs will assume their operational conditions as shown below.

Seq	MOD	NET	Time
1	GREEN	OFF	250 ms
2	RED	OFF	250 ms
3	GREEN	OFF	250 ms
4	GREEN	GREEN	250 ms
5	GREEN	RED	250 ms
6	GREEN	OFF	

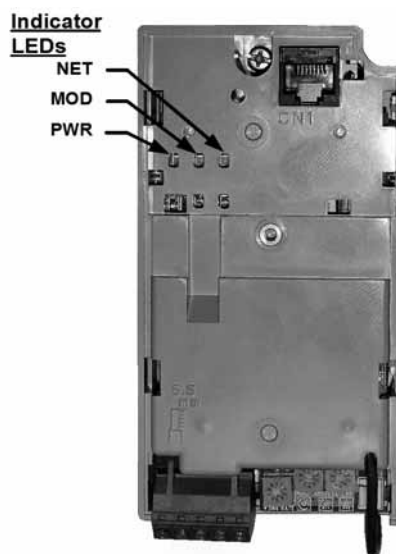


Fig 1.7 – LEDs

## ◆ DeviceNet Operation LED States

The operational states of the *V7 DeviceNet Option* LEDs after the DeviceNet diagnostic LED sequence has been completed is described below. Please wait at least 10 seconds for the loading process to complete before verifying the states of the LEDs.

Table 1.4 – DeviceNet Option LED States		
LED	State	Indicates
MOD	Off	No Power
	<b>On Green</b>	<b>Device Operational</b>
	Flash Green	Device in Standby
	Flash Red	Minor Fault
	On Red	Unrecoverable Fault
	Flash Red-Green	Device Self-Test
NET	Off	Not Powered/Not Online
	Flash Green	Online/Not Connected
	<b>On Green</b>	<b>Link OK/Online and Connected</b>
	Flash Red	Connection Timeout
	On Red	Critical Link Failure
	Flash Red & Green	Communication Faulted

## Verify that the Drive is on the Network

### ◆ Normal Operation LED States

The table below describes the *V7 DeviceNet Option Card* LED states under normal operation. The *V7 DeviceNet Option Card* has been properly connected to the DeviceNet network, configured on that network and is properly part of the scan list. The network is currently operational.

Table 1.5 – Normal Operation LED States		
LED	State	Indicates
MOD	<b>On Green</b>	<b>Device Operational</b>
NET	<b>On Green</b>	<b>Link OK/Online and Connected</b>

## ◆ DeviceNet Network

The example below refers to a DeviceNet network configured as shown. A Rockwell 1770-KFD module is used to interface a PC to the DeviceNet network.

Refer to the documentation included with the DeviceNet configuration utility supplied with the DeviceNet Master controller. Verify that the drive appears on the DeviceNet network at the correct node address.

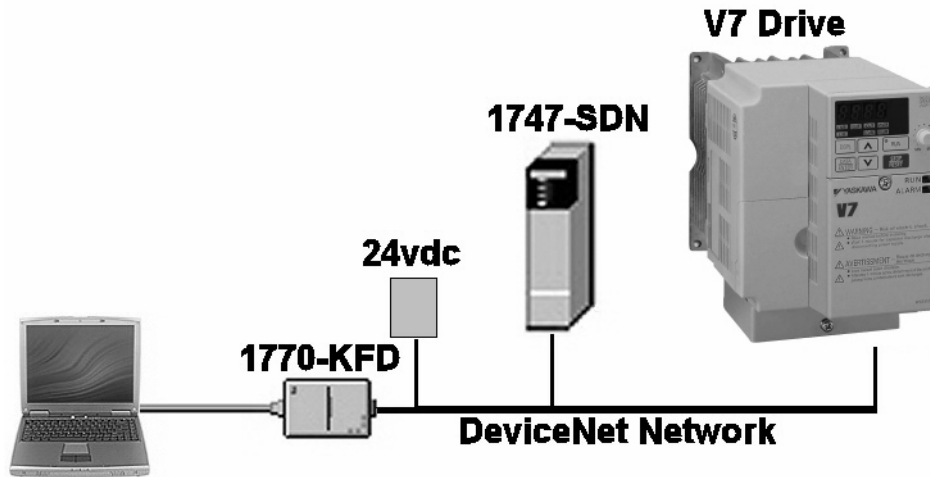


Fig 1.8 – DeviceNet Network Example

## ◆ RSLinx™

Configure Rockwell's RSLinx software for the 1770-KFD module by selecting the **DeviceNet Drivers (... , 1770-KFD, ...)** module. Select **Add New**, highlight the **Allen-Bradley 1770-KFD** and click on **Select**. Select the PC's communication **Port** and **Baud Rate** and the 1770-KFD module's **Node Address** and the **Data Rate** of the DeviceNet network. Click **OK**.

Refer to the documentation included with RSLinx. Verify that the drive appears on the DeviceNet network at the correct node address.

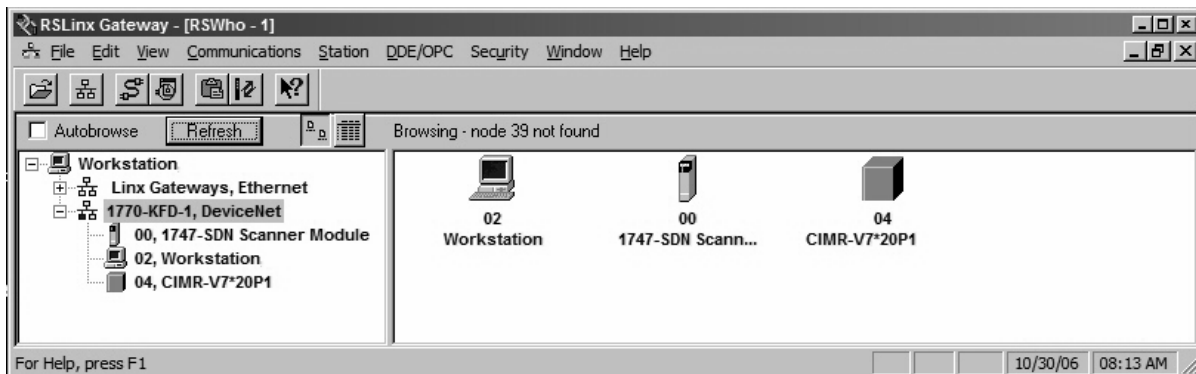


Fig 1.9 – RSLinx Example

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## ◆ RSNWorx for DeviceNet

With RSLinx running and configured for DeviceNet, run Rockwell's **RSNetWorx for DeviceNet**. Select **Network** → **On-Line** from the main menu and select **1770-KFD-1, DeviceNet** from the network selections.

Refer to the documentation included with the DeviceNet configuration utility supplied with the DeviceNet Master controller. Verify that the drive appears on the DeviceNet network at the correct node address.

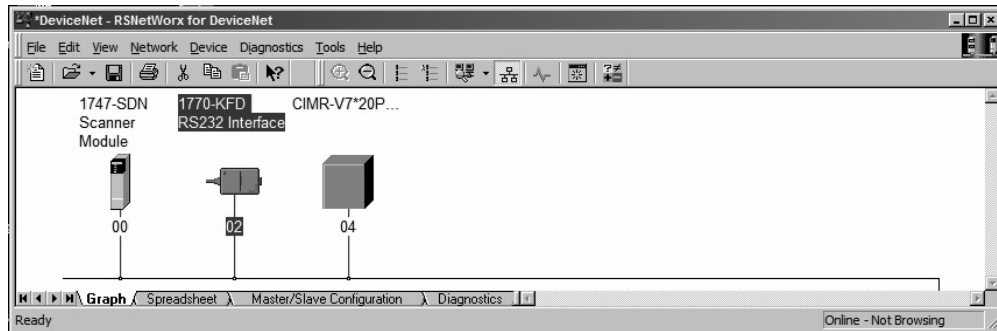


Fig 1.10 – RSNWorx for DeviceNet Example

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## EDS Files

### ◆ EDS Files

The EDS file can be obtained from the CD that was included with the drive or downloaded from [www.yaskawa.com](http://www.yaskawa.com). It is recommended that the EDS file be downloaded from [www.yaskawa.com](http://www.yaskawa.com) to be sure that the latest version is used. From [www.yaskawa.com](http://www.yaskawa.com) select **Downloads** → **Browse** → **By Inverter Drives** → **By Product**. Select **Network Comms-DeviceNet** from the menu on the left. Select the appropriate EDS file from those listed.

Note: The EDS files located on the CD or downloaded from [www.yaskawa.com](http://www.yaskawa.com) will be in “zip” format and will need to be unzipped to a temporary directory prior to installation.

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### ◆ Installing the EDS File

With RSNWorx for DeviceNet, select **Tools** → **EDS Wizard** from the main menu. Follow the resulting prompts to install the EDS file(s).

Note: It is recommended, when upgrading to a new version EDS file, that the original EDS file(s) be deleted prior to upgrading.

Install the EDS file into the DeviceNet configuration tool (i.e., RSNWorx for DeviceNet). There is a separate EDS file for each drive model. Verify that the correct EDS file has been installed for the drive model selected on the network. Refer to the documentation that came with the DeviceNet Master configuration tool for information on installing EDS files and configuring a DeviceNet node.

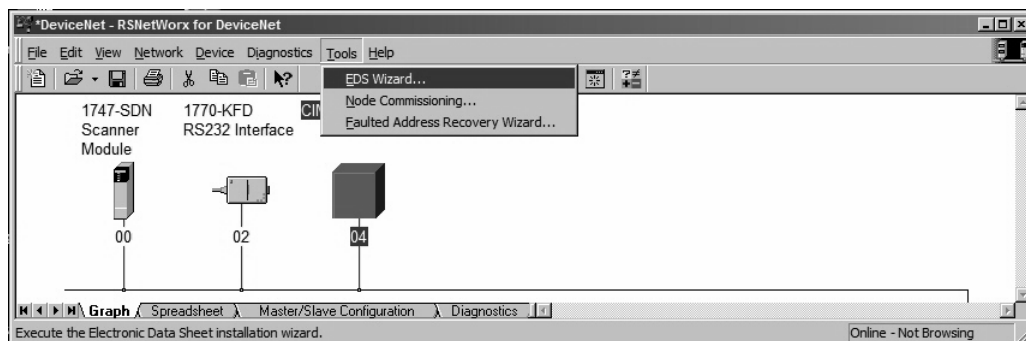


Fig 1.11 – RSNWorx for DeviceNet EDS Wizard

# Configure the V7 Drive on the Network

## ◆ Select Drive Properties

After the appropriate EDS file has been loaded and the drive is recognized by the network, highlight the drive, right click on it and select **Properties**.

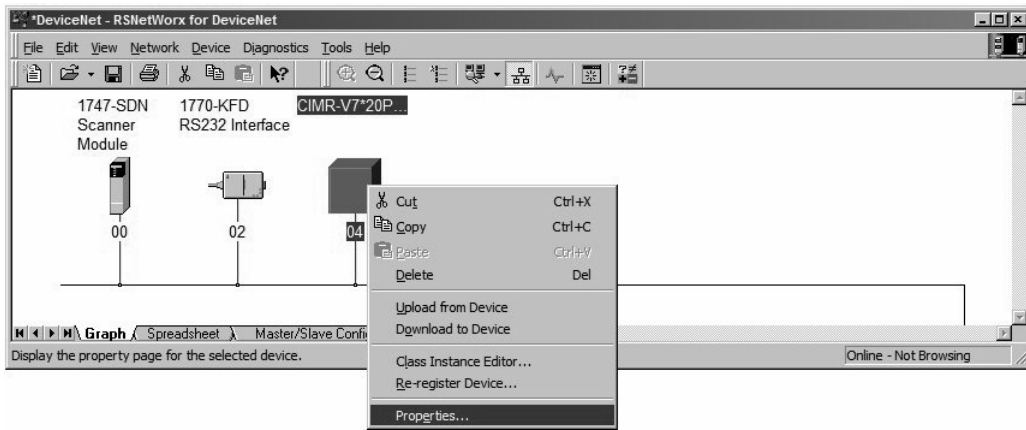


Fig 1.12 – Select Drive Properties

## ◆ Upload Drive Parameters

Select the **Parameters** tab and **Upload** the parameters from the drive.

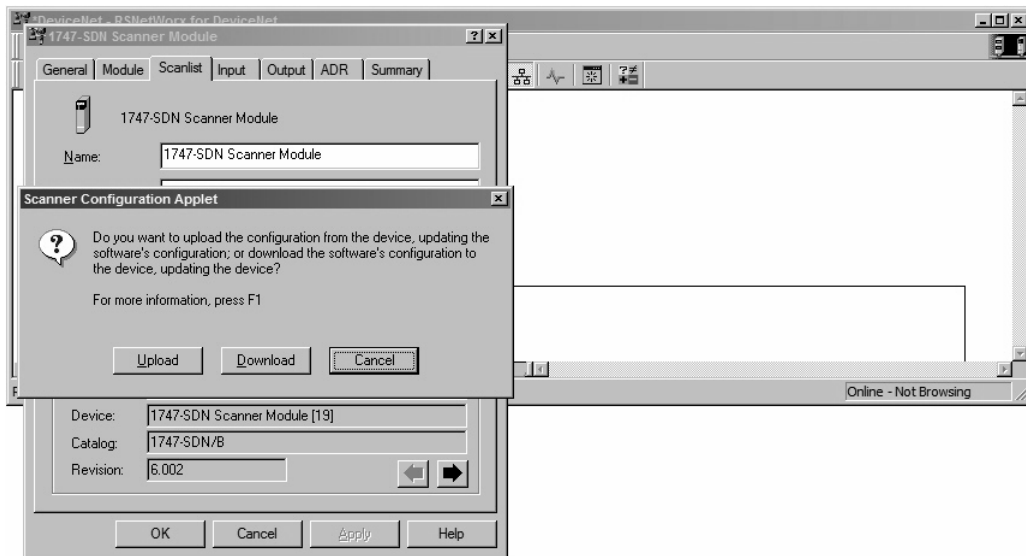


Fig 1.13 – Upload Drive Parameters



## ◆ Select the Poll Produced and Poll Consumed Assemblies

Scroll through the parameter list to the Poll Consumed Assembly (PCA). Enter the desired PCA. Scroll to the Polled Produced Assembly (PPA) and enter the desired PPA. Select **Apply** when done to download the new values to the drive. Select **OK**.

Note that the drive will have to be power cycled for the new PCA and PPA to take effect.

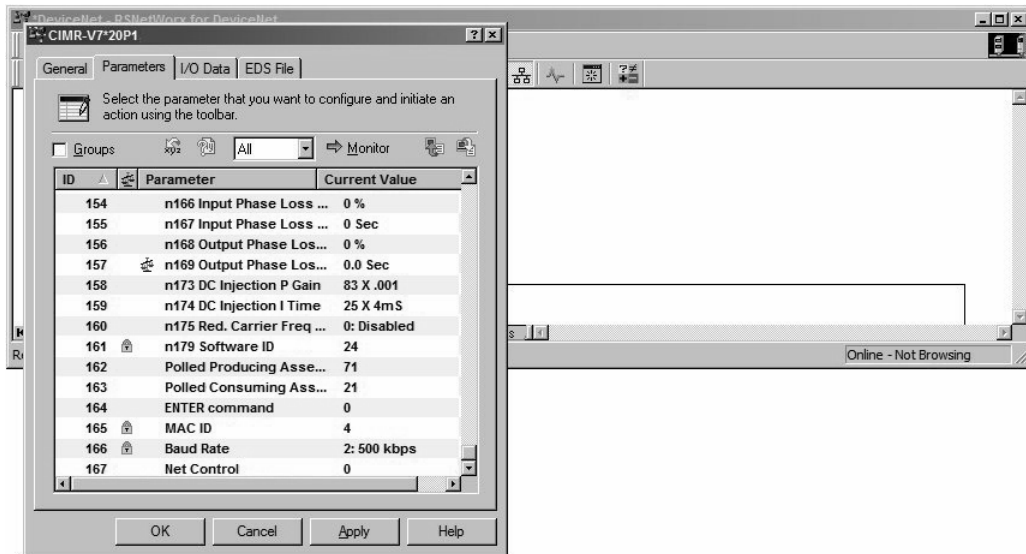


Fig 1.14 – Set Desired PCA and PPA

## Configure the Scanner

### ◆ Select Scanner Properties

Once the drive has been properly configured on the network, highlight the DeviceNet scanner, right click on it and select **Properties**.

The example below shows how to add a drive to an A-B 1747-SDN Scanner module. To configure another scanner, please consult the documentation for that particular scanner.

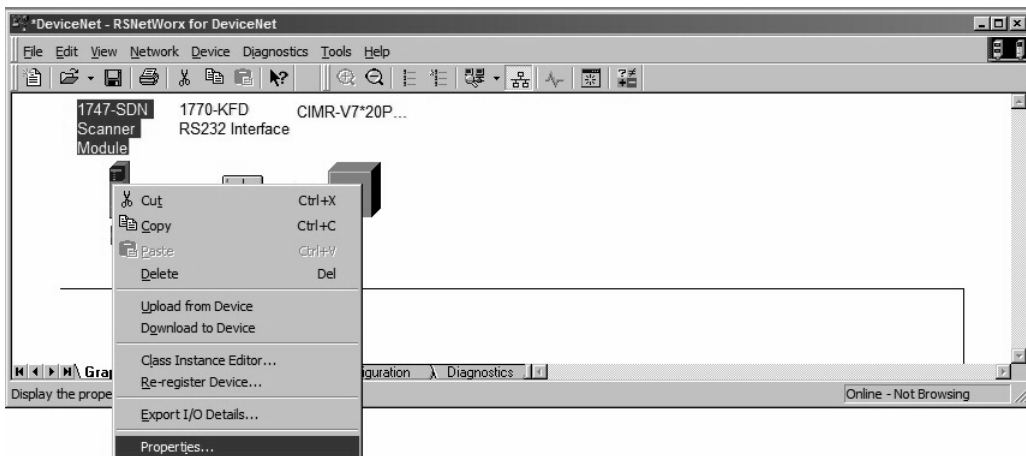


Fig 1.15 – Select Scanner Properties

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## ◆ Upload Scanner Configuration

Upload the current scanner configuration.

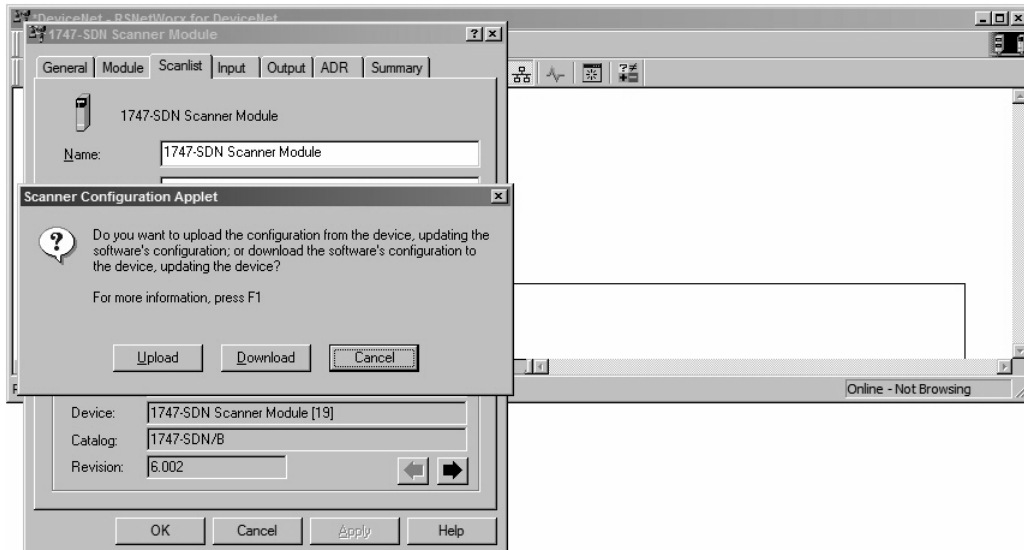


Fig 1.16 – Update Scanner Configurations

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## ◆ Update the Scan List

Update the scan list by highlighting any devices in the **Available Devices** column and clicking on either the > or >> buttons until all DeviceNet devices show in the **Scanlist** column. For each device in the scan list, select the **Input** and **Output** tabs and verify that the device memory has been properly allocated. Also select **Edit I/O Parameters** and verify that the number on input and output bytes matches those of the selected PCA and PPA.

When complete, select **Download to Scanner** in order to download the new configuration information to the scanner module.

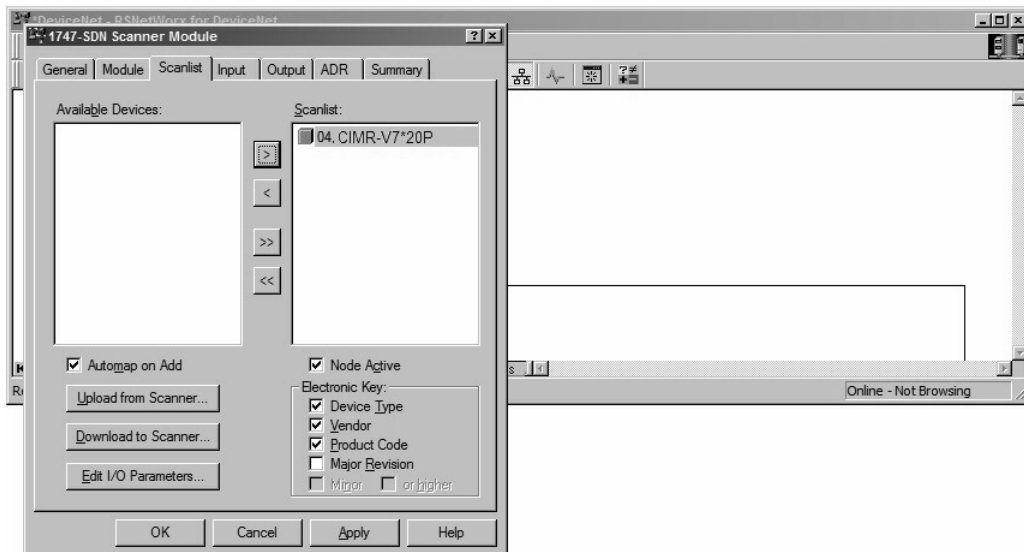


Fig 1.17 – Update the Scan List

# Configure the V7 Drive

## ◆ Command and Reference Source

The run/stop and frequency reference commands can originate from the operator keypad, external terminals or the *V7 DeviceNet Option*. Parameter n003 (Operation Method Selection) sets the source of the run/stop commands. Parameter n004 (Reference Selection) sets the source of the frequency reference. The run/stop and frequency reference commands may have different origins. For example, the run/stop command may be set to External Terminals (n003 = 1) while the Frequency Reference may be set to Option (*DeviceNet Option*) (n004 = 9).

Addr	Param	Function	Data	Description	Default
103h	n003	Operation Method Selection	0	Operator keypad	1
			1	Terminal	
			2	Serial Communication <sup>1</sup>	
			3	<b>Option kit - (V7 DeviceNet Option)</b>	
104h	n004	Reference Selection	0	Operator keypad potentiometer	2
			1	Operator keypad	
			2	Voltage Reference (0-10VDC)	
			3	Current Reference (4-20mA)	
			4	Current Reference (0-20mA)	
			5	Pulse Train Reference	
			6	Serial Communication <sup>1</sup>	
			7	Multifunction Analog Input (0-10VDC)	
			8	Multifunction Analog Input (4-20mA)	
9	<b>Option kit - (V7 DeviceNet Option)</b>				

Note: <sup>1</sup> RS485 communications is disabled with the *DeviceNet Option* installed.

## ◆ Speed Scaling

Since DeviceNet displays the motor speed and frequency reference in RPM, it is important to set the appropriate number of motor poles in parameter n035.

n035	Digital Operator Display Mode
0	Hz
1	%
2 ... 39	<b>DeviceNet displays the motor speed in RPM.</b> Enter the number of motor poles to set the input and output speed to RPM.
40 ... 3999	User Scaling

# Drive Fault Messages

## ◆ Drive DeviceNet Fault Messages

The table of V7 *DeviceNet Option* fault codes returned by the drive is shown below. Refer to the appropriate drive user and/or programming manual(s) for drive-specific information on the fault returned.

Drive Fault Code [hex]	DeviceNet Fault Code [hex]	Description	Drive Fault Code [hex]	DeviceNet Fault Code [hex]	Description
0h	0000h		14h	9000h	External Fault 6 (EF6)
1h	5120h		15h	9000h	External Fault 7 (EF7)
2h	3220h	DC Bus Undervoltage (UV1)	16h	9000h	
3h	5110h	CTL PS Undervoltage (UV2)	17h	4140h	Heat Sink Fan (FAN)
4h	3222h		18h	7310h	
5h	2130h		19h	7310h	
6h	2120h		1Ah	7301h	
7h	2300h	Overcurrent (OC)	1Bh	3130h	
8h	3210h	DC Bus Overvoltage (OV)	1Ch	3130h	
9h	4200h	Heat Sink Over-Temperature (OH)	1Dh	5300h	
0Ah	4210h		1Eh	5300h	Operator Disconnected (OPR)
0Bh	2220h	Motor Overload (OL1)	1Fh	6320h	
0Ch	2200h	Inverter Overload (OL2)	20h	0000h	
0Dh	2221h	Overtorque Detection 1 (OL3)	21h	7500h	SI-E Communications Error (CE)
0Eh	2222h		22h	7500h	DeviceNet Communication Error (BUS)
0Fh	7110h		23h	7500h	
10h	7112h		24h	7500h	
11h	9000h	External Fault 3 (EF3)	25h	8321h	
12h	9000h	External Fault 4 (EF4)	26h	8313h	
13h	9000h	External Fault 5 (EF5)	27h	9000h	External Fault 0 (EF0)

## ◆ Drive Operator Fault Messages

The following is a table of faults that could be caused by the V7 *DeviceNet Option* that will be displayed on the Operator Keypad only. For any fault displayed on the keypad that is not listed in the following table, please see the appropriate drive technical manual.

Fault	Content	Cause	Solution
BUS	<i>DeviceNet Option</i> communications error	Communication is not established between DeviceNet Master and the drive.	<ul style="list-style-type: none"> <li>• Check <i>DeviceNet Option</i> communication LED display.</li> <li>• Check DeviceNet cable and 24VDC power supply.</li> </ul>
EF0	<i>DeviceNet Option</i> external fault	Drive received an external fault command from the <i>DeviceNet Option</i> .	<ul style="list-style-type: none"> <li>• Check multifunction input settings.</li> <li>• Check PLC or controller program.</li> <li>• Check DeviceNet cable and 24VDC power supply.</li> </ul>
F06	<i>DeviceNet Option</i> fault	Faulty J1/2CN connection	<ul style="list-style-type: none"> <li>• Power cycle the drive.</li> <li>• Reset the <i>DeviceNet Option</i>.</li> <li>• Replace the <i>DeviceNet Option</i>.</li> <li>• Replace the inverter.</li> </ul>

# Notes

# Chapter 2 Supported Objects

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*This section describes DeviceNet objects supported by the V7 DeviceNet Option.*

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# Supported Input Assemblies

## ◆ Basic Speed Control – Input Instance 20 (14h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20 (14h) Basic Speed Control 4 Bytes	0	-	-	-	-	-	Fault Reset	-	Run FWD
	1	-							
	2	Speed Reference (Scaled by Parameter n035)							
	3								

## ◆ Extended Speed Control – Input Instance 21 (15h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
21 (15h) Extended Speed Control 4 Bytes	0	-	NetRef <sup>1</sup>	NetCtrl <sup>1</sup>	-	-	Fault Reset	Run REV	Run FWD
	1	-							
	2	Speed Reference (Scaled by Parameter n035)							
	3								
Note:	1	NetRef – When set, sets reference source (n004 = 9) to Option Card. When reset, returns n004 to its original setting.							
		NetCtrl – When set, sets Run command source (n003 = 3) to Option Card. When reset, returns n003 to its original setting.							

## ◆ Speed and Torque Control – Input Instance 22 (16h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
22 (16h) Basic Speed and Torque Control 6 Bytes	0	-	-	-	-	-	Fault Reset	-	Run FWD
	1	-							
	2	Speed Reference (Scaled by Parameter n035)							
	3								
	4	Reserved							
	5								

## ◆ Extended Speed and Torque Control – Input Instance 23 (17h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
23 (17h) Extended Speed and Torque Control 6 Bytes	0	-	NetRef <sup>1</sup>	NetCtrl <sup>1</sup>	-	-	Fault Reset	Run REV	Run FWD
	1	-							
	2	Speed Reference (Scaled by Parameter n035)							
	3								
	4	Reserved							
	5								
Note:	1	NetRef – When set, sets reference source (n004= 9) to Option Card. When reset, returns n004 to its original setting.							
		NetCtrl – When set, sets Run command source (n003 = 3) to Option Card. When reset, returns n003 to its original setting.							

# Yaskawa Input Assemblies

## ◆ Yaskawa Modbus Message – Input Instance 100 (64h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100 (64h) MODBUS Message	0	Function Code (Only Modbus functions register read (03h) and register write (10h) are supported)							
	1	Register Number							
	2								
	3	Data							
	4								
Note:	Refer to output instance 150 (96h) for response								

## ◆ Yaskawa Standard Control – Input Instance 101 (65h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
101 (65h) Standard Control	0	-	Terminal S7	Terminal S6	Terminal S5	Terminal S4	Terminal S3	Run REV	Run FWD
	1	Terminal P2	Terminal P1	Terminal MA/MB	-	-	-	Fault Reset	External Fault
	2	Speed Reference (Scaled by Parameter n035)							
	3								
	4	Reserved							
	5								
	6	Reserved							
7									

## ◆ Yaskawa Enhanced Control/Modbus Message – Input Instance 105 (69h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
105 (69h) Enhanced Control/ MODBUS Message	0	-	Terminal S7	Terminal S6	Terminal S5	Terminal S4	Terminal S3	Run REV	Run FWD	
	1	Terminal P2	Terminal P1	Terminal MA/MB	-	Function Bit 2 <sup>1</sup>	Function Bit 1 <sup>1</sup>	Fault Reset	External Fault	
	2	Speed Reference (Scaled by Parameter n035)								
	3									
	4	Register Number								
	5									
	6	Data								
7										
Note:	Refer to output instance 155 (9Bh) for response									
	1	Bit 1	Bit 2	Function						
		0	0	No Function						
		0	1	Read Register						
		1	0	Write Register						
1	1	No Function								



## ◆ Yaskawa Enhanced Control/Modbus Message – Input Instance 107 (6Bh)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
107 (6Bh) Standard DI/DO Control 8 Bytes	0	-	Terminal S7	Terminal S6	Terminal S5	Terminal S4	Terminal S3	Run REV	Run FWD
	1	-	-	-	-	-	-	Fault Reset	External Fault
	2	-	-	Terminal P2	Terminal P1	Terminal MA/MB	-	-	-
	3	-							
	4	Reserved							
	5								
	6	Speed Reference (Scaled by Parameter n035)							
	7								

## Supported Output Assemblies

### ◆ Basic Speed Control – Output Instance 70 (46h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
70 (46h) Basic Speed Control 4 Bytes	0	-	-	-	-	-	@FWD Run	-	@Fault	
	1	Reserved								
	2	Speed Actual (Scaled by Parameter n035)						Monitor U-02		
	3									

### ◆ Extended Speed Control – Output Instance 71 (47h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
71 (47h) Extended Speed Control 4 Bytes	0	@Speed	@Ref from Net <sup>1</sup>	@Ctrl from Net <sup>1</sup>	@Ready	@REV Run	@FWD Run	@Alarm	@Fault	
	1	Reserved								
	2	Speed Actual (Scaled by Parameter n035)						Monitor U-02		
	3									
Note:	1	@Ctrl from Net – set when n003 = 3								
		@Ref from Net – set when n004 = 9								

### ◆ Basic Speed and Torque Control – Output Instance 72 (48h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
72 (48h) Basic Speed and Torque Control 6 Bytes	0	-	-	-	-	-	@FWD Run	-	@Fault	
	1	Reserved								
	2	Speed Actual (Scaled by Parameter n035)						Monitor U-02		
	3									
	4	Reserved								
	5									

## ◆ Extended Speed and Torque Control – Output Instance 73 (49h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
<b>73 (49h) Extended Speed and Torque Control 6 Bytes</b>	0	@Speed	@Ref from Net <sup>1</sup>	@Ctrl from Net <sup>1</sup>	@Ready	@REV Run	@FWD Run	@Alarm	@Fault
	1	Reserved							
	2	Speed Actual (Scaled by Parameter n035)						Monitor U-02	
	3								
	4	Reserved							
5									
Note:	1	@Ctrl from Net – set when n003 = 3							
		@Ref from Net – set when n004 = 9							

## Yaskawa Output Assemblies

### ◆ Yaskawa Modbus Message – Output Instance 150 (96h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
<b>150 (96h) MODBUS Message 5 Bytes</b>	0	Function Code <sup>1</sup>							
	1	Register Number							
	2								
	3	Data							
	4								
Note:	Refer to input instance 100 (64h) for command								
	1	A Modbus message error is returned if the function code has the MSB (80h) set.							

### ◆ Yaskawa Standard Control – Output Instance 151 (97h)

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
<b>151 (97h) Standard Control 8 Bytes</b>	0	@Fault	@Alarm	@Ready	@Speed Agree	@Fault Reset	@REV Run	@Zero Speed	@FWD Run
	1	@Zero Servo Complete	-	@Terminal P2	@Terminal P1	@Terminal MA/MB	@Local Mode	@Pwr Loss Ride Thru	@OPE
	2	Output Frequency (Scaled by Parameter n035)						Monitor U-02	
	3								
	4	Reserved							
	5								
	6	Output Current 0.1A)						Monitor U-03	
	7								

◆ **Yaskawa Enhanced Control/Modbus Message – Output Instance 155 (9Bh)**

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
<b>155 (9Bh) Enhanced Control/ MODBUS Message 8 Bytes</b>	0	@Fault	@Alarm	@Ready	@Speed Agree	@Fault Reset	@REV Run	@ Zero Speed	@FWD Run	
	1	@Terminal P2	@Terminal P1	@Terminal MA/MB	@Local Mode	Function Bit 2 <sup>1</sup>	Function Bit 1 <sup>1</sup>	@UV	@OPE	
	2	Output Frequency (Scaled by Parameter n035)						Monitor U-02		
	3									
	4	Register Number								
	5									
	6	Data								
	7									
Note:	Refer to input instance 105 (69h) for command									
	1	Bit 1	Bit 2	Function						
		0	0	No Function						
		0	1	Message Accepted						
		1	0	Message Error						
1	1	Complete								

◆ **Yaskawa Standard DI/DO Control – Output Instance 157 (9Dh)**

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
<b>157 (9Dh) Standard DI/DO Control 8 Bytes</b>	0	@Fault	@Alarm	@Ready	@Speed Agree	@Fault Reset	@REV Run	@Zero Speed	@FWD Run	
	1	@Zero Servo Complete	-	-	-	-	@Local	@UV	@OPE	
	2	-	-	-	Terminal S7	Terminal S6	Terminal S5	Terminal S4	Terminal S3	
	3	-	-	Terminal P2	Terminal P1	Terminal MA/MB	-	-	-	
	4	Analog Input								
	5									
	6	Output Frequency (Scaled by Parameter n035)						Monitor U-02		
	7									

# CIP Supported Objects

## ◆ Class 1 (01h) – Identity Object

Service Code No. (hex)	Service Name
01h	Get Attribute All
05h	Reset
0Eh	Get Attribute Single

Attributes

Instance ID	Attribute	Description	Get	Set	Size	Default
0	1	Object Software Revision	X		Word	1
1	1	Vendor ID	X		Word	44 (YASKAWA)
	2	Device Type	X		Word	2 (AC drives)
	3	Product Code	X		Word	Product/Model Dependent Code <sup>1</sup>
	4	Revision	X		Word	Software Dependent
	5	Status	X		Word	0
	6	Serial Number	X		Word	Each product's serial number is unique <sup>2</sup>
	7	Product Name	X		String (14 Bytes)	Product Dependent <sup>3</sup>
	8	State	X		Byte	3
	9	Configuration Consistency	X		Word	0000
	10	Heartbeat Interval	X	X	Byte	00 – 10 (0 = disabled)
	100 (64h)	Password			X	Long
Note:	1	A combination of the drive family code and the drive model number. The MSB is the drive family and the LSB is the drive model number. For example: a V7AM model 20P4 would have a product code of 2C02h, 2C being the drive family and 02 the drive model number.				
		Drive Model Numbers				
		00	20P1	28h	40P1	
		01	20P2	29h	40P2	
		02	20P4	2Ah	40P4	
		03	20P7	2Bh	40P7	
		04	21P5	2Ch	41P5	
		05	22P2	2Dh	42P2	
		06	23P0	2Eh	43P0	
		07	23P7	2Fh	43P7	
		08	24P0	30h	44P0	
		09	25P5	31h	45P5	
		0Ah	27P5	32h	47P5	
2	Range is 0x8200000 ~ 0x82FFFFFF					
3	The product name is CIMR-[Drive Family][Drive Model]. A Product Name example would be CIMR-V7AM20P4, for a V7, AM-spec, model 20P4 (200V class, 0.4 kW) drive.					

## ◆ Class 2 (02h) – Message Router Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single

Attributes

Instance ID	Attribute	Description	Get	Set	Size	Default
0	1	Object Software Revision	X		Word	

## ◆ Class 3 (03h) – DeviceNet Object

Service Code No. (hex)	Service Name
05h	Reset
0Eh	Get Attribute Single

Attributes

Instance ID	Attribute	Name	Description	Get	Set	Size	Default
0	1		Object Software Revision	X		Word	
1	01	MAC ID	Current MAC ID Setting (0 ~ 63)	X	X	Byte	
	02	Baud Rate	Current Baud rate Setting 0: 125 kbps 1: 250 kbps 2: 500 kbps 3 ~ 9: Auto Baud	X	X	Byte	0
	03	Bus Off Interrupt	Bus Off Condition (0 ~ 1)	X		Byte	00
	04	Bus Off Counter	Number of Bus Off (0 ~ 255)	X		Byte	00
	05	Allocation Info	DeviceNet Communication Connection Info	X		(2) Bytes	00,00
	06	MAC ID Sw Change	MAC ID Switch Changed Since Power-up	X		Bool	0
	07	Baud Rate Sw Change	Baud Rate Switch Changed Since Power-up	X		Bool	0
	08	MAC ID Sw	MAC ID Switch Setting (0 ~ 99)	X		Word	63
09	Baud Rate Sw	Baud Rate Switch Setting (0 ~ 9)	X		Word	9	

## ◆ Class 4 (04h) – Assembly Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single

### Attributes

Instance ID	Attribute	Description	Get	Set	Size	Default
0	1	Object Software Revision	X		Word	1
20 (14h)	3	Basic Speed Control	X	X	Array 4 Bytes	00 00 00 00
21 (15h)		Extended Speed Control	X	X	Array 4 Bytes	00 00 00 00
22 (16h)		Basic Speed and Torque Control	X	X	Array 6 Bytes	00 00 00 00 00 00
23 (17h)		Extended Speed and Torque Control	X	X	Array 6 Bytes	00 00 00 00 00 00
70 (46h)		Basic Speed Control Status	X		Array 4 Bytes	00 00 00 00
71 (47h)		Extended Speed Control Status	X		Array 4 Bytes	00 00 00 00
72 (48h)		Basic Speed and Torque Control Status	X		Array 6 Bytes	00 00 00 00 00 00
73 (49h)		Extended Speed and Torque Control Status	X		Array 6 Bytes	00 00 00 00 00 00
100 (64h)		Yaskawa Modbus Message	X	X	Array 5 Bytes	00 00 00 00 00
101 (65h)		Yaskawa Standard Control	X	X	Array 8 Bytes	00 00 00 00 00 00 00 00
105 (69h)		Yaskawa Enhanced Control/Modbus Message	X	X	Array 8 Bytes	00 00 00 00 00 00 00 00
107 (6Bh)		Yaskawa Standard DI/DO Control	X	X	Array 8 Bytes	00 00 00 00 00 00 00 00
150 (96h)		Yaskawa Modbus Message Response	X		Array 5 Bytes	00 00 00 00 00
151 (97h)		Yaskawa Standard Control Status	X		Array 8 Bytes	00 00 00 00 00 00 00 00
155 (9Bh)		Yaskawa Enhanced Control/Modbus Message	X		Array 8 Bytes	00 00 00 00 00 00 00 00
157 (9Dh)		Yaskawa Standard DI/DO Control Status	X		Array 8 Bytes	00 00 00 00 00 00 00 00

## ◆ Class 5 (05h) – DeviceNet Connection Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single

Attributes

Instance ID	Attribute	Description	Get	Set	Size	Default
0	1	Object Software Revision	X		Word	1
1	1	State	X		Byte	3
	2	Instance Type	X		Byte	0
	3	Transport Class Trigger	X		Byte	83h
	4	Produced Connection ID	X		Word	
	5	Consumed Connection ID	X		Word	
	6	Initial Communications Characteristics	X		Byte	21h
	7	Produced Connection Size	X		Byte	
	8	Consumed Connection Size	X		Byte	
	9	Expected Packet Rate	X	X	Word	09C4h
	12 (0Ch)	Watch-dog Timeout Action	X		Byte	1
	13 (0Dh)	Produced Connection Path Length	X		Word	0
	14 (0Eh)	Produced Connection Path	X		Array	
	15 (0Fh)	Consumed Connection Path Length	X		Word	0
	16 (10h)	Consumed connection Path	X		Array	
2	1	State	X		Byte	1
	2	Instance Type	X		Byte	1
	3	Transport Class Trigger	X		Byte	83h
	4	Produced Connection ID	X		Word	
	5	Consumed Connection ID	X		Word	
	6	Initial Communications Characteristics	X		Byte	1
	7	Produced Connection Size	X	X	Byte	4
	8	Consumed Connection Size	X	X	Byte	4
	9	Expected Packet Rate	X	X	Word	0
	12 (0Ch)	Watch-dog Timeout Action	X	X	Byte	1
	13 (0Dh)	Produced Connection Path Length	X		Word	3
	14 (0Eh)	Produced Connection Path	X	X	Array	62 34 36
	15 (0Fh)	Consumed Connection Path Length	X		Word	3
	16 (10h)	Consumed Connection Path	X	X	Array	62 31 34

## ◆ Class 40 (28h) – Motor Data Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single

Attributes

Instance ID	Attribute	Description	Get	Set	Size	Data
0	1	Object Software Revision	X		Word	1
1	3	Motor Type	X		Byte	7 (fixed)
	6	Rated Current (0.1A)	X	X	Word	Parameter n036
	7	Rated Voltage (1V)	X	X	Word	Parameter n147

## ◆ Class 41 (29h) – Control Supervisor Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single
05h	Reset

Attributes

Instance ID	Attribute	Description	Get	Set	Size	Data
0	1	Object Software Revision	X	-	Word	1
1	3h	Run 1 (Forward Run)	X	X	Byte	Forward Run Command
	4h	Run 2 (Reverse Run)	X	X	Byte	Reverse Run Command
	5h	Net Control	X	X	Byte	Net Control Command - Parameter n003
	6h	State	X		Byte	Inverter Status (3 = Ready, 7 = Faulted)
	7h	Running 1 (Forward)	X		Byte	Forward Running
	8h	Running 2 (Reverse)	X		Byte	Reverse Running
	9h	Ready	X		Byte	Inverter Ready
	10 (0Ah)	Faulted	X		Byte	Inverter Fault
	11 (0Bh)	Warning	X		Byte	Inverter Alarm
	12 (0Ch)	Fault Reset	X	X	Byte	Fault Reset
	13 (0Dh)	Fault Code	X		Word	Current Fault
	15 (0Fh)	Control from Net	X		Byte	Net Control Status - Parameter n003
	16 (10h)	DeviceNet Fault Mode	X		Byte	Always "2"
17 (11h)	Force Fault	X	X	Byte	External Fault - EF0	
18 (12h)	Force Status	X		Byte	External Fault Status - EF0	



## ◆ Fault Code Table

Class 41 (29h) – Control Supervisor Object					
Drive Fault Code [hex]	DeviceNet Fault Code [hex]	Description	Drive Fault Code [hex]	DeviceNet Fault Code [hex]	Description
0h	0000h		14h	9000h	External Fault 6 (EF6)
1h	5120h		15h	9000h	External Fault 7 (EF7)
2h	3220h	DC Bus Under-Voltage (UV1)	16h	9000h	
3h	5110h	CTL PS Under-Voltage (UV2)	17h	4140h	Heat Sink Fan (FAN)
4h	3222h		18h	7310h	
5h	2130h		19h	7310h	
6h	2120h		1Ah	7301h	
7h	2300h	Over-Current (OC)	1Bh	3130h	
8h	3210h	DC Bus Over-Voltage (OV)	1Ch	3130h	
9h	4200h	Heat Sink Over-Temperature (OH)	1Dh	5300h	
0Ah	4210h		1Eh	5300h	Operator Disconnected (OPR)
0Bh	2220h	Motor Overload (OL1)	1Fh	6320h	
0Ch	2200h	Inverter Overload (OL2)	20h	0000h	
0Dh	2221h	Over-Torque Detection 1 (OL3)	21h	7500h	SI-E Communications Error (CE)
0Eh	2222h		22h	7500h	DeviceNet Communication Error (BUS)
0Fh	7110h		23h	7500h	
10h	7112h		24h	7500h	
11h	9000h	External Fault 3 (EF3)	25h	8321h	
12h	9000h	External Fault 4 (EF4)	26h	8313h	
13h	9000h	External Fault 5 (EF5)	27h	9000h	External Fault 0 (EF0)

## ◆ Class 41 (2Ah) – AC Drive Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single

### Attributes

Instance ID	Attribute	Description	Get	Set	Size	Data
0	1	Object Software Revision	X		Word	1
1	3h	At Reference	X		Byte	Speed Agree
	4h	Net Reference	X	X	Byte	Parameter n004
	6h	Reserved			Byte	
	7h	Speed Actual (scaled by n035)	X		Word	Parameter U-02
	8h	Speed Reference (scaled by n035)	X	X	Word	Parameter U-01
	9h	Current Actual (0.1A)	X		Word	Parameter U-03
	15 (0Fh)	Power Actual (W)	X		Word	Parameter U-11
	16 (10h)	Input Voltage (VAC)	X		Word	Parameter n012
	17 (11h)	Output Voltage (VAC)	X		Word	Parameter U-04
	18 (12h)	Accel Time (ms)	X	X	Word	Parameter n019
	19 (13h)	Decel Time (ms)	X	X	Word	Parameter n020
	20 (14h)	Reserved			Word	
	21 (15h)	Reserved			Word	
	22 (16h)	Speed Scale	X	X	Byte	-15 ~ +15
	23 (17h)	Current Scale	X	X	Byte	-15 ~ +15
	26 (1Ah)	Power Scale	X	X	Byte	-15 ~ +15
	27 (1Bh)	Voltage Scale	X	X	Byte	-15 ~ +15
	28 (1Ch)	Time Scale	X	X	Byte	-15 ~ +15
29 (1Dh)	Reference from the Net	X		Byte	Parameter n004	

# Yaskawa Supported Objects

## ◆ Class 100 (64h) – Yaskawa Command Object

Service Code No. (hex)	Service Name
0Eh	Get Attribute Single
10h	Set Attribute Single

### Attributes

Instance ID	Attribute	Description	Get	Set	Size	Default Value
0	1	Object Software Revision	X		Word	1
1	1	Operation Command	X	X	Word	0
	2	Frequency Reference (0.01Hz)	X	X	Word	0
	3	Reserved			Word	
	4	Reserved			Word	
	5	Reserved				
	6	Analog Output 1 (Terminal 21)	X	X	Word	0
	7	Reserved			Word	
	8	Digital Output	X	X	Word	0
	254 (FEh)	Reserved			Word	0
	255 (FFh) <sup>1</sup>	Enter Command	X	X	Word	0
Note:	<sup>1</sup>	Due to a limited number of non-volatile memory writes permitted, care should be taken when using the Enter command.				

Yaskawa Command Object – Class 64h, Instance 1, Attribute 1 – Operation Command	
Bit	Definition
0	Terminal S1 – Multifunction Digital Input 1 – Parameter n050 setting (Typically Forward RUN (1) /Stop (0))
1	Terminal S2 – Multifunction Digital Input 2 – Parameter n051 setting (Typically Reverse RUN (1) /Stop (0))
2	Terminal S3 – Multifunction Digital Input 3 – Parameter n052 setting
3	Terminal S4 – Multifunction Digital Input 4 – Parameter n053 setting
4	Terminal S5 – Multifunction Digital Input 5 – Parameter n054 setting
5	Terminal S6 – Multifunction Digital Input 6 – Parameter n055 setting
6	Terminal S7 – Multifunction Digital Input 7 – Parameter n056 setting
7	Reserved
8	External Fault
9	Fault Reset
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Yaskawa Command Object – Class 64h, Instance 1, Attribute 8 – Digital Output	
Bit	Definition
0	Terminal MA/MB – Multifunction Digital Output 1 – Parameter n057 setting
1	Terminal P1 – Multifunction Digital Output 2 – Parameter n058 setting
2	Terminal P2 – Multifunction Digital Output 3 – Parameter n059 setting
3	Reserved
4	Reserved
5	Reserved
6	Fault Contact Enable
7	Fault Contact – Bit 6 must be set to 1 in order to enable the function of bit 7

## ◆ Class 120 (78h) – Yaskawa V7 Drive Monitor Object

The following table lists the attributes of the drive monitors that are supported by the *DeviceNet Option*. For further details on the drive monitors, refer to the *V7 and V74X Drives Technical Manual (TM.V7.01)*.

Class 120 (78h) - Yaskawa V7 Drive Monitor Object			
Monitor	Attribute	Description	Size
	1	Status	Word
	2	Fault	Word
U-01	3	Frequency Reference	Word
U-02	4	Output Frequency	Word
U-03	5	Output Current	Word
U-04	6	Output Voltage	Word
U-06	7	Input Terminal Status	Word
U-07	8	Output Terminal Status	Word
U-05	9	DC Bus Voltage	Word
U-08	10 (0Ah)	Torque Monitor	Word
U-11	11 (0Bh)	Output Power	Word
U-16	12 (0Ch)	PID Feedback	Word
U-17	13 (0Dh)	PID Input	Word
U-18	14 (0Eh)	PID Output	Word
U-15	15 (0Fh)	Transmission Error	Word
U-09	16 (10h)	Fault History	Word
U-10	17(11h)	Software Number	Word
Reserved	18 (12h)	Reserved	Word
Reserved	...	Reserved	Word
Reserved	29 (1Dh)	Reserved	Word
U-50	30 (1Eh)	CASE Monitor 1	Word
U-51	31 (1Fh)	CASE Monitor 2	Word
U-52	32 (20h)	CASE Monitor 3	Word
U-53	33 (21h)	CASE Monitor 4	Word
U-54	34 (22h)	CASE Monitor 5	Word

# Yaskawa V7 Drive Parameter Object

The following table lists the attributes of the drive parameters that are supported by the *DeviceNet Option*. For further details on the drive parameters, refer to the *V7 and V74X Drives Technical Manual (TM.V7.01)*. Instance is always 1.

## ◆ Class 121 (79h) – V7 Drive Parameter Object

Class 121 (79h) - V7 Drive Parameter Object					
Parameter	Attribute	Description	Get	Set	Size
n001	1	Initialization/Access Level	X	X	Word
n002	2	Control Mode Select	X	X	Word
n003	3	Operation Method Select	X	X	Word
n004	4	Reference Select	X	X	Word
n005	5	Stop Method	X	X	Word
n006	6	Reverse Prohibit	X	X	Word
n007	7	STOP Key Function	X	X	Word
n008	8	Reference Select – Digital Operator	X	X	Word
n009	9	Frequency Reference Setting	X	X	Word
n010	10 (0Ah)	Operator Disconnect Select	X	X	Word
n011	11 (0Bh)	Max Frequency (0.1Hz)	X	X	Word
n012	12 (0Ch)	Max Voltage (0.1VAC)	X	X	Word
n013	13 (0Dh)	Frequency @ Max Voltage (0.1Hz)	X	X	Word
n014	14 (0Eh)	Mid Frequency (0.1Hz)	X	X	Word
n015	15 (0Fh)	Mid Voltage (0.1VAC)	X	X	Word
n016	16 (10h)	Min Frequency (0.1Hz)	X	X	Word
n017	17 (11h)	Min Voltage (0.1VAC)	X	X	Word
n018	18 (12h)	Acc/Dec Setting Unit	X	X	Word
n019	19 (13h)	Acc Time 1 (0.1s or 0.01s) (see n018)	X	X	Word
n020	20 (14h)	Dec Time 1 (0.1s or 0.01s) (see n018)	X	X	Word
n021	21 (15h)	Acc Time 2 (0.1s or 0.01s) (see n018)	X	X	Word
n022	22 (16h)	Dec Time 2 (0.1s or 0.01s) (see n018)	X	X	Word
n023	23 (17h)	S Curve Select	X	X	Word
n024	24 (18h)	Frequency Reference 1 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n025	25 (19h)	Frequency Reference 2 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n026	26 (1Ah)	Frequency Reference 3 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n027	27 (1Bh)	Frequency Reference 4 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n028	28 (1Ch)	Frequency Reference 5 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n029	29 (1Dh)	Frequency Reference 6 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n030	30 (1Eh)	Frequency Reference 7 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n031	31 (1Fh)	Frequency Reference 8 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n032	32 (20h)	Jog frequency (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n033	33 (21h)	Frequency Reference Upper Limit (%)	X	X	Word
n034	34 (22h)	Frequency Reference Lower Limit (%)	X	X	Word
n035	35 (23h)	Digital Operator Display Mode	X	X	Word
n036	36 (24h)	Motor Rated Current (0.1A)	X	X	Word
n037	37 (25h)	Electronic Thermal Overload Protect	X	X	Word
n038	38 (26h)	Electronic Thermal Overload Protect Time Constant (min)	X	X	Word
n039	39 (27h)	Cooling Fan Select	X	X	Word
n040	40 (28h)	Motor Rotation Select	X	X	Word

Class 121 (79h) - V7 Drive Parameter Object					
Parameter	Attribute	Description	Get	Set	Size
n041	41 (29h)	Acc Time 3 (0.1s or 0.01s) (see n018)	X	X	Word
n042	42 (2Ah)	Dec Time 3 (0.1s or 0.01s) (see n018)	X	X	Word
n043	43 (2Bh)	Acc Time 4 (0.1s or 0.01s) (see n018)	X	X	Word
n044	44 (2Ch)	Dec Time 4 (0.1s or 0.01s) (see n018)	X	X	Word
n045	45 (2Dh)	Reserved	X	X	Word
n046	46 (2Eh)	Reserved	X	X	Word
n047	47 (2Fh)	Reserved	X	X	Word
n048	48 (30h)	Reserved	X	X	Word
n049	49 (31h)	Reserved	X	X	Word
n050	50 (32h)	Multifunction Input Terminal S1 Select	X	X	Word
n051	51 (33h)	Multifunction Input Terminal S2 Select	X	X	Word
n052	52 (34h)	Multifunction Input Terminal S3 Select	X	X	Word
n053	53 (35h)	Multifunction Input Terminal S4 Select	X	X	Word
n054	54 (36h)	Multifunction Input Terminal S5 Select	X	X	Word
n055	55 (37h)	Multifunction Input Terminal S6 Select	X	X	Word
n056	56 (38h)	Multifunction Input Terminal S7 Select	X	X	Word
n057	57 (39h)	Multifunction Output Terminal MA/MB Select	X	X	Word
n058	58 (3Ah)	Multifunction Output Terminal P1 Select	X	X	Word
n059	59 (3Bh)	Multifunction Output Terminal P2 Select	X	X	Word
n060	60 (3Ch)	Analog Frequency Reference Gain (%) (Terminal FR)	X	X	Word
n061	61 (3Dh)	Analog Frequency Reference Bias (%) (Terminal FR)	X	X	Word
n062	62 (3Eh)	Analog Frequency Reference Filter Time Constant (0.01s) (Terminal FR)	X	X	Word
n063	63 (3Fh)	Reserved			Word
n064	64 (40h)	Frequency Reference Loss Detect	X	X	Word
n065	65 (41h)	Monitor Output Select	X	X	Word
n066	66 (42h)	Multifunction Analog Output Select (Terminal AM)	X	X	Word
n067	67 (43h)	Analog Monitor Gain	X	X	Word
n068	68 (44h)	Analog Frequency Reference Gain (%) (CN2 Voltage Reference)	X	X	Word
n069	69 (45h)	Analog Frequency Reference Bias (%) (CN2 Voltage Reference)	X	X	Word
n070	70 (46h)	Analog Frequency Reference Filter Time Constant (0.01s) (CN2 Voltage Reference)	X	X	Word
n071	71 (47h)	Analog Frequency Reference Gain (%) (CN2 Current Reference)	X	X	Word
n072	72 (48h)	Analog Frequency Reference Bias (%) (CN2 Current Reference)	X	X	Word
n073	73 (49h)	Analog Frequency Reference Filter Time Constant (0.01s) (CN2 Current Reference)	X	X	Word
n074	74 (4Ah)	Pulse Train Reference Gain (%) (Terminal RP)	X	X	Word
n075	75 (4Bh)	Pulse Train Reference Bias (%) (Terminal RP)	X	X	Word
n076	76 (4Ch)	Pulse Train Reference Filter Gain (s) (Terminal RP)	X	X	Word
n077	77 (4Dh)	Multifunction Analog Input Selection	X	X	Word
n078	78 (4Eh)	Multifunction Analog Input Signal Select	X	X	Word
n079	79 (4Fh)	Multifunction Analog Input Bias (%)	X	X	Word
n080	80 (50h)	Carrier Frequency Select	X	X	Word
n081	81 (51h)	Momentary Power Loss Ride Thru Select	X	X	Word
n082	82 (52h)	Number of Auto Restart	X	X	Word
n083	83 (53h)	Prohibit Frequency 1 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n084	84 (54h)	Prohibit Frequency 2 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n085	85 (55h)	Prohibit Frequency 3 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n086	86 (56h)	Prohibit Frequency Deadband (0.01Hz)	X	X	Word
n087	87 (57h)	Reserved			Word
n088	88 (58h)	Reserved			Word

Class 121 (79h) - V7 Drive Parameter Object					
Parameter	Attribute	Description	Get	Set	Size
n089	89 (59h)	DC Injection Current (%)	X	X	Word
n090	90 (5Ah)	DC Injection Time @ Stop (0.1s)	X	X	Word
n091	91 (5Bh)	DC Injection Time @ Start (0.1s)	X	X	Word
n092	92 (5Ch)	Stall Prevent @ Dec Select	X	X	Word
n093	93 (5Dh)	Stall Prevent @ Acc (%)	X	X	Word
n094	94 (5Eh)	Stall Prevent @ Run (%)	X	X	Word
n095	95 (5Fh)	Frequency Detect Level (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n096	96 (60h)	Over Torque Detect Enable	X	X	Word
n097	97 (61h)	Over Torque Detect Select	X	X	Word
n098	98 (62h)	Over Torque Detect Level (%)	X	X	Word
n099	99 (63h)	Over Torque Detect Delay Time (0.1s)	X	X	Word
n100	100 (64h)	UP/Down Hold Memory Select	X	X	Word
n101	101 (65h)	Speed Search Dec Time (0.1s)	X	X	Word
n102	102 (66h)	Speed Search Level (%)	X	X	Word
n103	103 (67h)	Torque Compensation Gain	X	X	Word
n104	104 (68h)	Torque Compensation Time Constant (s)	X	X	Word
n105	105 (69h)	Torque Compensation Iron Loss (1W or 0.1W) (set by drive rating)	X	X	Word
n106	106 (6Ah)	Motor Rated Slip (0.1Hz)	X	X	Word
n107	107 (6Bh)	Motor Line to Line Resistance (0.001Ohm)	X	X	Word
n108	108 (6Ch)	Motor Leakage Inductance (0.01mH or 0.1mH) (set by drive rating)	X	X	Word
n109	109 (6Dh)	Torque Compensation Limit (%)	X	X	Word
n110	110 (6Eh)	Motor No Load Current (%)	X	X	Word
n111	111 (6Fh)	Slip Compensation Gain	X	X	Word
n112	112 (70h)	Slip Compensation Primary Delay Time (0.1s)	X	X	Word
n113	113 (71h)	Slip Compensation @ Regen Select	X	X	Word
n114	114 (72h)	Reserved			Word
n115	115 (73h)	Stall Prevent Above Base Speed @ Run Select	X	X	Word
n116	116 (74h)	Stall Prevent @ Run Acc/Dec Select	X	X	Word
n117	117 (75h)	Under Torque Detect Select	X	X	Word
n118	118 (76h)	Under Torque Detect Level (%)	X	X	Word
n119	119 (77h)	Under Torque Detect Time (0.1s)	X	X	Word
n120	120 (78h)	Frequency Reference 9 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n121	121 (79h)	Frequency Reference 10 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n122	122 (7Ah)	Frequency Reference 11 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n123	123 (7Bh)	Frequency Reference 12 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n124	124 (7Ch)	Frequency Reference 13 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n125	125 (7Dh)	Frequency Reference 14 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n126	126 (7Eh)	Frequency Reference 15 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n127	127 (7Fh)	Frequency Reference 16 (0.01Hz < 100Hz) (0.1Hz >= 100Hz)	X	X	Word
n128	128 (80h)	PID Control Select	X	X	Word
n129	129 (81h)	PID Feedback Gain	X	X	Word
n130	130 (82h)	PID P Gain	X	X	Word
n131	131 (83h)	PID I Time (0.1s)	X	X	Word
n132	132 (84h)	PID D Time	X	X	Word
n133	133 (85h)	PID Offset Adjust (%)	X	X	Word
n134	134 (86h)	PID I Limit (%)	X	X	Word
n135	135 (87h)	PID Output Lag Filter Time (0.1s)	X	X	Word
n136	136 (88h)	Feedback Loss Select	X	X	Word

Class 121 (79h) - V7 Drive Parameter Object					
Parameter	Attribute	Description	Get	Set	Size
n137	137 (89h)	Feedback Loss Detect Level (%)	X	X	Word
n138	138 (8Ah)	Feedback Loss Detect Time (0.1s)	X	X	Word
n139	139 (8Bh)	Energy Save Select	X	X	Word
n140	140 (8Ch)	Energy Save Gain K2	X	X	Word
n141	141 (8Dh)	Energy Save Voltage Low Limit @ 60Hz (%)	X	X	Word
n142	142 (8Eh)	Energy Save Voltage Low Limit @ 6Hz (%)	X	X	Word
n143	143 (8Fh)	Energy Save Time of Average kW (x24ms)	X	X	Word
n144	144 (90h)	Energy Save Voltage Limit @ Tuning (%)	X	X	Word
n145	145 (91h)	Energy Save Step Voltage of Tuning to 100% Output Voltage (0.1%)	X	X	Word
n146	146 (92h)	Energy Save Step Voltage of Tuning to 5% Output Voltage (0.1%)	X	X	Word
n147	147 (93h)	Reserved			Word
n148	148 (94h)	Reserved			Word
n149	149 (95h)	Pulse Train Input Scaling (x10Hz)	X	X	Word
n150	150 (96h)	Pulse Monitor Output Frequency Select	X	X	Word
n151	151 (97h)	Modbus Timeout Detect Select	X	X	Word
n152	152 (98h)	Modbus Frequency reference Unit Select	X	X	Word
n153	153 (99h)	Modbus Slave Address Select	X	X	Word
n154	154 (9Ah)	Modbus Baud Rate Select	X	X	Word
n155	155 (9Bh)	Modbus Parity Select	X	X	Word
n156	156 (9Ch)	Modbus Send Wait Time (ms)	X	X	Word
n157	157 (9Dh)	Modbus RTS Control Select	X	X	Word
n158	158 (9Eh)	Motor Code Select	X	X	Word
n159	159 (9Fh)	Energy Save Voltage Upper Limit @ 60Hz (%)	X	X	Word
n160	160 (A0h)	Energy Save Voltage Upper Limit @ 6Hz (%)	X	X	Word
n161	161 (A1h)	Energy Save Power Supply Hold Width (%)	X	X	Word
n162	162 (A2h)	Power Supply Detect Filter Time Constant (x4ms)	X	X	Word
n163	163 (A3h)	PID Output Gain	X	X	Word
n164	164 (A4h)	PID Feedback Select	X	X	Word
n165	165 (A5h)	Reserved			Word
n166	166 (A6h)	Input Phase Loss Detect Level (%)	X	X	Word
n167	167 (A7h)	Input Phase Loss Detect Time (s)	X	X	Word
n168	168 (A8h)	Output Phase Loss Detect Level (%)	X	X	Word
n169	169 (A9h)	Output Phase Loss Detect Time (s)	X	X	Word
n170	170 (AAh)	Reserved			Word
n171	171 (ABh)	Reserved			Word
n172	172 (ACh)	Reserved			Word
n173	173 (ADh)	DC Injection P Gain	X	X	Word
n174	174 (AEh)	DC Injection I Time (x4ms)	X	X	Word
n175	175 (AFh)	Reduce Carrier @ Low Speed Select	X	X	Word
n176	176 (B0h)	Digital Operator COPY Function Select	X	X	Word
n177	177 (B1h)	Digital Operator COPY Access Select	X	X	Word
n178	178 (B2h)	Fault History	X		Word
n179	179 (B3h)	Software ID Number	X		Word



# Hexadecimal/Decimal Conversion

Hexadecimal/Decimal Conversions										
Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	
0	0	34	52	68	104	9C	156	D0	208	
1	1	35	53	69	105	9D	157	D1	209	
2	2	36	54	6A	106	9E	158	D2	210	
3	3	37	55	6B	107	9F	159	D3	211	
4	4	38	56	6C	108	A0	160	D4	212	
5	5	39	57	6D	109	A1	161	D5	213	
6	6	3A	58	6E	110	A2	162	D6	214	
7	7	3B	59	6F	111	A3	163	D7	215	
8	8	3C	60	70	112	A4	164	D8	216	
9	9	3D	61	71	113	A5	165	D9	217	
A	10	3E	62	72	114	A6	166	DA	218	
B	11	3F	63	73	115	A7	167	DB	219	
C	12	40	64	74	116	A8	168	DC	220	
D	13	41	65	75	117	A9	169	DD	221	
E	14	42	66	76	118	AA	170	DE	222	
F	15	43	67	77	119	AB	171	DF	223	
10	16	44	68	78	120	AC	172	E0	224	
11	17	45	69	79	121	AD	173	E1	225	
12	18	46	70	7A	122	AE	174	E2	226	
13	19	47	71	7B	123	AF	175	E3	227	
14	20	48	72	7C	124	B0	176	E4	228	
15	21	49	73	7D	125	B1	177	E5	229	
16	22	4A	74	7E	126	B2	178	E6	230	
17	23	4B	75	7F	127	B3	179	E7	231	
18	24	4C	76	80	128	B4	180	E8	232	
19	25	4D	77	81	129	B5	181	E9	233	
1A	26	4E	78	82	130	B6	182	EA	234	
1B	27	4F	79	83	131	B7	183	EB	235	
1C	28	50	80	84	132	B8	184	EC	236	
1D	29	51	81	85	133	B9	185	ED	237	
1E	30	52	82	86	134	BA	186	EE	238	
1F	31	53	83	87	135	BB	187	EF	239	
20	32	54	84	88	136	BC	188	F0	240	
21	33	55	85	89	137	BD	189	F1	241	
22	34	56	86	8A	138	BE	190	F2	242	
23	35	57	87	8B	139	BF	191	F3	243	
24	36	58	88	8C	140	C0	192	F4	244	
25	37	59	89	8D	141	C1	193	F5	245	
26	38	5A	90	8E	142	C2	194	F6	246	
27	39	5B	91	8F	143	C3	195	F7	247	
28	40	5C	92	90	144	C4	196	F8	248	
29	41	5D	93	91	145	C5	197	F9	249	
2A	42	5E	94	92	146	C6	198	FA	250	
2B	43	5F	95	93	147	C7	199	FB	251	
2C	44	60	96	94	148	C8	200	FC	252	

Hexadecimal/Decimal Conversions

Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal
2D	45	61	97	95	149	C9	201	FD	253
2E	46	62	98	96	150	CA	202	FE	254
2F	47	63	99	97	151	CB	203	FF	255
30	48	64	100	98	152	CC	204	100	256
31	49	65	101	99	153	CD	205		
32	50	66	102	9A	154	CE	206		
33	51	67	103	9B	155	CF	207		

# Notes

# Chapter 3 Automatic Device Recovery

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*This section describes the Automatic Device Recovery feature of the DeviceNet Option Card.*

Overview.....	3-2
Setup .....	3-2
Replace a Faulted Drive.....	3-4

# Overview

Automatic Device Recovery allows a faulted device to be replaced by another device with minimal intervention by the user. The replacement device must match the faulted device in all major aspects. For replacing a faulted Yaskawa drive, the replacement drive must at least match the device type, Vendor ID, product code and drive control mode.

## Setup

It is necessary to set up the network and the devices on the network for Automatic Device Recovery.

### ◆ Network Configuration

Verify that all devices on the network are present, at their appropriate node addresses and properly configured.

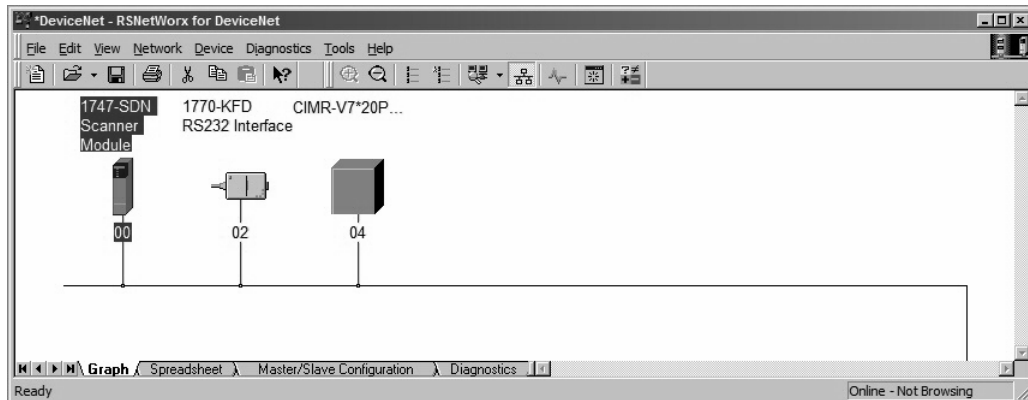


Fig 3.1 – Network Configuration

### ◆ Select Scanner → Properties

Automatic Device Recovery is only available to those devices in the scan list and configured for ADR. Select the Scanner Module and Properties.

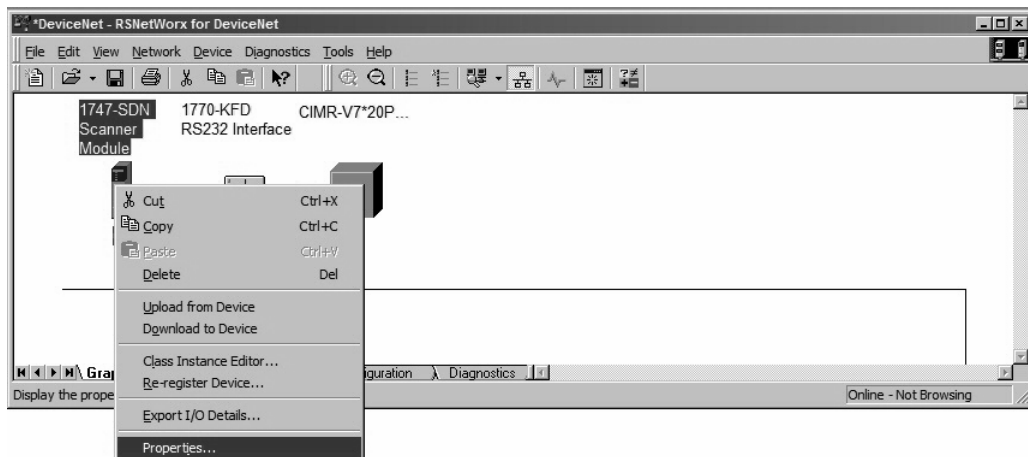


Fig 3.2 – Scanner Properties

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## ◆ Upload Scan List Configuration

Upload the current network configuration from the scanner.

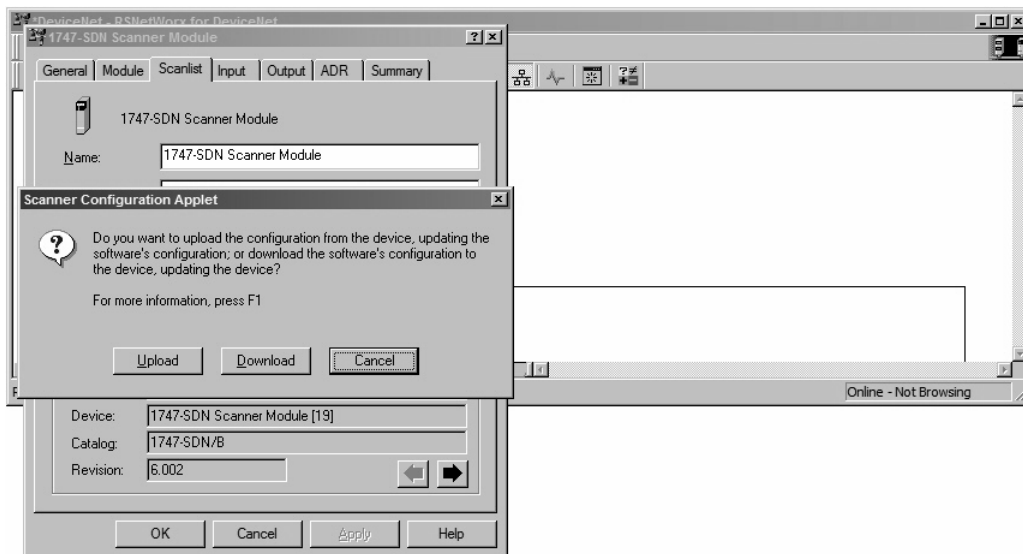


Fig 3.3 – Upload Scan List Configuration

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## ◆ Verify Scan List – Electronic Keying

Verify that all network devices appear on the scan list and are properly configured. Select each device and then select the items for that device's electronic key. The electronic key specifies which data must match exactly between the faulted device and its replacement.

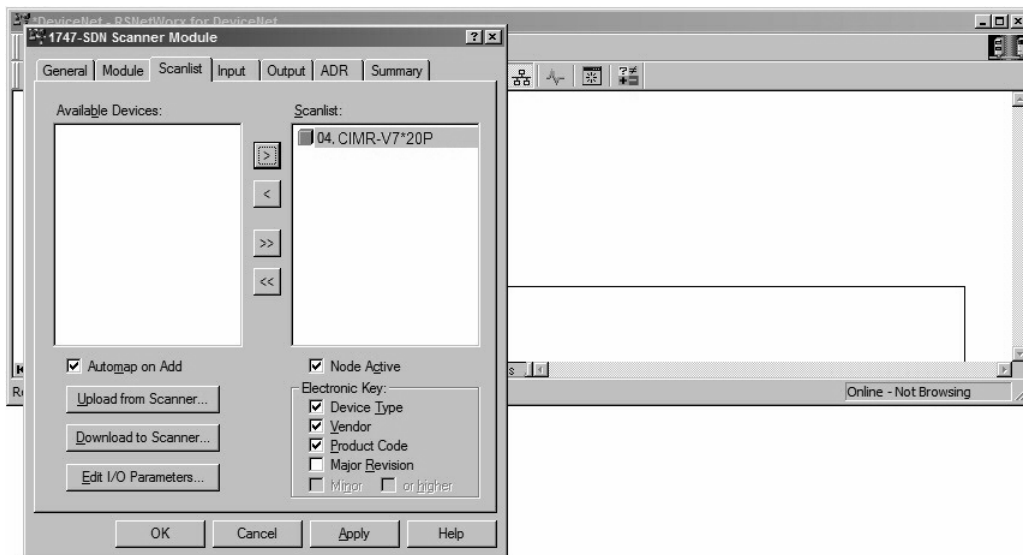


Fig 3.4 – Set Devices' Electronic Key

## ◆ Set Drive ADR Configuration

After the scan list has been verified and the electronic keys have been entered for the devices on the network, select the ADR tab and highlight the device. Check **Enable Auto-Address Recovery**, then select **Load Device Config**. Check **Configuration Recovery**, then check **Auto-Address Recovery**. Once the ADR settings for all devices have been entered, select **Download to Scanner** to save the ADR configuration data to the scanner.

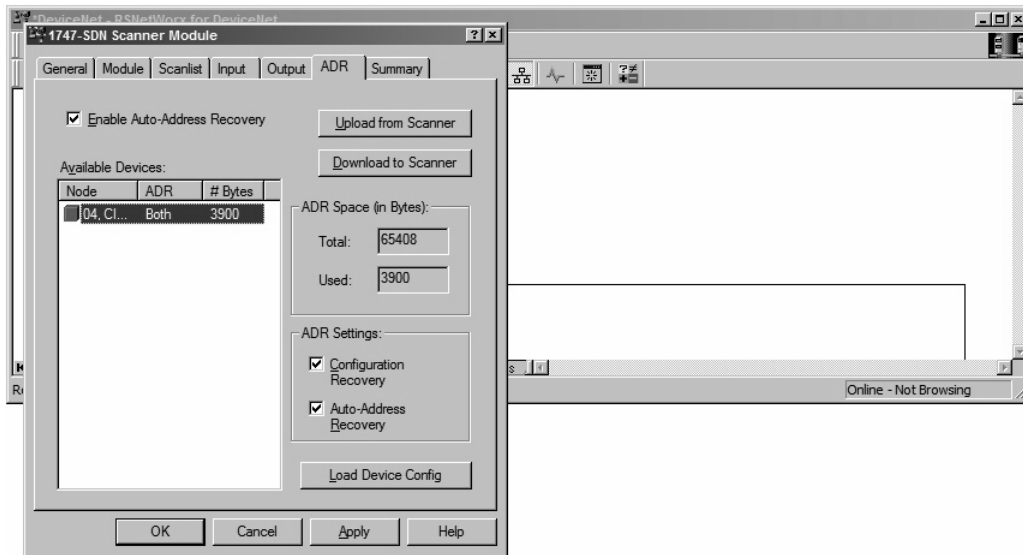


Fig 3.5 – Device ADR Configuration

## Replace a Faulted Drive

Verify that the replacement drive is identical to the faulted drive. The replacement drive must be of the same drive family (V7AM) and same drive model (20P4, 22P2, etc.) as the faulted drive.

Verify that the main power has been shut off and locked out and that there is no voltage present at the drive. Connect the replacement drive's power and motor leads. Refer to the appropriate drive user and/or technical manual for the proper way to connect the drive. Install the *DeviceNet Option Card* but do not connect it to the DeviceNet network. Set the *DeviceNet Option Card* baud rate switch to 9 for **Auto Sense** and set the MAC ID address switches to 99. With the motor's load disconnected, apply power to the drive and verify that it functions properly from the operator keypad.

Set the drive control mode to the control mode of the faulted drive and remove power from the drive. Set the *DeviceNet Option Card* MAC ID address switches to 63. Reapply power to the drive.

Auto-tune the drive.

Connect the *DeviceNet Option Card* to the DeviceNet network.

# Chapter 4 Product Description

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*This section describes the V7 DeviceNet Option.*

Product Description ..... 4-2



# Product Description

<b>Table 4.1 – Product Description</b>	
<b>Item</b>	<b>Description</b>
Current (Network connection +24VDC)	100 mA
Operating Voltage (Network)	11 ~ 25VDC
Operating Temperature	-10°C to 45°C
Storage Temperature	-20°C to 60°C
Humidity	95% RG (non-condensing)
Vibration	1G @ 20Hz, 0.2G @ 20 to 50Hz
Altitude	3300 ft or less

# Chapter 5 Cable Specification

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*This section describes the V7 DeviceNet Option Cable Requirements.*

Cable Specifications.....	5-2
Cable Length.....	5-3

# Cable Specifications

## ◆ Thick Cable

This cable consists of two shielded pairs of wire twisted on a common axis with a drain wire in the center. It is covered with an overall braid shield.

- One 18AWG twisted pair signal wire (Blue & White)
- One 15AWG twisted pair power wire (Red & Black)
- Separate aluminized mylar shields around the signal and power wires
- Overall foil/braid shield with 18AWG drain wire

Table 5.1 – DeviceNet Thick Cable					
Belden Wire & Cable Co.					
Part #	Pair	AWG	Insulation	Outer Jacket	Color
3082A	Data	18	Datalene	PVC	Lt. Gray
	Power	15	PVC/Nylon		
3083A	Data	18	Datalene	PVC	Yellow CPE
	Power	15	PVC/Nylon		
Berk-Tek.					
Part #	Pair	AWG	Insulation	Outer Jacket	Color
210051	Data	18	FPE/HDPE	PVC	Lt. Gray
	Power	15	PVC/Nylon		

## ◆ Thin Cable

This cable consists of two shielded pairs of wire twisted on a common axis with a drain wire in the center. It is covered with an overall braid shield.

- One 24AWG twisted pair signal wire (Blue & White)
- One 22AWG twisted pair power wire (Red & Black)
- Separate aluminized mylar shields around the signal and power wires
- Overall foil/braid shield with 22AWG drain wire

Table 5.2 – DeviceNet Thin Cable					
Belden Wire & Cable Co.					
Part #	Pair	AWG	Insulation	Outer Jacket	Color
3084A	Data	24	Datalene	PVC	Lt. Gray
	Power	22	PVC/Nylon		
3085A	Data	24	Datalene	PVC	Yellow CPE
	Power	22	PVC/Nylon		
Berk-Tek.					
Part #	Pair	AWG	Insulation	Outer Jacket	Color
210144	Data	24	FPE/HDPE	PVC	Lt. Gray
	Power	22	PVC/Nylon		

# Cable Length

## ◆ Trunk Line

The maximum allowed trunk line length depends on the type of cable used and the network baud rate. The total cable length includes the length of the trunk and the sum of all the drop lines.

Baud Rate	Thick Cable	Thin Cable
125 kbaud	500 m	100 m
250 kbaud	250 m	
500 kbaud	100 m	

For trunk lines of mixed thick and thin cables, the total length at the various baud rates:

- o 125 kbaud:  $L_{\text{thick}} + (5 \times L_{\text{thin}}) = 500 \text{ m}$
- o 250 kbaud:  $L_{\text{thick}} + (2.5 \times L_{\text{thin}}) = 250 \text{ m}$
- o 500 kbaud:  $L_{\text{thick}} + L_{\text{thin}} = 100 \text{ m}$

## ◆ Drop Line

The drop line is measured from the tap on the trunk line to the transceiver of the DeviceNet node. Note that the total cable length includes the length of the trunk and the sum of all the drop lines.

Baud Rate	Maximum @ Each	Maximum Total
125 kbaud	6 m	156 m
250 kbaud		78 m
500 kbaud		39 m

# Notes

# Chapter 6 Troubleshooting

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*This section describes troubleshooting the DeviceNet Option Card.*

Verify the Drive .....	6-2
LED States .....	6-2
DeviceNet Faults.....	6-3
Network Wiring .....	6-5

# Verify the Drive

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.

**⚠ WARNING!**

Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

Remove the DeviceNet Option Card. Reapply power to the drive and verify that the drive runs as expected without the DeviceNet Option Card installed.

If the drive runs as expected, remove power from the drive, following the guidelines described above, and reinstall the DeviceNet Option Card. With the DeviceNet Option Card installed, reapply power to the drive.

## LED States

The operational state of the *DeviceNet Option Card* LEDs after the DeviceNet diagnostic LED sequence has been completed is described below. Please wait at least 10 seconds for the loading process to complete before verifying the states of the LEDs. Compare the state of the DeviceNet Option Card LEDs with the states listed in the table below to determine the nature of the fault.

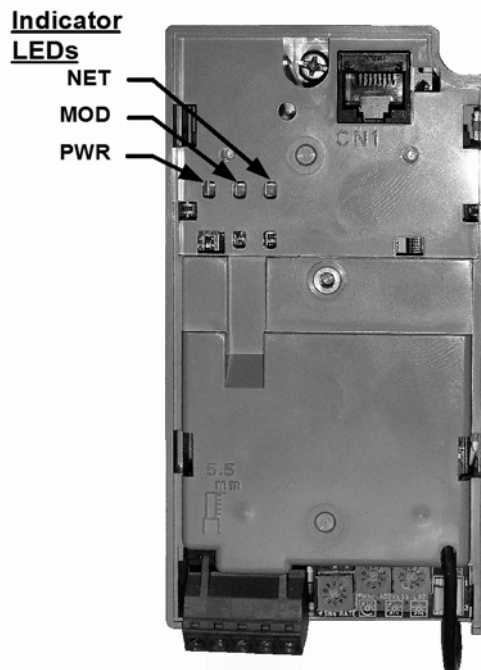


Fig 6.1 – LEDs

LED	State	Indicates	
MOD	Off	No Power	Verify that the DeviceNet Option Card is properly installed. Verify that the drive connected properly and is powered.
	On Green	Device Operational	Normal operation
	Flash Green	Device in Standby	Drive not configured on the network
	Flash Red	Minor Fault	Recoverable fault
	On Red	Unrecoverable Fault	Cycle power to the DeviceNet Option Card. If fault continues replace the card.
	Flash Red-Green	Device Self-Test	Self-Test mode
NET	Off	Not Powered/Not Online	Verify that the DeviceNet Option Card is properly installed. Verify that the DeviceNet Option Card is properly connected to the network. Verify that the drive connected properly and is powered.
	Flash Green	Online/Not Connected	Check network configuration. Check PLC and DeviceNet scanner.
	On Green	Link OK/Online and Connected	Normal operation
	Flash Red	Connection Timeout	Check network connections. Check PLC and DeviceNet scanner.
	On Red	Critical Link Failure	Check for duplicate MAC ID. Check for faulty network connection. Check 24VDC power supply voltage. Check for proper installation of the termination resistors.
	Flash Red & Green	Communication Faulted	Check duplicate MAC IDs.

## DeviceNet Faults

The table of *DeviceNet Option Card* fault codes returned by the drive is shown below. Refer to the appropriate drive user and/or programming manual(s) for drive-specific information on the fault returned.

Drive Code	DeviceNet Code	Description	
0h	0000h	None	
1h	5120h	DC Bus Fuse Open (PUF)	Output Transistor Failure – Replace the drive.
2h	3220h	DC Bus Undervoltage (UV1)	Input power fluctuation too large
3h	5110h	CTL PS Undervoltage (UV2)	Cycle drive power – Replace drive if fault continues.
4h	3222h	MC Answerback (UV3)	Cycle drive power – Replace drive if fault continues.
5h	2130h	Short Circuit (SC)	Check drive wiring. Cycle drive power – Replace drive if fault continues.
6h	2120h	Ground Fault (GF)	Check for motor and/or cable damage.
7h	2300h	Overcurrent (OC)	Check motor, motor load and acc/dec rates.
8h	3210h	DC Bus Overvoltage (OV)	Check incoming voltage. Check deceleration time.
9h	4200h	Heatsink Over-Temperature (OH)	Check ambient temperature. Check drive cooling fan.
0Ah	4210h	Heatsink Maximum Temperature (OH1)	Check drive cooling fan.
0Bh	2220h	Motor Overload (OL1)	Check the load, acc/dec and cycle times. Check motor rated current (E2-01).
0Ch	2200h	Inverter Overload (OL2)	Check the load, acc/dec and cycle times. Check drive rating.
0Dh	2221h	Overtorque Detection 1 (OL3)	Check L6-02 and L6-03 settings. Check system mechanics.
0Eh	2222h	Overtorque Detection 2 (OL4)	Check L6-05 and L6-06 settings. Check system mechanics.
0Fh	7110h	Dynamic Braking Transistor (RR)	Cycle drive power – Replace drive if fault continues.
10h	7112h	Dynamic Braking Resistor (RH)	Check load, operating speed and deceleration time.



Drive Code	DeviceNet Code	Description	
11h	9000h	External Fault 3 (EF3)	Multifunction digital input set to external fault Circuit at terminal is closed.
12h	9000h	External Fault 4 (EF4)	
13h	9000h	External Fault 5 (EF5)	
14h	9000h	External Fault 6 (EF6)	
15h	9000h	External Fault 7 (EF7)	
16h	9000h	External Fault 8 (EF8)	
17h	4140h	Heatsink Fan (FAN)	Check drive cooling fan.
18h	7310h	Overspeed Detection (OS)	Check reference and reference gain. Check F1-08 and F1-09 settings.
19h	7310h	Speed Deviation (DEV)	Check load, acc/dec times and system mechanics. Check F1-10 and F1-11 settings.
1Ah	7301h	PG Open (PGO)	Check PG card connections.
1Bh	3130h	Input Phase Loss (PF)	Excessive input voltage fluctuation.
1Ch	3130h	Output Phase Loss (LF)	Check for broken wire/loose terminals. Check motor rating.
1Eh	5300h	Operator Disconnected (OPR)	Reconnect the digital operator.
1Eh	5300h	OPE Faults	Verify parameter settings.
1Fh	6320h	EEPROM R/W Error (ERR)	Cycle drive power – Replace drive if fault continues.
20h	0000h	No Fault	
21h	7500h	DeviceNet Communication Error (BUS)	Check DeviceNet network cable connections. Check 24VDC power supply voltage.
22h	7500h	SI-E Communications Error	Check DeviceNet Option Card installation and connections.
23h	7500h	SI-F/G Communications Error	Check DeviceNet Option Card installation and connections.
24h	7500h	SI-F/G CPU error	Cycle drive power – Replace drive if fault continues.
25h	8321h	Out of Control (CF)	Check motor parameters. Auto-tune.
26h	8313h	Zero Servo Fault (SVE)	Check load. Torque limit is too small.
27h	9000h	External Fault 0 (EF0)	Check PLC program. Check MI switch setting. Check DeviceNet Option Card LEDs for fault indication.

# Network Wiring

1.  Connector Wiring
  - The network cable wires are connected in the correct order.
  - All network wires are securely connected.
  - There are no short circuits between network wires or shield.
  - The network connector is securely inserted into the mating connector.
  
2.  Network Cable
  - The number of DeviceNet nodes does not exceed 64 on any one network.
  - No drop line is longer than 6 m.
  - The total drop length is less than the allowable length for the network baud rate and cable type.
  - The network trunk length does not exceed the allowable length for the network baud rate and cable type.
  - Network cables are not close to high power or frequency cables.
  
3.  Terminating Resistors
  - The terminating resistors are appropriately installed and are of the correct size and type.
  - Measure the DC resistance between CAN\_L and CAN\_H at the ends and middle of the network. The measurement should be between 50 ohms and 70 ohms.
  
4.  Grounding
  - Single point ground technology is used.
  - The network shield and drain wire are grounded at only one point, preferably in the center of the network.
  - The 24VDC power supply common is grounded at the same point as the network shield and drain wire.
  - Check for noise with an oscilloscope.
  
5.  24VDC Power Supply
  - Turn on the 24VDC power supply and configure all nodes for their maximum current draw.
  - Measure the voltage between V+ and V- at the power supply and at each end of the network. The voltage should not fall below 11VDC at any point on the network. If the network contains powered devices (proximity sensors, photoelectric sensors, etc.) the voltage should not fall below 20VDC.
  - The 24VDC power supply common is grounded at the single point ground.

# Notes

# CM013 V7 DeviceNet Option



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