V7N Drive with DeviceNet Technical Manual

This Manual also available on www.drives.com

DeviceNet

Models: CIMR-V7NU   Document Number: TM.V7N.01

QUICK REFERENCE – – DRIVE PARAMETERS

PARAMETERS	FACTORY SETTING	USER SETTING
n001	1	
n002	0	
n003	3	
n004	9	
n005	0	
n006	0	
n007	0	
n008	0	
n009	0	
n010	0	
n011	60	
n012	230/460	
n013	60	
n014	(Note 2)	
n015	(Note 2)	
n016	(Note 2)	
n017	(Note 2)	
n018	0	
n019	10.0	
n020		
n021		
n022		
n023	0	
n024	6.00	
n025	0.00	
n026	0.00	
n027	0.00	
n028	0.00	
n029	0.00	
n030	0.00	
n031	0.00	
n032	6.00	
n033	100	
n034	0	
n035	0	
n036	(Note 1)	
n037	0	
n038	8	
n039	0	
n040	0	
n041	10.0	
n042		
n043		
n044		
n050	1 (1)	
n051	2 (2)	
n052	3 (0)	
n053	5 (5)	
n054	6 (6)	
n055	7 (7)	
n056	10 (10)	
n057	2	
n058	1	

PARAMETERS	FACTORY SETTING	USER SETTING
n059	0	
n064	0	
n068	100	
n069	0	
n070	0.10	
n071	100	
n072	0	
n073	0.10	
n077	0	
n078	0	
n079	0	
n080	3	
n081	0	
n082	0	
n083	0.00	
n084	0.00	
n085	0.00	
n086	0.00	
n087[3]	0	
n088[3]	0	
n089	50	
n090	0.0	
n091	0.0	
n092	0	
n093	170	
n094	160	
n095	0.00	
n096	0	
n097	0	
n098	160	
n099	0.1	
n100	0	
n101	2.0	
n102	150	
n103	1.0	
n104	(Note 2)	
n105	(Note 1)	
n106	(Note 1)	
n107	(Note 1)	
n108	(Note 1)	
n109	150	
n110	(Note 1)	
n111	(Note 2)	
n112	(Note 2)	
n113	0	
n115	0	
n116	0	
n117	0	
n118	10	
n119	0.1	
n120	0.00	
n121	0.00	
n122	0.00	
n123	0.00	

PARAMETERS	FACTORY SETTING	USER SETTING
n124	0.00	
n125	0.00	
n126	0.00	
n127	0.00	
n128	0	
n129	1.00	
n130	1.0	
n131	1.0	
n132	0.00	
n133	0	
n134	100	
n135	0.0	
n136	0	
n137	0	
n138	1.0	
n139	0	
n140	(Note 1)	
n141	50	
n142	12	
n143	1 (24 ms)	
n144	0%	
n145	0.5%	
n146	0.2%	
n148	71	
n149	21	
n150	63	
n151	0	
n152	0.2	
n153	0	
n154	0	
n155	0	
n156	0	
n157	0	
n158	(Note 1)	
n159	120	
n160	16	
n161	10	
n162	5 (20 ms)	
n163	1.0	
n164	0	
n166	0	
n167	0	
n168	0	
n169	0.0	
n170	0	
n173	83 (0.083)	
n174	25 (100 ms)	
n175	0	
n176	rdy	
n177	0	
n178	N/A	
n179	0011	

Note 1: Factory setting differs depending on the Drive capacity. See Appendix 3-1.
Note 2: Factory setting differs depending on control method selected **(n002)**. See Appendix 3-1.
Note 3: Available only in CIMR-V7NU25P5, 27P5, 45P5, and 47P5 drives.

CONTENTS

CONTENTS – Continued

WARNINGS, CAUTIONS, 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 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

- Do not connect or disconnect wiring while the power is on. Do not remove covers or touch circuit boards while the 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 50 VDC. To prevent electric shock, wait at least 5 minutes after all indicators are OFF.
- 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 18,000 RMS symmetrical amperes at 250V maximum or 480V maximum. Install adequate branch short circuit protection. Refer to Appendix 4. Failure to do so may result in equipment damage and/or personal injury.

⚠ CAUTION

The Drive leaves the factory with parameters initialized for 2-Wire control (when using external Run/Stop signals). Before using the initialization function of constant **n001**, know your control wiring configuration:
10 = Factory 2-Wire Control Initialization (Maintained RUN Contact)
11 = Factory 3-Wire Control Initialization (Momentary START/STOP Contact)

Entering either Initialization code resets all parameters to factory settings, and automatically returns parameter **n001** setting to “ 1 ”. If the Drive is connected for 3-Wire control and this parameter is set to “ 10 ” (2-Wire Control Initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

Parameter **n012** must be set to proper motor voltage.

Always ground the Drive using the ground terminal provided.
Never connect main circuit output terminals T1 (U), T2 (V) & T3 (W) to AC main circuit power supply.

When programmed for auto-restart (**n082** = “ 1 ” thru “ 10 ”), the motor may restart unexpectedly — personal injury may result

For Enclosed wall-mounted type (NEMA type 1)

When mounting units in an enclosure, remove the top, bottom and terminal covers. Install a cooling fan or some other means to maintain the air entering the enclosure below 113°F (45°C).

IMPORTANT

- Wiring should be performed only by qualified personnel.
- Verify that the rated voltage of the drive matches the voltage of the incoming power.
- Some drawings in this manual are shown with the protective covers and shields removed, in order to describe detail with more clarity. Make sure all covers and shields are replaced before operating this product.
- This manual may be modified when necessary because of product improvement, modification, or changes in specifications.
- YASKAWA is not responsible for any modification of the product made by the user, doing so will void the warranty.

SIMPLIFIED STARTUP PROCEDURE

This procedure is a simplified step by step guide to installing, programming, and using the Yaskawa V7N (hereafter referred to as the Drive). It highlights several common installation configurations. Detailed information on all drive features can be found in this Technical Manual.

❑ **Check Nameplate** - Be certain your input voltage source, motor and drive nameplates are all marked either 230V or 460V. Other voltages can be used, but require additional programming; see paragraph 5.27, V/f pattern.

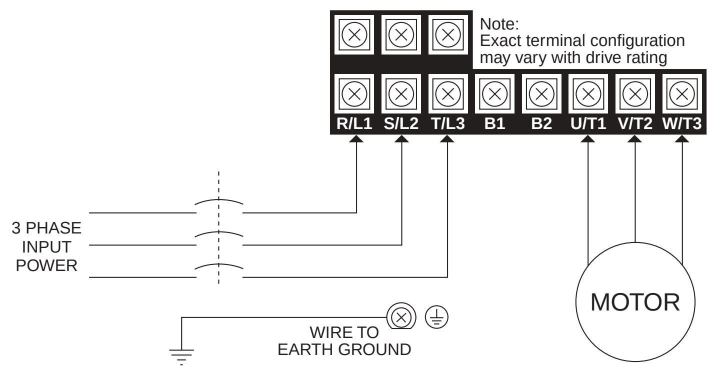
❑ **Mount drive** - on a vertical surface with adequate space for air circulation (4.7" above and below, 1.2" on each side).

❑ **Remove front cover** - fit conduit to bottom plate, and connect power and ground wires as shown.

⚠ CAUTION

BE CERTAIN YOU CONNECT INPUT POWER TO TERMINALS L1, L2, AND L3 ONLY, OR SERIOUS DAMAGE WILL RESULT. CONNECT MOTOR TO TERMINALS T1, T2, AND T3 ONLY.

POWER WIRING SCHEMATIC

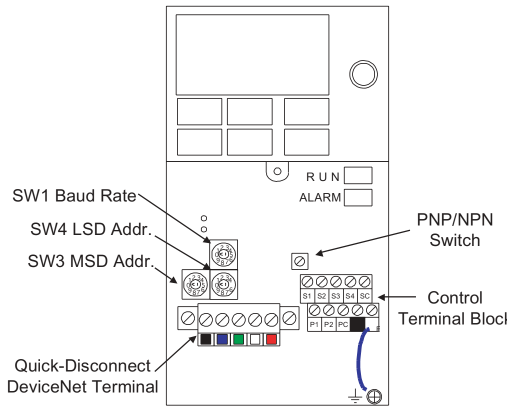


❑ **Replace cover and apply input power** – digital operator shows “0.00”; The FREF LED is on and the RUN LED is flashing. Press the **DSPL** key until the LO/RE LED is on. Press the **UP ARROW** button until the display shows “Lo,” then press the **DSPL** button until the FREF LED is on. Rotate the potentiometer on the front of the digital operator until the display shows “6.00.” Press the **RUN** button and note the direction of motor rotation. If rotation is incorrect, remove power, wait for the display lights to go out, then switch wires between terminals T1 and T2. Replace the front cover and apply input power.

❑ **DeviceNet and Control Terminal Wiring** – Remove power and wait for all LEDs to go out before making DeviceNet and control terminal connections. Use standard DeviceNet thin or thick cable when connecting to DeviceNet terminals.

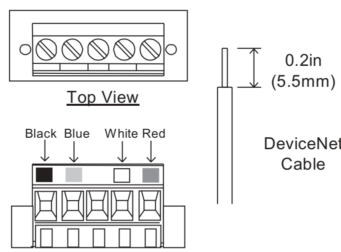
Remove the front cover and connect the DeviceNet communication wires on the quick-disconnect screw terminal on the drive (Section 6.2.3 Cable Installation).

Control wiring should be sized 16 to 20 AWG. Control wiring should be shielded, with the shield wire connected to the ground terminal ⏚, which is located towards the left side of the aluminum heat sink.



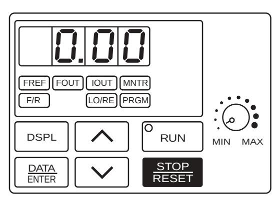
Without Front Cover

Terminal Color	Name	Wiring Color	Content
Black	V-	Black	Communication power supply GND
Blue	CAN_L	Blue	Communication data low side
-	Shield	Bare	Shield wire
White	CAN_H	White	Communication data high side
Red	V+	Red	Communication power supply DC+24V



❑ **Digital Operator**
The **DSPL** button cycles through all of the quick start LEDs.

To access a parameter, press the **DSPL** button until the PRGM LED is on. Use the **UP** and **DOWN** keys until the desired parameter number is displayed, then press **ENTER**. Use the **UP** and **DOWN** keys to adjust the value then press **ENTER** then **DSPL**.



Before the drive will accept a RUN command, one of the following LEDs must be on: FREF, FOUT, IOUT, MNTR, or F/R. For more specific information on the digital operator, see Section 4.

❑ **Control Method –** This section assumes that the drive will be left in the volts per hertz (V/f) control method. For a further explanation of control method or to change the control method, see Section 2.1.

❑ **DeviceNet Settings**

Using the rotary switch SW1 (RATE) on the drive, set communication baud rate (Section 2.6 Baud Rate and Address Configuration).

S1 Switch Setting	0	1	2	3 - 9
Baud Rate	125 kbps	250 kbps	500 kbps	Parameter **n152**: 0: 125kbps 1: 250kbps 2: 500kbps

Using the rotary switch SW3 (MSD) and SW4 (LSD), set the DeviceNet MAC ID. Be sure to verify that no devices on the network have duplicate MAC ID's (Section 2.6 Baud Rate and Address Configuration).

S3 + S4 Switch Setting	0 - 63	64 - 99
Address or MAC ID	MAC ID = (S3 x 10) + S4	Parameter n150: Setting Range: 0 to 63

Reassemble the front cover and power up the V7N. Verify that the MS LED is lit green and NS LED is flashing green (Section 2.8 DeviceNet Status Indication LED's)

❑ **DeviceNet Parameters**

Verify the drive's run/stop and frequency reference to be controlled by DeviceNet. (Section 2.10.2 Run / Stop and Frequency Selection)

Parameter	Display Text	Default Value	Description
n003	Run Source Option PCB	3	Sets the start/stop to come from DeviceNet.
n004	Reference Source Option PCB	9	Sets the frequency reference to come from DeviceNet.

Note: When the above parameters are set and DeviceNet communication to the drive has not begun, the operator will flash "CAL". This alarm indicates that the drive is waiting for DeviceNet communication to operate the drive. Once DeviceNet communication to the drive begins, the "CAL" alarm will cease.

❑ **EDS File**

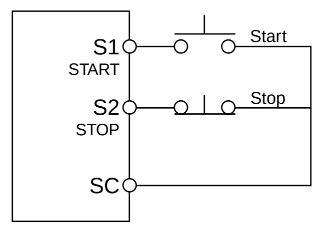
Download the proper EDS file for the corresponding V7N model number from the CD-ROM that came with the V7N drive, from www.odva.org in the "Downloads" area, or from www.drives.com in the "Our Products" - "Literature Library" - "Software Downloads" area. Each V7N drive capacity has its own EDS file, so it is important to select the EDS file that matches the drive capacity (Section 2.9 EDS File). Install the EDS file in the configuration tool software, such as DeviceNet Manager or RSNetworx from Rockwell Software. (Appendix 9 DeviceNet Configuration for RSNetWorx and DeviceNet Manager)

Definitions

Sequence – refers to how the drive is started, stopped, and told which direction to run. When the sequence comes from the digital operator (local), the drive is started and stopped using the "RUN" and "STOP" keys on the digital operator, and direction is given via the "FWD/REV" key. Sequence can also come from the drive's control terminals (remote) using either two-wire or three-wire control. **The sequence inputs to the drive do NOT require any outside voltages to activate them.** Instead, contact closures (either from switches, relay contacts or open collector circuits) activate the sequence inputs. Other sequence sources are available; consult Paragraph 5.13, Local/Remote Reference and Sequence Selection for details.

Two-wire sequence – utilizes a "maintained" switch or relay contact. It is used on applications where it is desirable to have the drive restart on restoration of power. It should not be used where safety of attending personnel might be threatened by a restart. This method is generally restricted to unattended fans & pumps, or where another controller is entrusted with the decision to restart. Direction is controlled by maintaining either a forward run or a reverse run command.

Three-wire sequence – utilizes "momentary" buttons or switches. This control scheme emulates the traditional 3-wire motor starter control. A momentary closure of a normally open run switch latches the drive in the RUN mode (STOP switch must be closed or the drive will not accept the momentary RUN command). A momentary opening of the normally closed STOP switch unlatches RUN mode bringing the drive to a stop. The three-wire sequence is used where it would be dangerous for the drive to restart after a power outage. This method requires an intentional restart, as the RUN command is unlatched immediately on loss of power. Direction is determined by another maintained contact closure (closed = reverse).



3-Wire Sequence

Reference – The frequency reference tells the drive how fast to run the motor. There are several source options for the frequency reference. First, the frequency reference can come from the digital operator (local). Simply put, the motor speed can be entered into the keypad. Second, the frequency reference can come from an analog signal (remote), such as 0 to 10 Volts DC. When 0 Volts is applied to the drive, the drive will run at zero speed. When 10V is applied to the drive, it will run at full speed. Apply anything in between and the drive will run at that corresponding frequency (2.5VDC = 25% speed = 15 Hz). Third, the frequency reference can come from DeviceNet communications. Other reference sources are available; consult Paragraph 5.11, Frequency Reference Selection for details.

Local Control – when the sequence and/or reference comes from the digital operator.

Remote Control – when the sequence and/or reference comes from the control terminals or DeviceNet communications.

Current Ratings & Horsepower Range

Rated Input Voltage	Current Rating [A]	Nominal Horsepower	Model Number CIMR-V7NU ☐
230V	0.8	1/8	20P1
	1.6	1/4	20P2
	3.0	1/2	20P4
	5.0	3/4 & 1	20P7
	8.0	2	21P5
	11.0	3	22P2
	17.5	5	23P7
	25.0	7.5	25P5
	33.0	10	27P5
460V	1.2	1/2	40P2
	1.8	3/4	40P4
	3.4	1 & 2	40P7
	4.8	3	41P5
	8.6	5	43P7
	14.8	7.5 & 10	45P5
	18.0	10	47P5

⚠ WARNING

Do not touch circuit components until main input power has been turned OFF. Status indicator LEDs and Digital Operator display will be extinguished when the DC bus voltage is below 50 VDC. Wait 5 additional minutes.

Do not connect or disconnect wires and connectors while the main input power is turned on.

⚠ CAUTION

The Drive leaves the factory with parameters initialized for 2-Wire control (when using external Run/Stop signals). Before using the initialization function of constant n001, know your control wiring configuration:

10 = Factory 2-Wire Control Initialization (Maintained RUN Contact)
11 = Factory 3-Wire Control Initialization (Momentary START/STOP Contact)

Entering either Initialization code resets all parameters to factory settings, and automatically returns parameter n001 setting to " 1 ". If the Drive is connected for 3-Wire control and this parameter is set to " 10 " (2-Wire Control Initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

Section 1. RECEIVING AND INSTALLATION

1.1 GENERAL

This document pertains to the V7N ac drive. This manual reflects the Software Version 0011 for models CIMR-V7□□□0P1 through V7□□□4P0 and Software Version 0100 for models CIMR-V7□□□5P5 and V7□□□7P5. In this document, the word “drive”, “ac drive”, and “inverter” may be used interchangeably. The V7N is a general purpose sine-coded pulse width modulated AC motor drive with embedded DeviceNet communications. It generates an adjustable voltage/frequency three phase output for complete speed control of most conventional squirrel cage induction motors. Automatic stall prevention and voltage boost prevent nuisance tripping during load or line side transient conditions. The Drive will not induce any voltage line notching distortion back to the utility line, and it maintains a displacement power factor of not less than 0.98 throughout its speed range.

When properly installed, operated and maintained, the Drive will provide a lifetime of service. It is mandatory that the person who operates, inspects, or maintains this equipment thoroughly read and understand this manual before proceeding.

Information in this manual covers both the Drive functionality and DeviceNet communications. It also contains basic information for the operator control station. For detailed operation of other units in the drive system, refer to their respective manuals.

1.2 RECEIVING

The Drive is thoroughly tested at the factory. After unpacking, verify the part numbers on the nameplate with the purchase order (invoice). Any damages or shortages evident when the equipment is received must be reported immediately to the commercial carrier who transported the equipment. Assistance, if required, is available from your sales representative.

⚠ **CAUTION**

Do not install a drive that is damaged or missing parts.

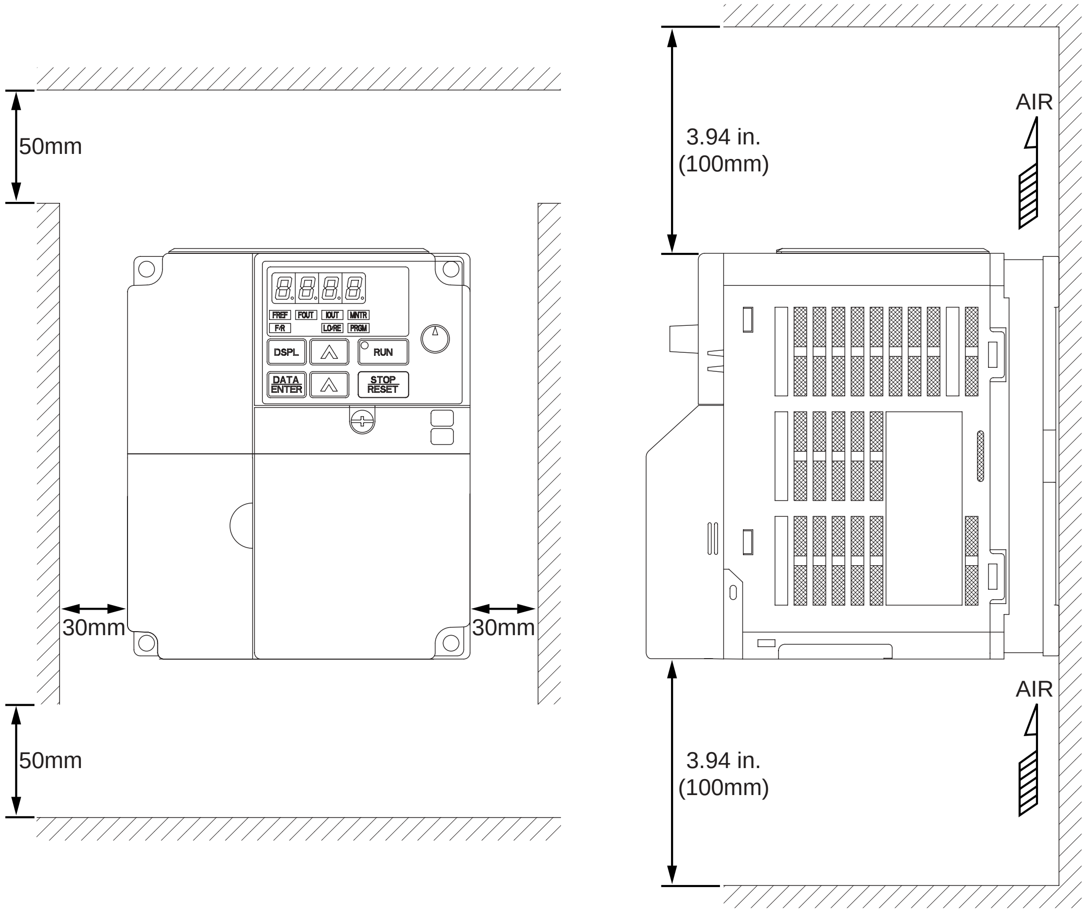
If the drive will be stored after receiving, keep it in its original packaging and store according to storage temperature specifications in Appendix 2.

1.3 PHYSICAL INSTALLATION

Location of the Drive is important to achieve proper performance and normal operating life. The unit should be installed in an area where it will be protected from:

- Extreme cold and heat. Use only within the ambient temperature range (for open chassis type): 14 to 122°F (-10 to +50°C)
- Rain, moisture
- Oil sprays, splashes
- Salt spray
- Direct sunlight. (Avoid using outdoors)
- Corrosive gases (e.g. sulfurized gas) or liquids
- Dust or metallic particles in the air
- Physical shock, vibration
- Magnetic noise (Example: welding machines, power devices, etc.)
- High humidity
- Radioactive substances
- Combustibles: thinner, solvents, etc.

When preparing to mount the Drive, lift it by its base, ***never*** by the front cover. For effective cooling, as well as proper maintenance, the Drive must be installed on a flat, non-flammable vertical surface (wall or panel) using four mounting screws. There MUST be a MINIMUM 3.9 in. clearance above and below the Drive to allow air flow over the heat sink fins. A minimum 1.2 in. clearance is required on each side of the Drive.



1. To use 5.5/5.7 kw (7.5/10 Hp) Drives as open chassis, remove both top and bottom covers.
2. The clearances required at top/bottom and both sides are common in open chassis type (IP00) and enclosed wall-mounted type (IP20).
3. For the external dimensions and mounting dimensions, refer to the “DIMENSIONS” section of Appendix 5.
4. Allowable intake air temperature to the Drive:
   Open chassis type: -10°C to +50°C
   Enclosed wall-mounted type: -10°C to +40°C
5. Allow sufficient space for the sections at the upper and lower parts marked with * in order to permit the flow of intake/exhaust air to/from the Drive.

For details on removing the front panels and accessing the terminals, see Appendix 8.

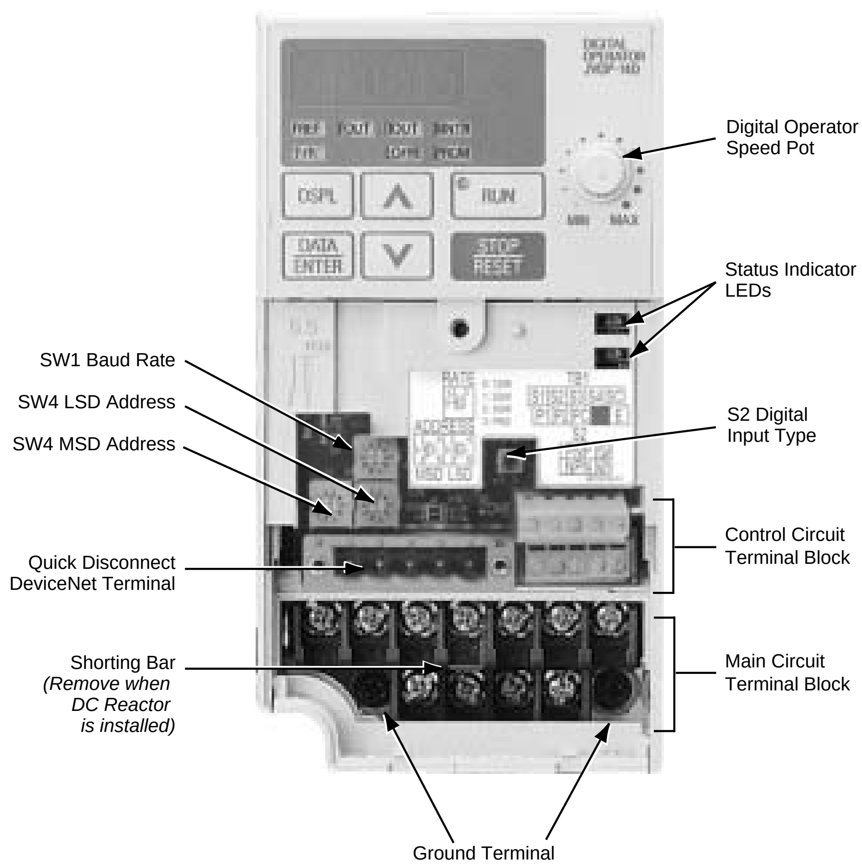


Figure 1-1a. Component Identification

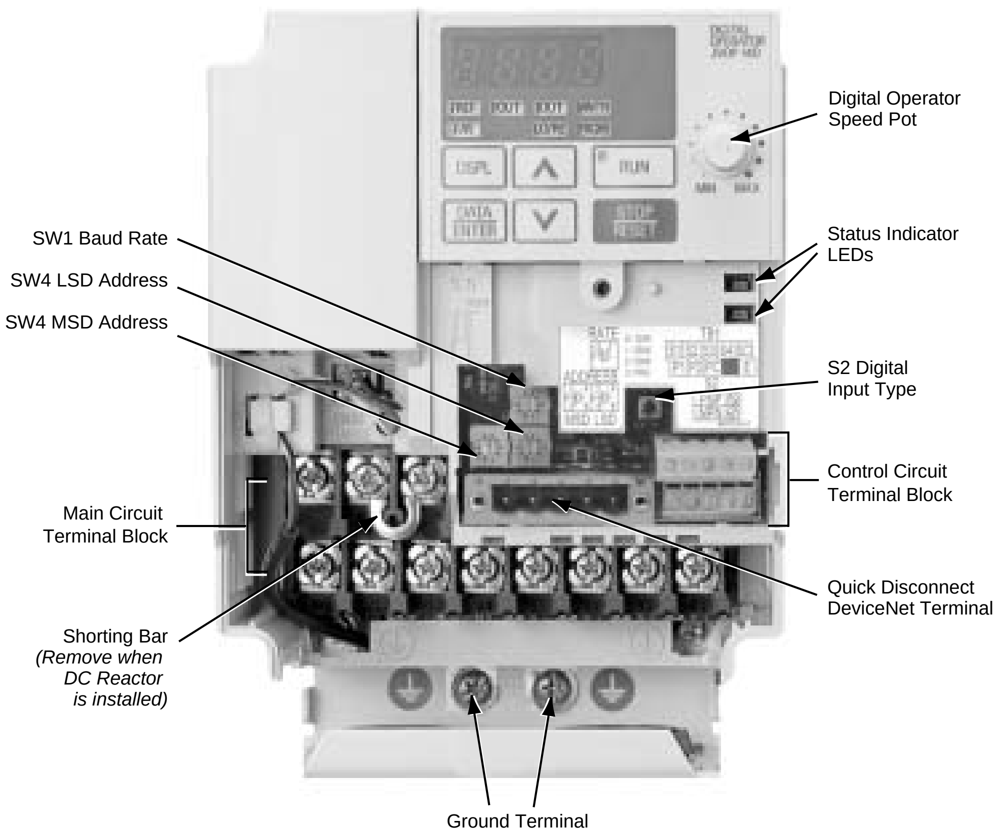
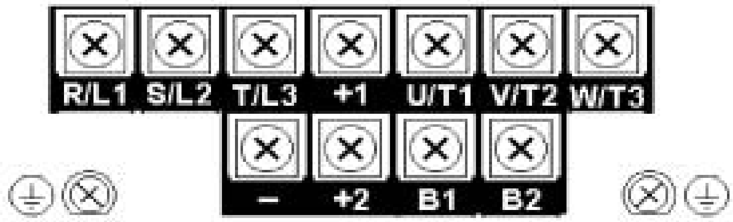


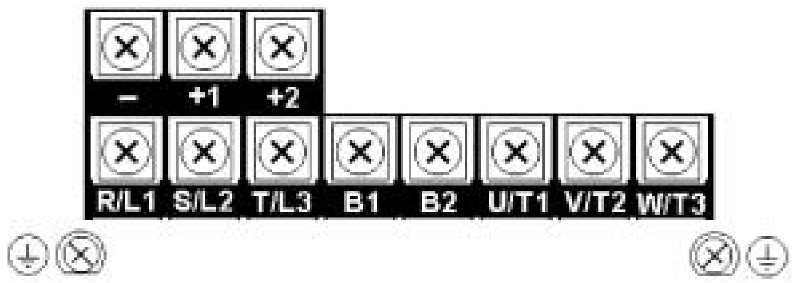
Figure 1-1b. Component Identification

I. Main Circuit Terminal Arrangement
Terminal arrangement of the main circuit terminal differs depending on the drive.

Model CIMR-V7NU☐	20P1	20P2	20P4	20P7



Model CIMR-V7NU☐	21P5	22P2	40P2	40P4	40P7	41P5	42P2



Model CIMR-V7NU☐	23P7	43P7

Model CIMR-V7NU☐	25P5	27P5	45P5	47P5

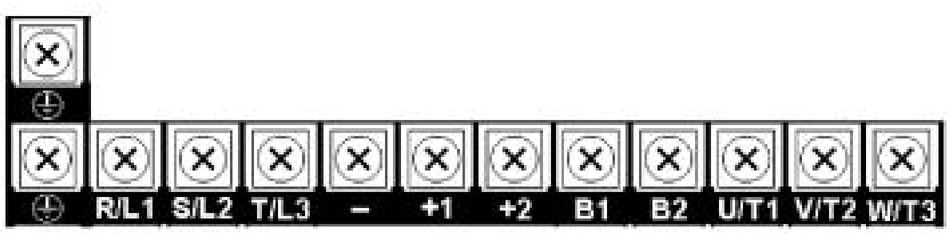


Figure 1-1c. Main Circuit Terminals

1.4 ELECTRICAL INSTALLATION

The Drive leaves the factory with all parameters set for 2-Wire external reference control. Figure 1-5 must be used for all external connections.

To use the Drive in a 3-Wire application, drive parameters ***n001, n003,*** and ***n004*** must be reprogrammed, using the Digital Operator. Figure 1-6 must then be used for all external connections.

A. Main Circuit Input /Output Wiring

Complete wire interconnections according to Table 1-2, Figure 1-5 thru Figure 1-7. Be sure to observe the following:

- Use 600V vinyl-sheathed wire or equivalent. Wire size and type should be determined by local electrical codes.
- Avoid routing power wiring near equipment sensitive to electrical noise.
- Avoid running input and output wiring in the same conduit.
- NEVER connect AC main power to output terminals T1(U), T2(V), and T3(W).
- NEVER allow wire leads to contact metal surfaces. Short-circuit may result.
- NEVER connect power factor correction capacitors to the drive output. Consult Yaskawa when connecting noise filters to the drive output.
- WIRE SIZING MUST BE SUITABLE FOR CLASS I CIRCUITS.
- When connecting motor to drive's output terminals, include a separate ground wire. Attach ground wire solidly to motor frame and to drive's ground terminal ⏚.
- When using armored or shielded cable for connection between drive and motor, solidly connect armor or shield to motor frame, and to drive's ground terminal ⏚.
- Motor lead length should NOT EXCEED 164 feet (50 meters), and motor wiring should be run in a separate conduit from the power wiring. If lead length must exceed this distance, reduce carrier frequency (see paragraph 5.8) and consult factory for proper installation procedures.
- Use UL listed closed loop connectors or CSA certified ring connectors sized for the selected wire gauge. Install connectors using the correct crimp tool recommended by the connector manufacturer.

 Continued

Table 1-1. Wire and Terminal Screw Sizes

230V 3-phase Input

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire				
				Applicable size		Recommended size		Type
CIMR-V7NU □				mm²	AWG	mm²	AWG	
20P1	R/L1, S/L2, T/L3 B1, B2 U/T1, V/T2, W/T3 -, +1,+2 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	600V vinyl-sheathed wire or equivalent
20P2		M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
20P4		M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 10	2	14	
20P7		M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
21P5		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
22P2		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	3.5	12	
23P7		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	5.5	10	
25P5		M5	22.19 (2.5)	5.5 to 8	10 to 8	8	8	
27P5		M5	22.19 (2.5)	5.5 to 8	10 to 8	8	8	

460V 3-phase Input

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire				
				Applicable size		Recommended size		Type
CIMR-V7NU □				mm²	AWG	mm²	AWG	
40P2	R/L1, S/L2, T/L3 B1, B2 U/T1, V/T2, W/T3 -, +1,+2 ⏚ x 1	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	600V vinyl-sheathed wire or equivalent
40P4		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
40P7		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
41P5		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
42P2		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
43P7		M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2 3.5 x 1	14 12 x 1	
45P5		M4	12.43 (1.4)	3.5 to 5.5	12 to 10	5.5	10	
47P5		M5	22.19 (2.5)	5.5 to 8	12 to 10	5.5	10	

Note: The wire size is set for copper wires at 160°F (75°C)

Control Circuit

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire					
				Applicable size			Recommended size		Type
				mm²		AWG	mm²	AWG	
Common to all models	S1 to S4, P1, P2, SC, PC	M2	1.94 to 2.21 (0.22 to 0.25)	twisted wire single	0.5 to 0.75 0.5 to 1.25	20 to 18 20 to 16	0.75	18	Shielded wire or equivalent
	DeviceNet Connector	M3	4.44 to 5.33 (0.5 to 0.6)	twisted wire	0.2 to 2.5	24 to 12	0.32/.2	22/24	DeviceNet Thin Cable

Table 1-2. Main Circuit Terminal Functions and Voltages

TERMINAL	FUNCTION	VOLTAGE / SIGNAL LEVEL
L1 (R) L2 (S) L3 (T)	Main circuit input power supply	230V Drive: 200 / 208 / 220 / 230V at 50/60 Hz 460V Drive: 380 / 400 / 440 / 460 / 480V at 50/60 Hz
T1 (U) T2 (V) T3 (W)	Main circuit output	230V Drive: 0 - 200 / 208 / 220 / 230V 460V Drive: 0 - 400 / 440 / 460 / 480V
B1 B2	For connection of braking resistor (option)	
+1 +2	DC Reactor terminals	
–	DC Bus terminals (+1 & –)	
⏚	Ground terminal (100 ohms or less)	– – – –

B. Control Circuit

All basic control circuit (signal) interconnections are shown in the appropriate diagram:

- Interconnections for external two-wire control in combination with the Digital Operator are shown in Figure 1-5.
- Interconnections for external three-wire control in combination with the Digital Operator are shown in Figure 1-6.

Make wire connections according to Figures 1-5 thru 1-7 and Table 1-3; observe the following:

- Signal Leads: Terminals S1-S4 & SC.
- Control Leads: Terminals P1, P2 & PC.
- Use twisted shielded or twisted-pair shielded wire (20-16 AWG [0.5 – 1.25mm2]) for control and signal circuit leads. The shield sheath MUST be connected at the drive end ONLY (terminal ⏚). The other end should be dressed neatly and left unconnected (floating). See Figure 1-2.
- DeviceNet Leads: Black, Blue, Shield, White, Red.
- Use DeviceNet thick or thin cable specified by ODVA.
- Signal leads and feedback leads (PG) must be separated from control leads main circuit leads, and any other power cables, to prevent erroneous operation caused by electrical noise.
- Lead length should NOT EXCEED 164 feet (50 meters). Wire sizes should be determined considering the voltage drop.
- All AC relays, contactors and solenoids should have RC surge supressors installed across their coils.
- All DC relays, contactors and solenoids should have diodes installed across their coils.

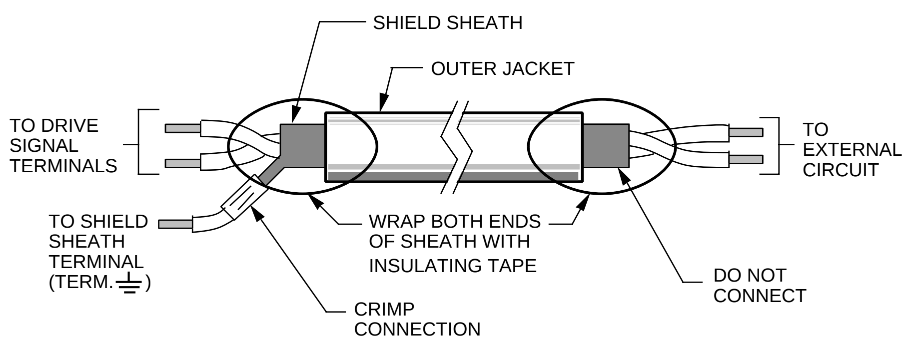
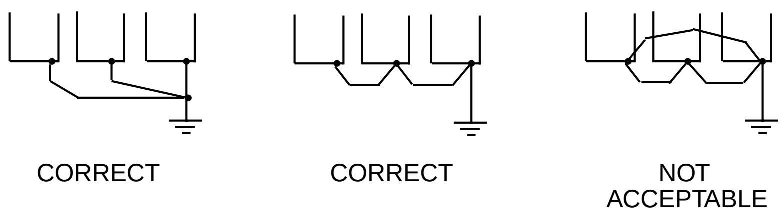


Figure 1-2. Shielded Sheath Termination

C. Grounding

- The drive must be solidly grounded using the main circuit ground terminal ⏚.
- If Drive is installed in a cabinet with other equipment, ground leads for all equipment should be connected to a common low-impedance ground point within the cabinet.
- The supply neutral should be connected to the ground point within the cabinet.
- Select appropriate ground wire size from Table 1-1.
- Make all ground wires as short as practical.
- NEVER ground the drive in common with welding machines, or other high power electrical equipment.
- Where several drives are used, ground each directly to the ground point (see Figure 1-1). DO NOT FORM A LOOP WITH THE GROUND LEADS.
- When connecting a motor to the drive's output terminals, include a separate ground wire. Attach ground wire solidly to motor frame and to drive's ground terminal ⏚.
- When using armored or shielded cable for connection between drive and motor, solidly connect armor or shield to motor frame, and to the drive's ground terminal ⏚.



D. DeviceNet Connector and Cabling

- See Section 6 DeviceNet Communications.

E. DeviceNet Terminating Resistors

- See Section 6 DeviceNet Communications.

Table 1-3. Terminal Functions and Signals of Control Circuit

TERMINAL	FUNCTION		DESCRIPTION*
S1	Multi-Function-Input 1		Factory setting is " ***Forward Run/Stop*** " (1). (Forward run when closed, stop when open)
S2	Multi-Function-Input 2		Factory setting is " ***Reverse Run/Stop*** " (1). (Reverse Run when closed, stop when open)
S3	Multi-Function-Input 3		Factory setting is " ***External Fault (NO contact) input*** " (1)
S4	Multi-Function-Input 4		Factory setting is " ***Fault Reset*** " (1)
SC	Sequence common for terminals S1-S4.		Common terminal for sequence inputs
P1	Multi-Function Open Collector Output 1	Factory setting is " ***Drive Running*** "	Photocoupler output: 48 VDC; 50 mA or less.
P2	Multi-Function Open Collector Output 2	Factory setting is " ***Speed Agree*** "	
PC	Multi-Function Open Collector Output common	0 V	
CN2 V	Frequency reference voltage input		0 to +10 / 100% (20K Ω)
CN2 I	Frequency reference current input		4 to 20 mA (250 Ω)
CN2 C	Frequency reference input common		0V

NOTES:

1. These inputs have factory settings based on 2-wire reset. For 3-wire reset definitions, see Figure 1-6.

Table 1-4. Terminal Functions and Signals of DeviceNet

TERMINAL	NAME	FUNCTION
BLACK	V-	DeviceNet power supply ground
BLUE	CAN_L	DeviceNet data low
GREEN	Shield	Shield wire
WHITE	CAN_H	DeviceNet data high
RED	V+	DeviceNet power supply +24VDC

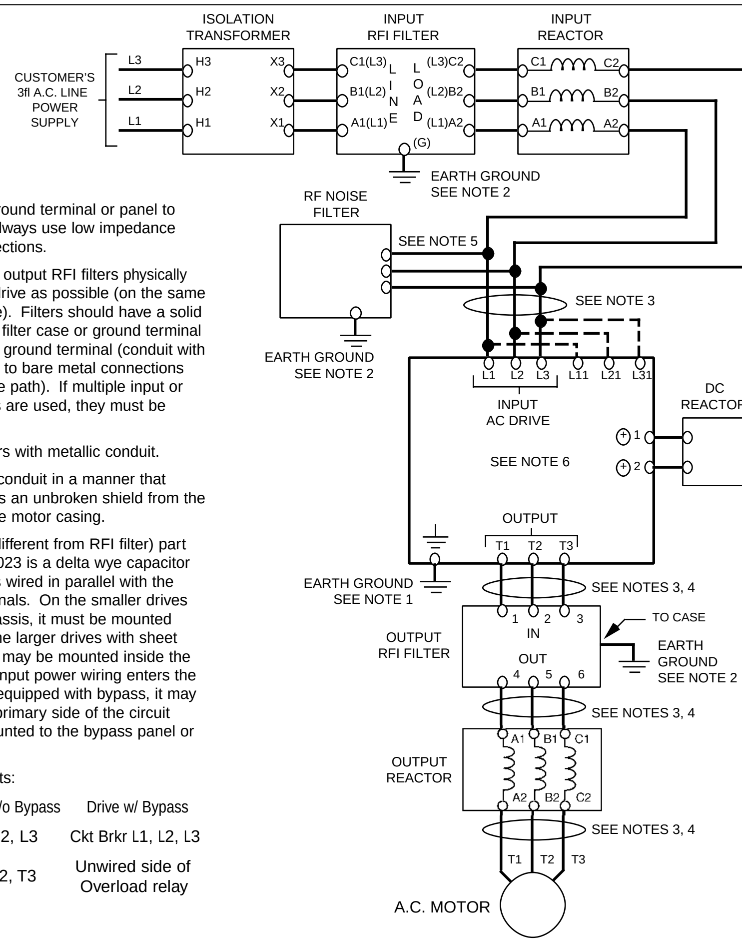
D. Auxiliary Input and Output Power Option Devices

A disconnect device (circuit breaker, contactor, disconnect switch, etc.) should NOT be used as a means of starting and stopping the drive or motor.

A disconnect device can be installed for emergency stop purposes, but when that disconnect device is opened, there may be loss of electrical braking.

Figure 1-3 is a factory guideline for proper wiring practices and relative locations within the electrical path from the line to the load. It does not imply what devices are needed for a particular application, nor does it show what devices were shipped with a particular order. Therefore, disregard those items in the diagram which are not being used in your installation. However, it is recommended that an input or DC reactor be used with all Drive ratings when wired to a source of 600 kVA or greater. Mount all optional power devices close to the drive, and keep electrical connections as short as possible.

DO NOT run input and output wiring in the same conduit.



NOTES

1. Connect drive ground terminal or panel to earth ground. Always use low impedance paths and connections.
2. Mount input and output RFI filters physically as close to the drive as possible (on the same panel, if possible). Filters should have a solid connection from filter case or ground terminal to drive panel or ground terminal (conduit with good bare metal to bare metal connections may serve as the path). If multiple input or output RFI filters are used, they must be wired in parallel.
3. Shield conductors with metallic conduit.
4. Connect output conduit in a manner that allows it to act as an unbroken shield from the drive panel to the motor casing.
5. RF noise filter (different from RFI filter) part no. 05P00325-0023 is a delta wye capacitor network which is wired in parallel with the drive input terminals. On the smaller drives with die cast chassis, it must be mounted externally. On the larger drives with sheet metal chassis, it may be mounted inside the area where the input power wiring enters the drive. On units equipped with bypass, it may be wired to the primary side of the circuit breaker and mounted to the bypass panel or sidewall.
6. Connection points:

	Drive w/o Bypass	Drive w/ Bypass
Input	L1, L2, L3	Ckt Brkr L1, L2, L3
Output	T1, T2, T3	Unwired side of Overload relay

Figure 1-3. Customer Connection Diagram For Isolation Transformers, Input Reactors, Input RFI Filters, DC Reactors, Output Reactors and Output RFI FIlters

E. Conformance to European EMC Directive

In order to conform to EMC standards, the following methods are required for line filter application, cable shielding and drive installation.

The line filter and Drive must be mounted on the same metal plate. The filter should be mounted as close to the drive as practical. The cable must be kept as short as possible and the metal plate should be securely grounded. The ground of the line filter and the drive must be bonded to the metal plate with as much bare-metal contact as possible.

For main circuit input cables, a screened cable is recommended within the panel and is also suggested for external connections. The screen of the cable should be connected to a solid ground. For the motor cables, a screened cable (max. 20 m) must be used and the screen of the motor cable should be connected to ground at both ends by a short connection, again using as much bare-metal contact as practical.

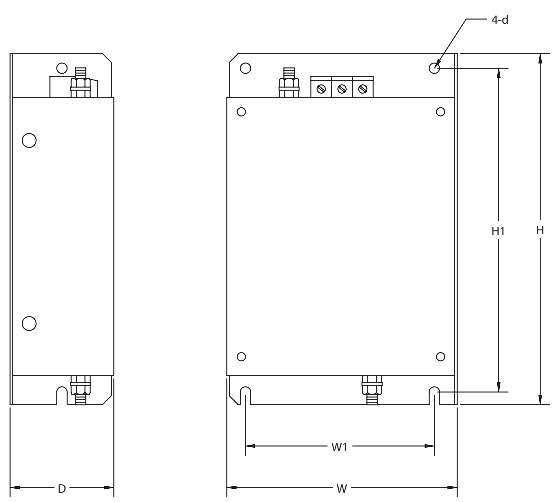
For a more detailed explanation, refer to the manufacturer document TD 4077, “Installation Guidelines For EMC Directive using AC Drive Products.”

Table 1-4 and Figure 1-4 show the line filter list for EMC standards and the installation/wiring of the Drive and line filter.

Table 1-5. Line Filters for EMC Standards

Model	Line Filter					
CIMR-V7NU ☐	Part Number FIL00 ☐	Rated Current (A)	Weight lbs. (kg)	Dimensions in in. (mm) H x W x D (1)	Mounting Dim. in in. (mm) H1 x W1	Screw Size
20P1 20P2 20P4 20P7	1083	10	1.8 (0.8)	7.6 x 3.2 x 2.0 (194 x 82 x 50)	7.1 x 2.4 (181 x 62)	M5
21P5 22P2	1084	16	2.2 (1.0)	6.7 x 4.4 x 2.0 (169 x 111 x 50)	6.1 x 3.6 (156 x 91)	M5
23P7	1085	26	2.4 (1.1)	6.9 x 5.7 x 2.0 (174 x 144 x 50)	6.3 x 4.7 (161 x 120)	M5
25P5 27P5	1100	50	5.1 (2.3)	12.0 x 7.2 x 2.2 (304 x 184 x 56)	11.3 x 5.9 (288 x 150)	M6
40P2 40P4	1086	5	2.2 (1.0)	6.7 x 4.4 x 1.8 (169 x 111 x 45)	6.1 x 3.6 (156 x 91)	M5
40P7 41P5 42P2	1087	10	2.2 (1.0)	6.7 x 4.4 x 1.8 (169 x 111 x 45)	6.1 x 3.6 (156 x 91)	M5
43P7	1088	15	2.4 (1.1)	6.9 x 5.7 x 2.0 (174 x 144 x 50)	6.3 x 4.7 (161 x 120)	M5
45P5 47P5	1101	30	5.1 (2.3)	12.0 x 7.2 x 2.2 (304 x 184 x 56)	11.3 x 5.9 (288 x 150)	M6

(1) D is the distance the filter will extend outward from the surface of the metal plate.



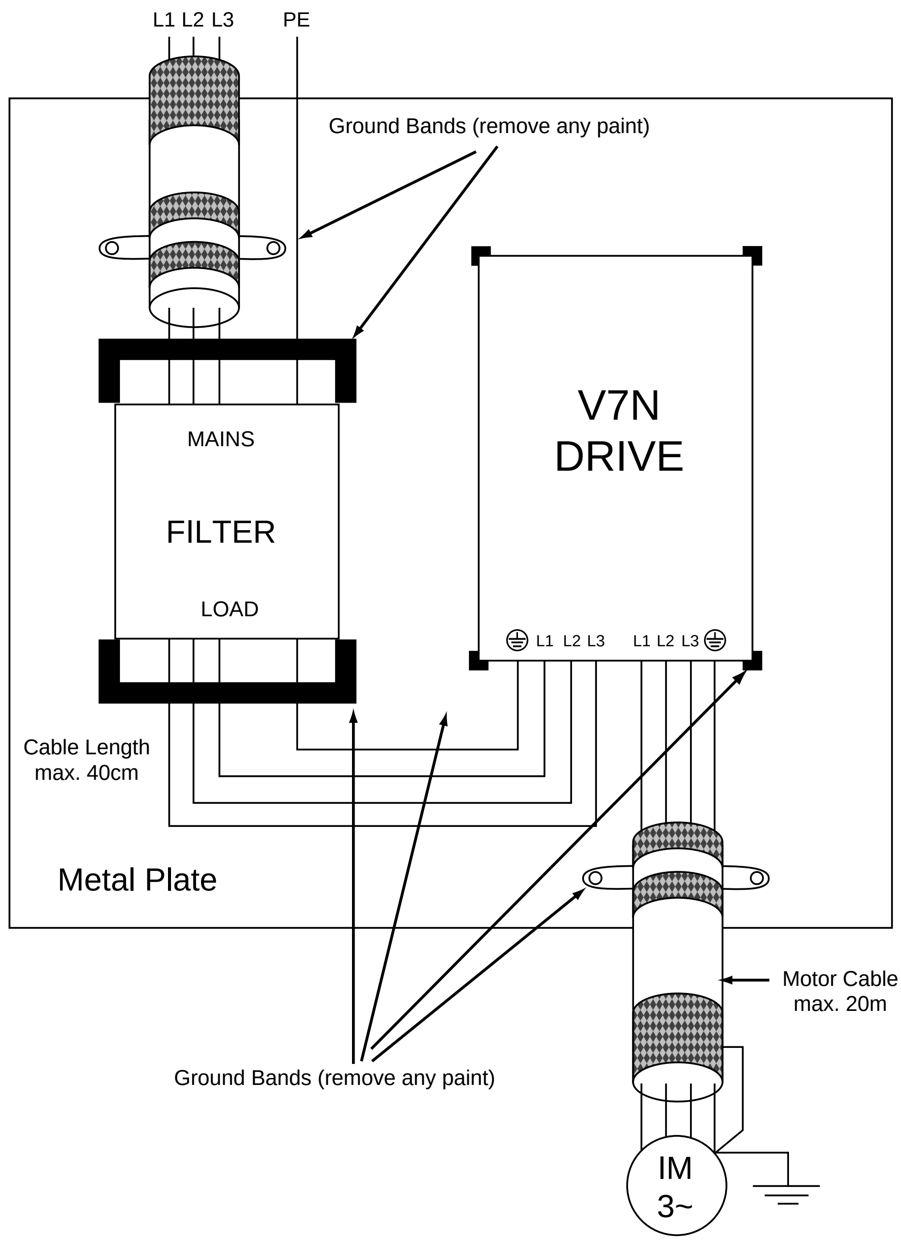


Figure 1-4. Installation of Line Filter and V7N Drive

F. Interconnection - 2 Wire

NOTES FOR FIGURE 1-5

✶ – Indicates components not supplied.

◎ – Main circuit terminal.

○ – Indicates control circuit terminal.

( ) – Indicates alternate terminal marking, i.e., (R) and L1.

▲ – Function labels shown for these terminals are determined by factory settings of ***n050*** through ***n056*** (see paragraph 5.18).

● – Function labels shown for these terminals are determined by factory settings of ***n057*** through ***n059*** (see paragraph 5.19).

1. Insulated twisted shielded wire is required.
   2-conductor #18 GA. (Belden #8760 or equivalent).
   3-conductor #18 GA. (Belden #8770 of equivalent).
   Connect shield ONLY AT the Drive END (ground terminal ⏚). Stub and isolate other end.
2. The Drive's Electronic Thermal Overload function (***n036***, ***n037***) meets standards set by UL and CUL for motor thermal overload protection. If local code requires a separate mechanical overload protection, an overload relay should be installed, interlocked with the Drive as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.
3. Customer to connect terminal ⏚ to earth ground.
4. For installation of Braking Resistor or Braking Resistor unit, refer to Appendix 6, "Dynamic Braking Option."
5. An optional DC reactor may be added for harmonic attenuation, if needed. See separate instruction sheet for wiring.
6. If application does not allow reverse operation, parameter ***n006*** , Reverse Run Prohibit Selection, should be set to " 1 " (Reverse Run Disabled), and the Reverse Run/Stop input can be eliminated.
7. Terminals S5-S7, MA and MC are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

⚠ WARNING

8. Input fuses are required for proper branch short circuit protection for all drives. Failure to use recommended fuses (see Appendix 4) may result in damage to the drive and/or personal injury.

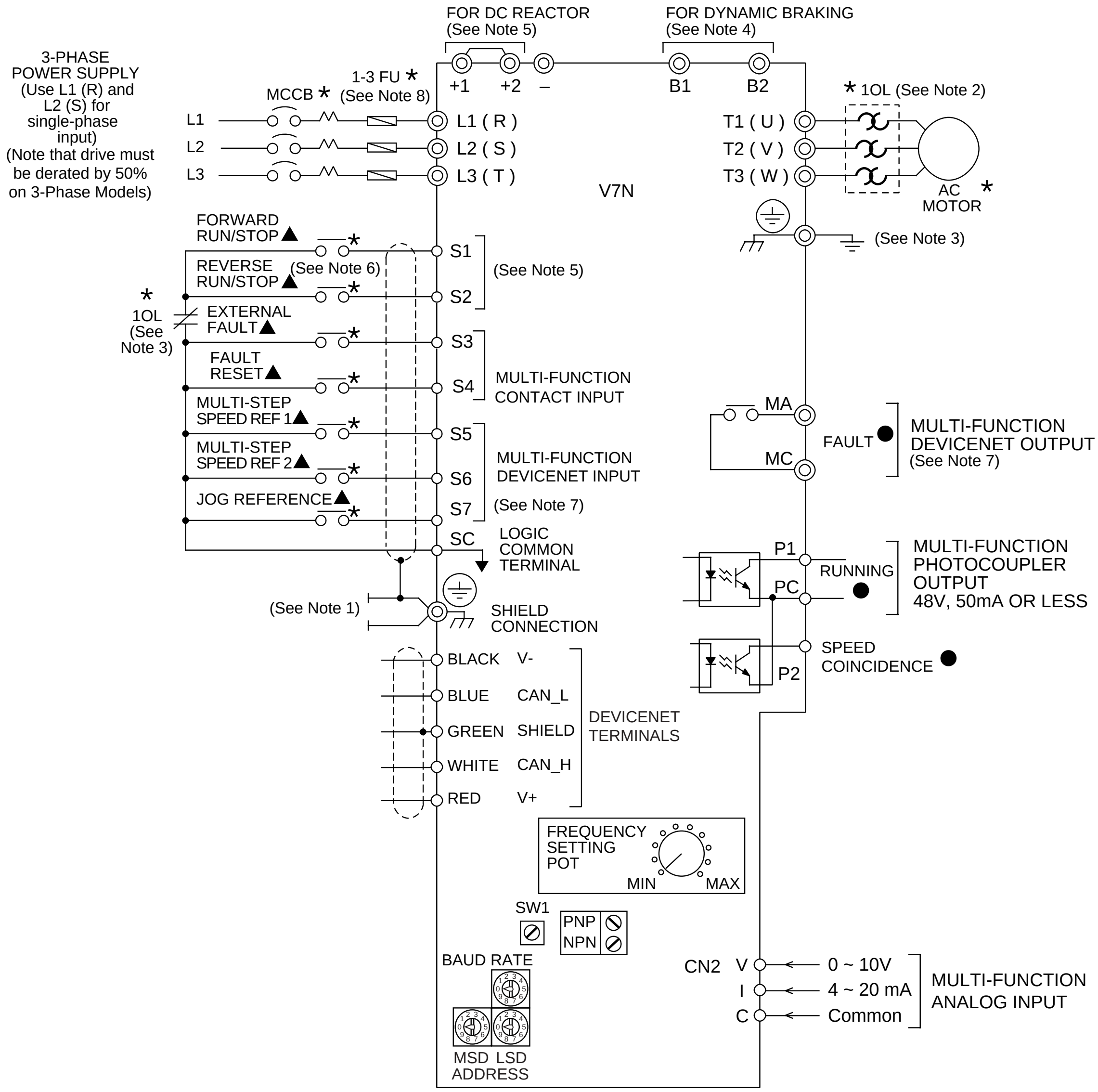


Figure 1-5. Standard Connections (2-Wire Control)
(Parameter n001 set to "10")

H. Inspection. After wiring is complete, verify that all wiring is correctly installed, excess screws and wire clippings are removed from inside of unit, screws are securely tightened, and exposed wire does not contact other wiring or terminals.

⚠ CAUTION

If a FWD or REV run command is given from the control circuit terminal when the operation method selection function (*n003*) is set to " 1 " and the "LO/RE" selection is set to "RE", the motor will start automatically as soon as power is applied to the main circuit.

G. Interconnection - 3 Wire

NOTES FOR FIGURE 1-6

✶ – Indicates components not supplied.

◎ – Main circuit terminal.

○ – Indicates control circuit terminal.

( ) – Indicates alternate terminal marking, i.e., (R) and L1.

▲ – Function labels shown for these terminals are determined by factory settings of ***n050*** through ***n056*** (see paragraph 5.18).

● – Function labels shown for these terminals are determined by factory settings of ***n057*** through ***n059*** (see paragraph 5.19).

1. Insulated twisted shielded wire is required.
   2-conductor #18 GA. (Belden #8760 or equivalent)
   3-conductor #18 GA. (Belden #8770 or equivalent)
   Connect shield only at the Drive end (ground terminal (⏚)). Stub and isolate other end.
2. The Drive's Electronic Thermal Overload function (***n036***, ***n037***) meets standards set by UL and CUL for motor thermal overload protection. If local code requires a separate mechanical overload protection, an overload relay should be installed, interlocked with the Drive as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.
3. Customer to connect ground terminal (⏚) to earth ground.
4. For installation of Braking Resistor or Braking Resistor Unit, refer to Appendix 6, "Dynamic Braking Option".
5. An optional DC reactor may be added for harmonic attenuation, if needed; see separate instruction sheet for wiring.
6. If application does not allow reverse operation, parameter ***n006*** , Reverse Run Prohibit Selection, should be set to " 1 " (Reverse Run Disabled) and Fwd/Rev input can be eliminated.
7. Terminals S5-S7, MA and MC are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

⚠ CAUTION

Parameter *n050* must be set to " 0 ", AND parameter *n001* must be set to " 11 ". Resetting drive parameter *n001* to " 10 " may cause the motor to run in reverse direction WITHOUT A RUN COMMAND, and possibly result in equipment damage or personal injury.

⚠ WARNING

8. Input fuses are required for proper branch short circuit protection for all drives. Failure to use recommended fuses (see Appendix 4) may result in damage to the drive and/or personal injury.

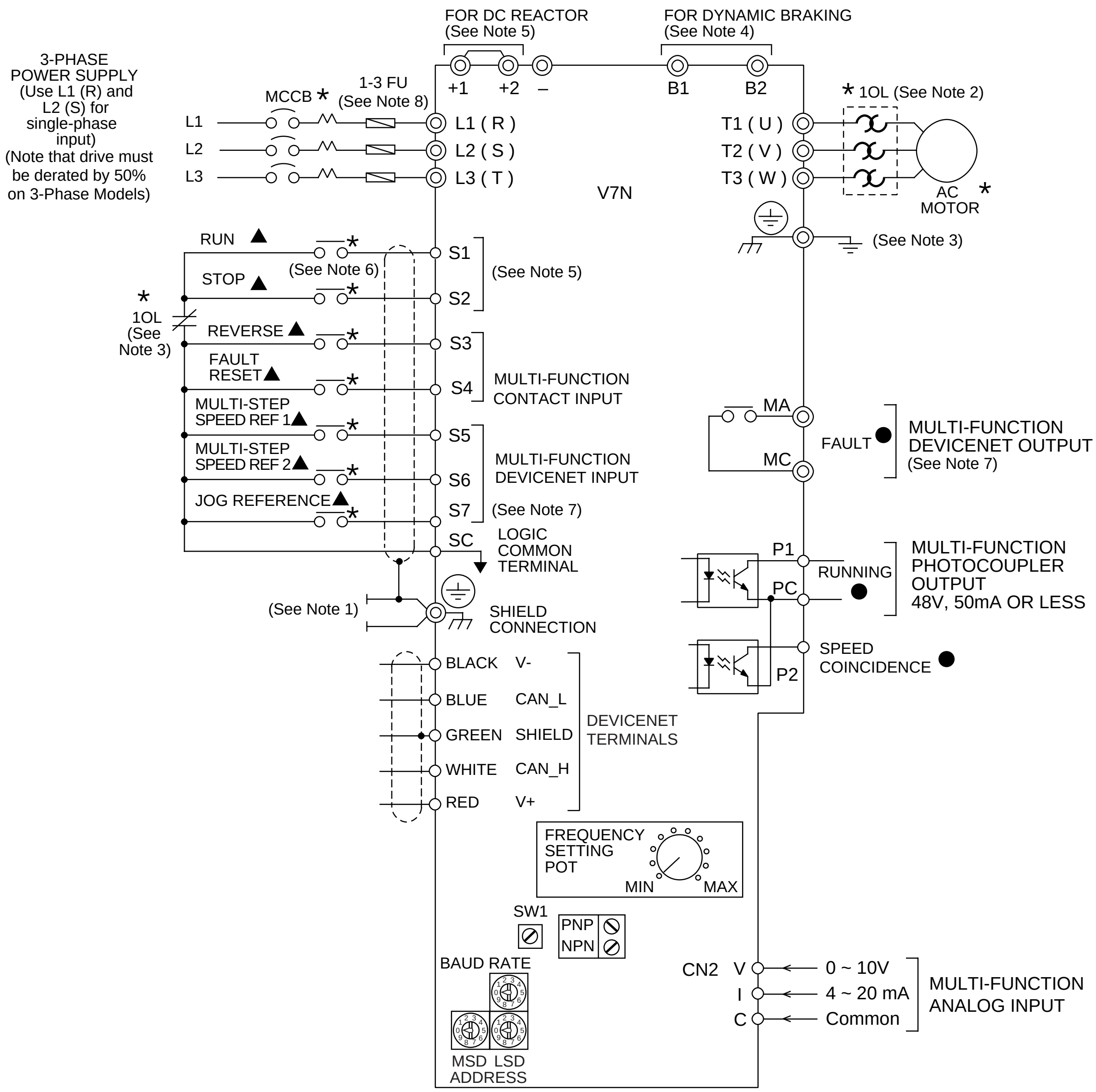


Figure 1-6. Standard Connections (3-Wire Control)
(Parameter n001 set to "11")

H. Inspection. After wiring is complete, verify that all wiring is correctly installed, excess screws and wire clippings are removed from inside of unit, screws are securely tightened, and exposed wire does not contact other wiring or terminals.

⚠ CAUTION

If a FWD or REV run command is given from the control circuit terminal when the operation method selection function (*n003*) is set to " 1 " and the "LO/RE" selection is set to "RE", the motor will start automatically as soon as power is applied to the main circuit.

Section 2. INITIAL START-UP

2.1 PRE-POWER CHECKS

- Verify wires are properly connected and no erroneous grounds exist.

- Remove all debris from the Drive enclosure, such as loose wire clippings, metal shavings, etc.

- Verify all mechanical connections inside the Drive are tight.

- Verify motor is not connected to load.

- Apply input power only after the front cover is in place. DO NOT remove the front cover or Digital Operator while input power is on.

- Determine the proper control method for the application.

Open Loop Vector Control - Use section 2.2 for startup instructions
Parameter **n002 = 1**. Open Loop Vector Control method should be used for most constant torque applications of the Drive. With this control method there is excellent starting torque and excellent speed regulation. The startup procedure for this control method is slightly more complicated.

V/f Control - Use section 2.3 for startup instructions
Parameter **n002 = 0**. V/f control should be used for most variable torque applications. Variable torque applications would include: fan, blower, centrifugal pump, and mixers. Generally variable torque loads do not require high levels of starting torque. V/f control can also be used for some constant torque loads where starting torque and speed regulation are not critical.

2.2 OPEN LOOP VECTOR STARTUP

NOTE: 2-wire, 3-wire, or DeviceNet sequence selection must be made prior to using this startup procedure or making any other adjustments (parameter n001).

Table 2-1. Open Loop Vector Startup Procedure

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the highest parameter access level. This will allow all parameters to be viewed and set.	Press the [DSPL] key until the [PRGM] LED is lit on the digital operator.	PRGM n001
	Press [DATA ENTER].	PRGM 1
	Press [∧] three times.	PRGM 4
	Press [DATA ENTER].	PRGM n001
Set drive for Open Loop Vector control. This is accomplished by setting n002 = 1	Press [∧] then [DATA ENTER].	PRGM 1
	Use the [∧] & [∨] keys to set a "1" in the display.	PRGM 1
	Then press [DATA ENTER].	PRGM n002
Set motor rated voltage. (This can be obtained from the nameplate of the motor.)	Press and hold [∧] until n012 is displayed on the digital operator.	PRGM n012
	Then press [DATA ENTER].	PRGM 400.0 (1)
	Use the [∧] & [∨] keys until the number in the display matches the motor rated voltage.	PRGM 460.0 (1)
	Then press [DATA ENTER].	PRGM n012

Table 2-1. Open Loop Vector Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set motor rated current. (This can be obtained from the nameplate of the motor.)	Press and hold [Λ] until n036 is displayed on the digital operator. Then press [DATA ENTER]. Use the [Λ] & [V] keys until the number in the display matches the motor rated current. Then press [DATA ENTER].	[PRGM] 4.2 [1] [PRGM] n036
Set the motor rated slip. This can be calculated by using the following formula: Slip = $\frac{(Ns-Nr) * P}{120}$ Where: Ns = Motor synch. speed [2] Nr = Motor rated speed P = Number of motor poles Example: Slip = $\frac{(1800 - 1725) * 4}{120}$ Slip = 2.5	Press and hold [Λ] until n106 is displayed on the digital operator. Then press [DATA ENTER]. Use the [Λ] & [V] keys until the number in the display matches the calculated slip value (see equation at left). Then press [DATA ENTER].	[PRGM] 3.0 [1] [PRGM] n106
Prepare to test run the drive from the Digital Operator. Motor should be disconnected from the load. This will set the drive into the “Local” mode and bring up the motor current display.	Press and hold [DSPL] several times until the [LO/RE] LED is lit. Press the [Λ] key once. Display the drive’s output current by pressing [DSPL] four times. Turn the Digital Operator Pot all the way to the left (counter-clockwise.	[LO/RE] rE [LO/RE] Lo [IOUT] 0.0

Table 2-1. Open Loop Vector Startup Procedure - Continued

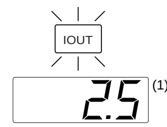
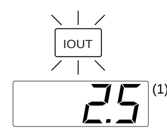
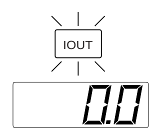
DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Test run the drive from the Digital Operator.	**WARNING: The next key press will cause the motor to turn! Take appropriate safety precautions!** Press the ○RUN key then slowly turn the Digital Operator Pot to the right about 1/4 of a turn. The display on the drive will show the actual motor amps. Operation checkpoints: • Motor rotates smoothly • Motor rotates in correct direction. (If motor does not rotate in the proper direction, stop the motor and remove power from the Drive. Switch motor connections T1 (U) and T2 (V) at the Drive.) • Motor has no abnormal vibration or noise. • Acceleration and deceleration are smooth. • Unit is not overloaded. (Displayed current does not exceed drive rated current).	
Determine the motor "no load current."	With the drive still running, turn the Digital Operator Pot all the way to the right (full speed) and record the current on the display. Actual Value: ________________________ Press the STOP/RESET button to stop the drive.	 

Table 2-1. Open Loop Vector Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the motor "no load current" in the drive. Motor no load current is set as a percentage of motor rated current. It is calculated using the formula: $\frac{I_{noload}}{I_{rated}} *100 = n110$ Where: I_{noload} = Motor no load current (measured in the previous step) I_{rated} = Motor rated current (from motor nameplate) Example: $\frac{2.5 * 100}{4.2} = 60$	Press the DSPL key four times.	PRGM n106
	Press the Λ key four times.	PRGM n110
	Press the DATA/ENTER key.	PRGM 35 (1)
	Use the Λ & V keys until the number in the display matches calculated no-load current.	
	Press the DATA/ENTER key.	PRGM n110
This completes the startup. Make further programming changes as required.	Press the DSPL key to get out of the programming mode.	FREF 0.00 (1)

(1) The number in the display may be different than shown.

(2) Motor synchronous speed can be calculated using the following formula:

$$\text{synch. speed} = \frac{120 \text{ x motor rated frequency}}{\text{number of motor poles}}$$

For 60 Hz Rated Motors	
Poles	**Synchronous Speed**
2	3600 RPM
4	1800 RPM
6	1200 RPM
8	900 RPM

2.3 V/f STARTUP PROCEDURE

IMPORTANT

2-wire, 3-wire, or DeviceNet sequence selection must be made prior to any other adjustments (Parameter n001).

Table 2-2. V/f Startup Procedure

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the highest parameter access level. This will allow all parameters to be viewed and set.	Press [DSPL] key until the [PRGM] LED is lit on the digital operator.	PRGM n001
	Press [DATA ENTER].	PRGM 1
	Press [∧] three times.	PRGM 4
	Press [DATA ENTER].	PRGM n001
Set drive for V/f control. This is accomplished by setting n002 = 0	Press [∧] then [DATA ENTER].	PRGM 1
	Use the [∧] & [∨] keys to set a “0” in the display.	PRGM 0
	Then press [DATA ENTER].	PRGM n002

Table 2-2. V/f Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set motor rated current. (This can be obtained from the nameplate of the motor.)	Press and hold [Λ] until n036 is displayed on the digital operator.	
	Then press [DATA ENTER].	PRGM 4.2 (1)
	Use the [Λ] & [V] keys until the number in the display matches the motor rated current.	
	Then press [DATA ENTER].	PRGM n036
Set the V/f pattern. Parameters n011 through n017 set the V/f pattern. Table 5-4 in section 5.27 lists recommended V/f patterns. The numbers in parentheses shown in the example below are for a 460V / 60 Hz variable torque application (fan or pump).		
Set Parameter n011- Maximum output frequency. (60.0 Hz)	Press and hold [V] until n011 is displayed on the digital operator.	
	Then press [DATA ENTER].	PRGM 60.0 (1)
	Use the [Λ] & [V] keys until the desired number is in the display.	PRGM 60.0 (1)
	Then press [DATA ENTER].	PRGM n011

Table 2-2. V/f Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set Parameter n012- Voltage Max. (460.0 V)	Press [Λ] then [DATA ENTER]. Use the [Λ] & [V] keys until the desired number is in the display. Then press [DATA ENTER].	PRGM 400.0 (1) PRGM 460.0 (1) PRGM n012
Set Parameter n013- Frequency at max. voltage point (motor rated frequency) (60.0 Hz)	Press [Λ] then [DATA ENTER]. Use the [Λ] & [V] keys until the desired number is in the display. Then press [DATA ENTER].	PRGM 60.0 (1) PRGM 60.0 (1) PRGM n013
Set Parameter n014- Frequency - Midpoint (30.0 Hz)	Press [Λ] then [DATA ENTER]. Use the [Λ] & [V] keys until the desired number is in the display. Then press [DATA ENTER].	PRGM 1.5 (1) PRGM 30.0 (1) PRGM n014

Table 2-2. V/f Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set Parameter n015- Voltage - Midpoint (80.4 V)	Press [Λ] then [DATA ENTER].	PRGM 24.0 (1)
	Use the [Λ] & [V] keys until the desired number is in the display.	PRGM 80.4 (1)
	Then press [DATA ENTER].	PRGM n015
Set Parameter n016- Frequency - Minimum (1.5 Hz)	Press [Λ] then [DATA ENTER].	PRGM 1.5 (1)
	Use the [Λ] & [V] keys until the desired number is in the display.	PRGM 1.5 (1)
	Then press [DATA ENTER].	PRGM n016
Set Parameter n017- Voltage - Minimum (18.4 V)	Press [Λ] then [DATA ENTER].	PRGM 24.0 (1)
	Use the [Λ] & [V] keys until the desired number is in the display.	PRGM 18.4 (1)
	Then press [DATA ENTER].	PRGM n017

Table 2-2. V/f Startup Procedure - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Prepare to test run the drive from the Digital Operator. Motor should be disconnected from the load. This will set the drive into the “Local” mode, and bring up the motor current display.	Press [DSPL] several times until the “LO/RE” LED is lit. Press the [Λ] key once. Display the drive’s output current by pressing [DSPL] four times. Turn the Digital Operator Pot all the way to the left (counter-clockwise).	LO/RE rE LO/RE Lo IOUT 0.0
Test run the drive from the Digital Operator	**WARNING: The next key press will cause the motor to turn! Take appropriate safety precautions!** Press the [○RUN] key then slowly turn the Digital Operator Pot to the right about 1/4 of a turn. The display on the drive will show the actual motor amps. Operation checkpoints: • Motor rotates smoothly • Motor rotates in correct direction. (If motor does not rotate in the proper direction, stop the motor and remove power from the Drive. Switch motor connections T1 (U) and T2 (V) at the Drive to change direction). • Motor has no abnormal vibration or noise. • Acceleration and deceleration are smooth. • Unit is not overloaded. (Displayed current does not exceed drive rated current). Press the [STOP/RESET] key.	IOUT 2.5 [1]
This completes the startup. Make further programming changes as required.		

[1] The number in the display may be different than shown.

Section 3. OPERATION AT LOAD

After completing the start-up, and programming of constants, turn off the AC main circuit power. Make additional wiring connections required for the external control functions selected by the constant programming. Connect the driven machine to the motor. Verify that the driven machine is in running condition, and that no dangerous conditions exist around the drive system.

⚠ CAUTION

- Before applying a RUN command to the Drive, verify that the motor is stopped.
- **NEVER** use a motor whose full-load amps exceeds the Drive rating.
- When starting and stopping the motor, use the operation signals (RUN/STOP, FWD/REV), NOT a magnetic contactor on the power supply side.

Run the motor under load with control by the Digital Operator using the same procedure as for the Initial Start-up. If the Digital Operator is used in combination with external commands or external commands only are used, the procedure must be altered accordingly.

Section 4. DIGITAL OPERATOR

4.1 GENERAL

All functions of the Drive are accessed using the Digital Operator. In addition to controlling motor operation, the operator can enter information into the Drive memory to configure the Drive's application, by using the Function LEDs.

4.2 DIGITAL OPERATOR

A. Digital Operator Description

The Digital Operator has a 4-digit LED display. Both numeric and alpha-numeric data can appear on the display. Indicators and keys on the Digital Operator are described in Figure 4-1.

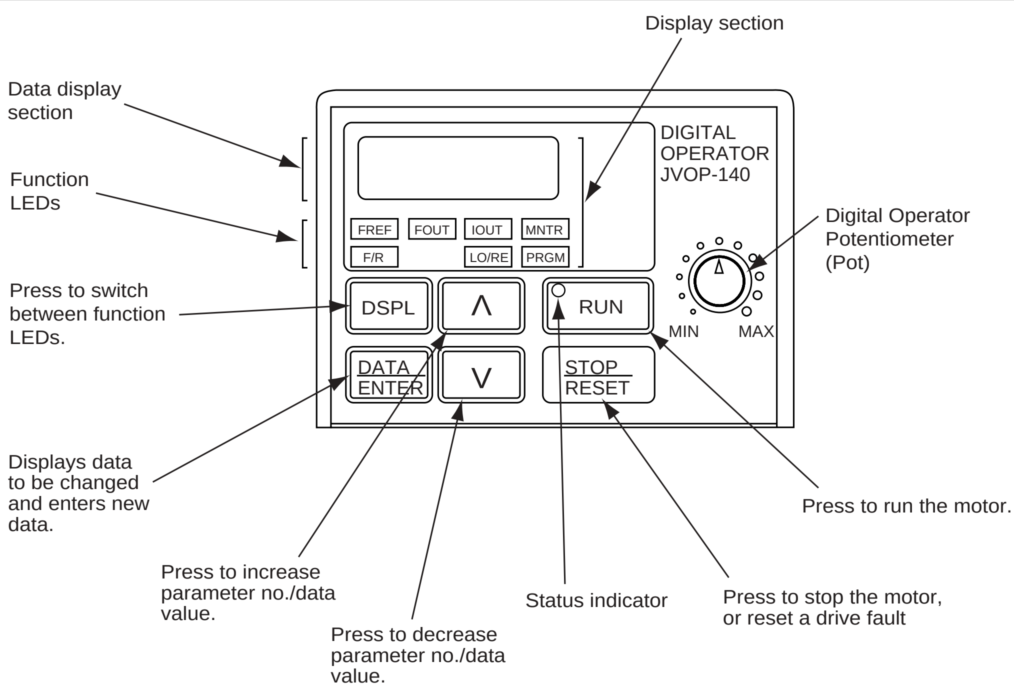
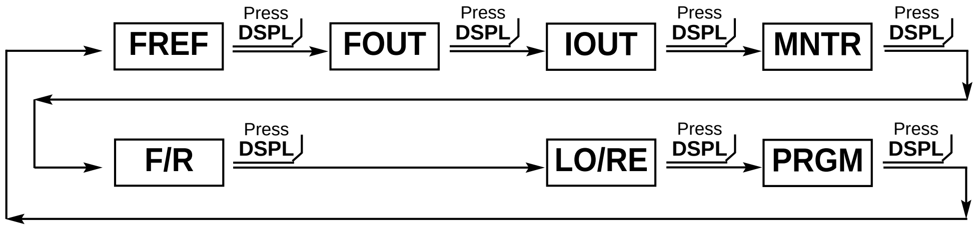


Figure 4-1. Digital Operator

B. Description of Function LEDs

By pressing the **DSPL** key on the Digital Operator, the operator can step to each of the seven Function LEDs and its associated display/setting function:



FREF — **Frequency Reference Setting**
Sets/Displays the Drive operation speed (Hz).

FOUT — **Output Frequency Monitor**
Displays the output frequency (Hz) at which the Drive is currently operating. This is a **monitor only** function; the operator cannot change the displayed value by use of the keypad.

IOUT — **Output Current Monitor**
Displays the level of output current (Amps) that the Drive is currently producing. This is a **monitor only** function; the operator cannot change the displayed value by use of the keypad.

MNTR — **Monitor Selection**
Pressing **ENTER** allows access to the various Monitor parameters, ***U-01*** through ***U-10***. These are monitor only functions; the operator cannot change the displayed value. Accessible during run command. See section 4.4. for complete listing of all monitor parameters.

F/R — **FWD/REV Run Selection**
Sets the rotation direction of the motor when a Run command is given by the Digital Operator keypad. Display of ***For*** = forward run, ***rEu*** = reverse run.

LO/RE — **Local / Remote Selection**
This toggles between the Local (Digital Operator) and Remote (set by parameters n003 & n004) modes of operation. This affects both the start/stop functions, as well as the frequency reference. Local / Remote status cannot be changed using this LED when a multi-function input terminal is set for Local/Remote (n050 through n056 set for “17”).*

PRGM — **Parameter Programming**
Selects or reads data using parameter number (***nXXX***). Data is displayed by pressing the **ENTER** key, and can be changed by pressing the “up arrow” or “down arrow” keys. Any changes can be saved by again pressing the **ENTER** key. Pressing the **DSPL** key exits the Programming mode.*

* The RUN command will not be accepted by the drive when the LO/RE or PRGM Function LEDs are lit. Select any other Function LED to allow the drive to accept RUN command.

4.3 STATUS INDICATOR LEDs

There are two indicator LEDs on the front of the Drive. The drive status is indicated by various combinations of ON, Blinking, and OFF conditions of these two LEDs:

CONDITION	(Green) O RUN	(Red) O ALARM
Operation Ready (during stop) Ramp to Stop (during decel)	Blinking Long Blinking	Off Off
Normal Operation (running) Alarm	On Blinking or ON	Off Blinking
Fault	Off	On

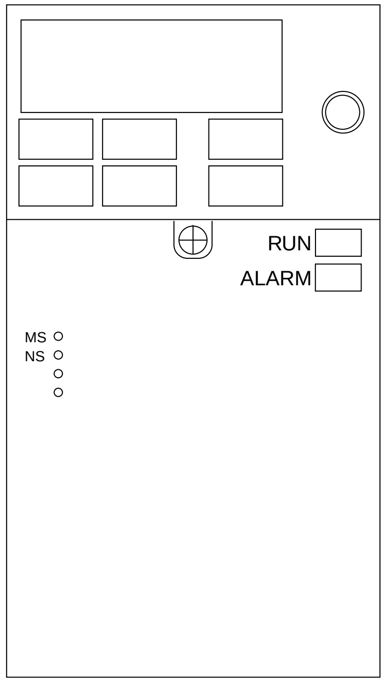
For details of how the status indicator LEDs function during a drive fault, refer to the “TROUBLESHOOTING” section.

4.4 DEVICENET LEDs

The Drive has two LEDs (MS and NS) on the front cover to indicate DeviceNet communications status. The table below describes the function of DeviceNet specific LEDs.

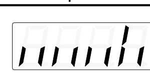
LED Name	Display		Operation Status	Description
	Color	Status		
MS	Green	Lit	During drive operation	The drive is operating normally.
	Green	Flashing	During drive initialization	Initial setting status or communication not ready.
	Red	Lit	Unrecoverable fault	An unrecoverable fault occurred in the drive.
	Red	Flashing	Recoverable fault	A recoverable fault occurred, such as switch setting error.
	—	Not lit	Power OFF	Power not being supplied to the drive.
NS	Green	Lit	DeviceNet communication taking place	DeviceNet communicating normally.
	Green	Flashing	DeviceNet communication not taking place	DeviceNet network normal, but not communicating with the master.
	Red	Lit	Communication fault	A fault that makes it impossible for the DeviceNet to communicate occurred. • Duplicate MAC ID • Bus-off detection
	Red	Flashing	Communication timeout	Communication timeout with master occurred.
	—	Not lit	Offline, Power OFF	DeviceNet not set to Online. Power not being supplied to the interface card. Mismatch of baud rate.

NOTE: The LEDs will flash red once (100ms) during power up initialization. This is used in the internal testing process to verify that the red LED is working properly.


RUN
ALARM
MS
NS

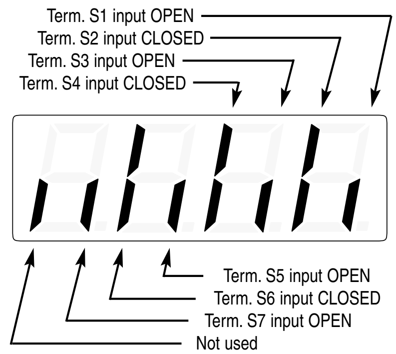
4.5 MONITOR DISPLAYS

When using the **Monitor** Function, a variety of information will appear on the Digital Operator display when each of the U-XX (display only) parameters is selected.

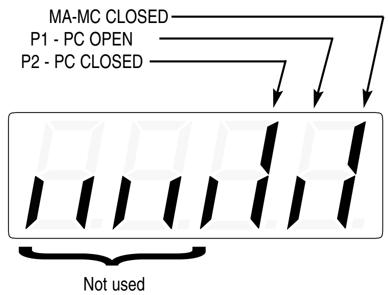
Monitor	Contents	Display Example	MEMOBUS Address (hex)
U-01	Frequency reference (Hz)	60.0	23
U-02	Output frequency (Hz)	60.0	24
U-03	Output current (A)	12.5	3B
U-04	AC output voltage (V)	230	28
U-05	DC Bus voltage (VPN)	325	31
U-06	Multi-function input terminal and DeviceNet input status	 (1)	2B
U-07	Multi-function output terminal and DeviceNet output status	 (2)	2D
U-08	Motor torque (%) (Open loop vector only)	72	32
U-09	Fault history (last 4 faults)[3]	1.bUS	1B2
U-10	Software number <u>XXXX</u>	0010	1B3
U-11	Output power (KW)	99.9	37
U-12	Reserve (Not displayed)	-	-
U-13[1]	Elapse time (0-6550 (x 10hour))	1234	35
U-14	Reserve (N/A)	-	-
U-15	Reserve (N/A)	-	-
U-16	PID feedback (%)	35.0	38
U-17	PID input (%)	100	39
U-18	PID output (%)	75.5	3A
U-19	Reserve (Not displayed)	-	-
U-60	DeviceNet Polled Producing Attribute (PPA)	70: Basic speed control 71: Extended Speed Control 150: V7N Memobus I/O Control 151: V7N Standard Drive Control 152: V7N Accel/Decel Time Control 155: V7N Extended I/O MEMOBUS Instance 156: V7N General Purpose DI/DO Instance	- (Readable via DeviceNet Object Class 5, Instance 2, Attribute 10)
U-61	DeviceNet Polled Consuming Attribute (PCA)	20: Basic speed control 21: Extended Speed Control 100: V7N Memobus I/O Control 101: V7N Standard Drive Control 102: V7N Accel/Decel Time Control 105: V7N Extended I/O MEMOBUS Instance 106: V7N General Purpose DI/DO Instance	- (Readable via DeviceNet Object Class 5, Instance 2, Attribute 10)
U-62	DeviceNet MAC ID switch setting (S3 x 10 + S4)	17	-
U-63	DeviceNet MAC ID set	17	- (Readable via DeviceNet Object Class 3, Instance 1, Attribute 1)
U-64	DeviceNet Baud Rate switch setting (S1)	1	-
U-65	DeviceNet Baud Rate set	125: 125 kbps 250: 250 kbps 500: 500 kbps	- (Readable via DeviceNet Object Class 3, Instance 1, Attribute 2)
U-66	DeviceNet connection status	 (4)	- (Readable via DeviceNet Object Class 5, Instance 1 and 2, Attribute 1)

(1) Available only in CIMR-V7NU25P5, 27P5, 45P5, and 47P5 drives

(1) Actual display appearance:

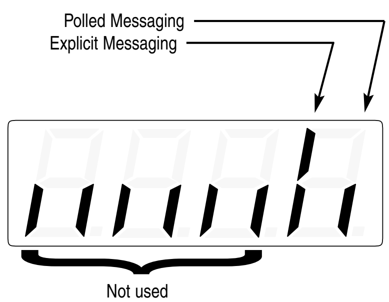


(2) Actual display appearance:



(3) See section 6 for viewing of fault log contents.

(4) Actual display appearance:



Section 5. PROGRAMMABLE FEATURES

5.1 GENERAL

This section describes features of the Drive which are defined by programmed settings in the various parameters in memory. Since most features use more than one parameter, the descriptions appear in alphabetical order by the function name. In Table 5-1, the functions are grouped into operational categories. To cross reference a particular parameter to the features to which it applies, see the listings in Appendix 1.

Table 5-1. List of Features Defined By Parameters

FUNCTION	PARAGRAPH REFERENCE	PARAMETER(S)
SET-UP		
Initialization (Reset), 2-Wire or 3-Wire	5.18	***n001***
Volts/Hertz Patterns	5.24	***n011 - n017***
Thermal Motor Overload Protection	5.22	***n036 - n038***
Control Method Selection	2.2	***n002***
Copy Function	5.26	***n176, n177***
STARTING		
Accel Time	5.2	***n018, n019, n021***
S-Curve Characteristics	5.3	***n023***
DC Injection Braking at Start	5.7	***n089, n091***
STOPPING		
Stopping Method	5.21	***n005***
Decel Time	5.2	***n018, n020, n022***
DC Injection Braking at Stop	5.7	***n089, n090***
SPEED CONTROL		
Frequency Reference, Upper & Lower Limits	5.9	***n033, n034***
Jog Reference*	5.12	***n032, n050 - n056***
Frequency Reference Selection	5.11	***n004, n008, n009***
Multi-step Speed Setting*	5.11	***n004, n024 - n031 n050 - n056, n120 - n127***
Up/Down Frequency Setting	5.10, 5.15E	***n056, n100***
DeviceNet Control	6.3.1	***n003, n004, n148 - n157***
PID Control	5.25	***n128 - n138, n163, n164***
REVERSE		
Reverse Run Disabled	Table A1-1	***n006***
Critical Frequency Rejection	5.6	***n083 - n086***
Carrier Frequency	5.5	***n080, n175***
Speed Search*	5.15D	***n050 - n056***
Speed Coincidence*	5.16	***n057 - n059, n095***
Slip Compensation	5.19	***n036, n106, n110 - n113***
RUNNING IMPROVEMENTS		
Torque Compensation	5.23	***n103 - n105, n109***
Stall Prevention	5.20	***n092 - n094, n115, n116***
Energy Saving	5.28	***n139 - n146, n158 - n162***
PROTECTIVE FEATURES		
Momentary Power Loss Ride-thru	5.14	***n081***
Auto Restart	5.4	***n082***
Overtorque/Undertorque Detection*	5.17, 5.31	***n057 - n059, n096 - n099***
Miscellaneous Protective Functions	5.13	***n007, n010***
DRIVE CONTROLS, INPUT		
Multi-function Input Terminals*	5.15	***n050 - n056***
External Fault Terminals*	5.16	***n057 - n059***
Multi-function Analog Input CN2	5.29	***n077-n078***
DRIVE OUTPUT		
Multi-function Output Terminals*	5.16	***n057 - n059***

* Terminals S5-S7 and MA are not physical terminals, but they are multi-function inputs and outputs controlled via DeviceNet communications.

5.2 ACCEL/DECEL TIME

A. ***n019* :** Accel Time 1
***n020* :** Decel Time 1

Factory setting (each): ***10.0*** seconds
Range (each): 0.00 to 6000.0 seconds

***n021* :** Accel Time 2
***n022* :** Decel Time 2

Factory setting (each): ***10.0*** seconds
Range (each): 0.00 to 6000.0 seconds

***n041* :** Accel Time 3
***n042* :** Decel Time 3

Factory setting (each): ***10.0*** seconds
Range (each): 0.00 to 6000.0 seconds

***n043* :** Accel Time 4
***n044* :** Decel Time 4

Factory setting (each): ***10.0*** seconds
Range (each): 0.00 to 6000.0 seconds

The drive incorporates four sets of individually programmable acceleration and deceleration times. Four acceleration and deceleration times can be selected if two Multi-Function Input Terminals (***n050*** to ***n056***) are set to '11' (accel/decel time 1) and '27' (accel/decel time 2).

B. ***n050* thru *n056* :** Multi-function Inputs (Term. S1 thru S7)

Data ***11* :** Accel/Decel Time Selection 1
Data ***27* :** Accel/Decel Time Selection 2

The following table shows which acceleration and deceleration times are selected by each combination of accel/decel time select 1 (***n050*** thru ***n056*** =11) and accel/decel time select 2 (***n050*** thru ***n056*** = 27).

Accel/decel time Select 1 (terminal S1 thru S7)	**Accel/decel time Select 2 (terminal S1 thru S7)**	**Acceleration time**	**Deceleration time**
OPEN	OPEN	Acceleration time 1 n019	Deceleration time 1 n020
CLOSED	OPEN	Acceleration time 2 n021	Deceleration time 2 n022
OPEN	CLOSED	Acceleration time 3 n041	Deceleration time 3 n042
CLOSED	CLOSED	Acceleration time 4 n043	Deceleration time 4 n044

C. ***n018* :** Accel Time Setting Unit

Factory setting: ***0***
Range : 0 = 0.1 seconds 1 = 0.01 seconds

In addition to determining the setting resolution, this parameter controls the range of ***n019*** thru ***n022***; if the resolution is 0.01 sec., the range is 0.00 to 600.00 sec. If the resolution is set to 0.1 sec., the range is 0.0 to 6000.0 sec.

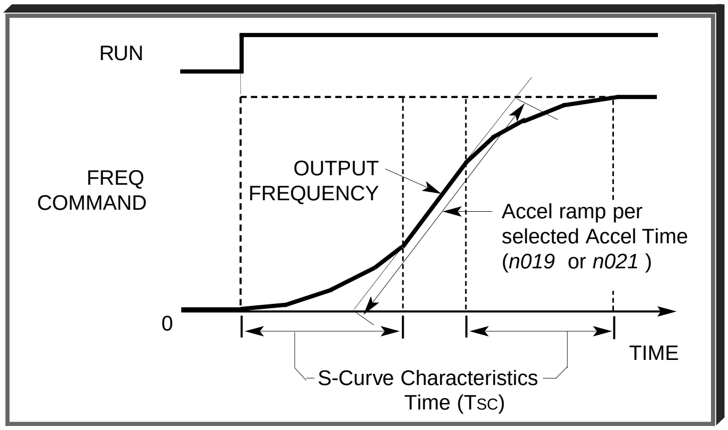
5.3 ACCEL/DECEL: S-CURVE CHARACTERISTICS

n023 **:** S-Curve Selection

Factory setting: ***0***	
Range: 0 to 3	

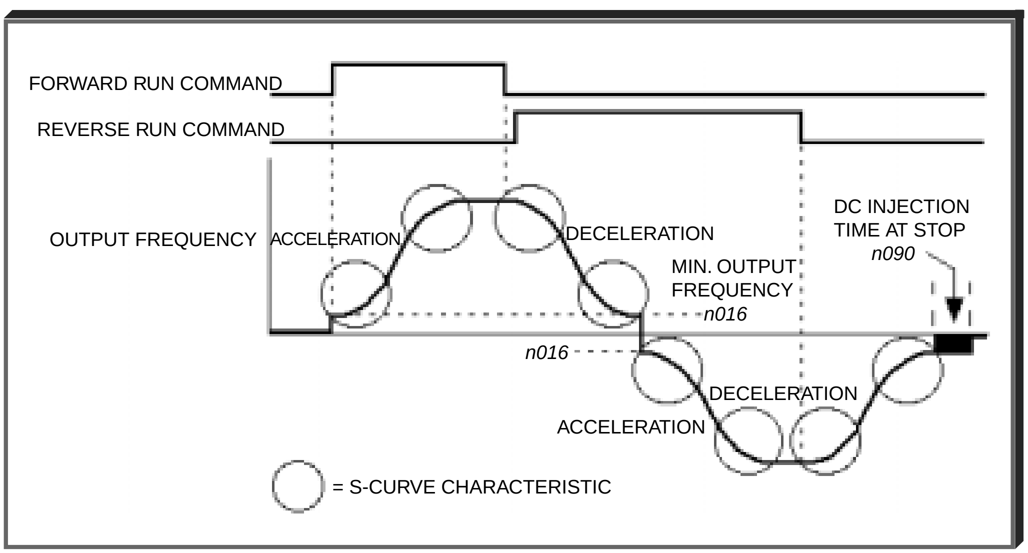
Setting of this parameter determines the S-curve (starting) characteristics of the acceleration ramp.

0 = S-curve disabled
1 = S-curve of 0.2 seconds
2 = S-curve time of 0.5 seconds
3 = S-curve time of 1.0 seconds



NOTE: Actual accel time = Set accel time + (2 * S-curve selection)
Actual decel time = Set decel time + (2 * S-curve selection)

The following figure shows FWD/REV switching and acceleration & deceleration to a stop with S-curve active.



5.4 AUTO-RESTART

A. ***n082*** **:** Number of Auto-Restart Attempts

Factory setting: ***0***
Range: 0 - 10

When a fault occurs during operation, the Drive can be programmed for an auto-restart operation to automatically reset the fault. Auto-restart operation will use the number of reset attempts set in this parameter, up to the maximum of 10. When set to " 0 ", no auto-restarts will be attempted.

Fault contact will <u>not</u> actuate (change state) during auto-restart attempts.

- The following faults can be automatically reset:

  oC: Overcurrent
  ou: Overvoltage (OV)

- The number of restart attempts available will be reset to the ***n082*** setting when:

  1. 10 minutes has elapsed without a fault occurring.
  2. The **RESET** key, or external Fault Reset push button, is pressed.
  3. Power is removed from the Drive.

5.5 CARRIER FREQUENCY

n080 **:** Carrier Frequency

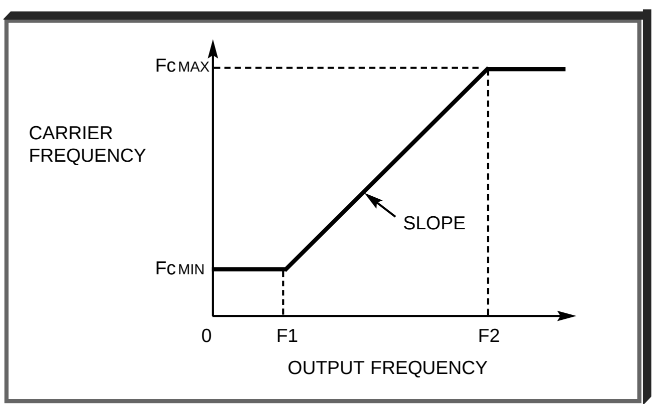
Factory Setting: *3*
Range: 1 to 4; 7 to 9

The relationship between output frequency and carrier frequency is determined from the set value of ***n080*** .

(a) For constant carrier frequency, set to " 1 ", " 2 ", " 3 ", " 4 ".

(b) For synchronous mode, set ***n080*** to " 7 ", " 8 ", or " 9 ". These setting values establish carrier frequencies of 12f, 24f, or 36f, respectively.

n080 SETTING	CARRIER FREQUENCY(kHz) Maximum(F_{CMAX})	CARRIER FREQUENCY(kHz) Minimum(F_{CMIN})	SLOPE $(=\frac{Fc}{Fo})$	OUTPUT FREQUENCY(Hz) F1	OUTPUT FREQUENCY(Hz) F2	MODE
1	2.5	2.5	0	NA	NA	CONSTANT
2	5.0	5.0	0	NA	NA	
3	7.5	7.5	0	NA	NA	
4	10.0	10.0	0	NA	NA	
7	2.5	1.0	12	83.3	208.3	SYNCHRONOUS
8	2.5	1.0	24	41.6	104.1	
9	2.5	1.0	36	27.7	69.4	



DRIVE DERATING FOR HIGHER CARRIER FREQUENCY

Setting carrier frequency to a value higher than its factory setting requires derating of the drive's output current - refer to the following table:

Rated input	New Drive Model No. CIMR-V7NU	Rated Output Current (A)	n080		Derated Output Current (A) (1)
			Factory Setting	Frequency (kHz)	
230V	20P1 20P2	0.8 1.6	4 4	10 10	No Derate
	20P4 20P7	3.0 5.0	4 4	10 10	
	21P5 22P2 23P7	8.0 11.0 17.5	3 3 3	7.5 7.5 7.5	7.0 10.0 16.5
	25P5 27P5	25.0 33.0	3 3	7.5 7.5	23.0 30.0
460V	40P2 40P4	1.2 1.8	3 3	7.5 7.5	1.0 1.6
	40P7 41P5 43P7	3.4 4.8 8.6	3 3 3	7.5 7.5 7.5	3.0 4.0 No Derate
	45P5 47P5	14.8 18.0	3 3	7.5 7.5	14.0 17.0

(1) Derated Output Current values are the maximum currents available with a carrier frequency **n080** setting of "4" (10kHz).

Carrier frequency should be decreased as the distance between the drive and the motor increases, to reduce capacitive coupling in the motor leads.

- For wiring distances greater than 100m (328 ft.), ***n080*** should be set to 5 kHz (data " 2 ") or less.

***n175* :** Reduce carrier at low speed selection

Factory Setting: *0*
Range: 0 or 1

SETTING	DESCRIPTION
0	Disabled
1	Carrier frequency reduced to 2.5 KHz

When ***n175*** is enabled (= "1"), the carrier frequency will automatically be reduced to 2.5 kHz, regardless of the setting of ***n080***, whenever the output frequency is at or below 5 Hz AND the output current is above 110% of drive rated current.

5.6 CRITICAL FREQUENCY REJECTION

A. ***n083*** **:** Prohibited Frequency 1
n084 **:** Prohibited Frequency 2
n085 **:** Prohibited Frequency 3

Factory setting (each): ***0.00***	
Range (each): 0.00 to 400.0 Hz	

These parameters allow programming of up to three prohibited frequency points for eliminating problems with resonant vibration of the motor/machine. This feature does not actually eliminate the selected frequency values, but will accelerate and decelerate the motor through the prohibited bandwidth.

B. ***n086*** **:** Prohibited Frequency Deadband

Factory setting: ***0.00***	
Range: 0.00 to 25.50 Hz	

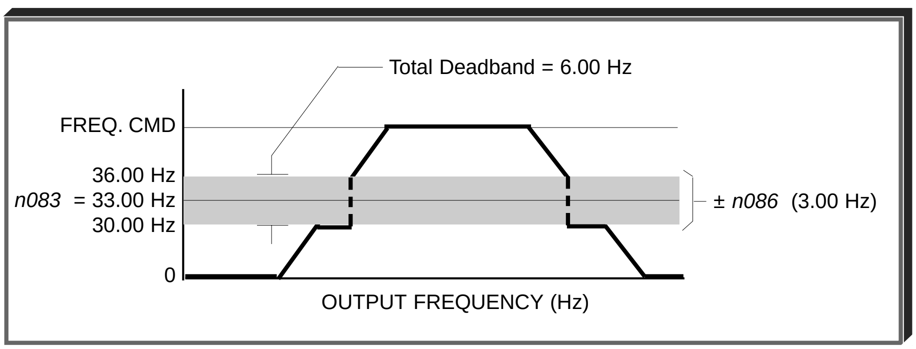
This parameter determines the width of the deadband around each selected prohibited frequency point.

EXAMPLE:

Vibration encountered between 30.00 and 36.00 Hz.

SOLUTION: Set ***n083*** to " 33.00 ". This is the center of the problem frequency band.
Set ***n086*** to " 3.00 ". This will cause the Drive to reject all frequency command values between 30.00 and 36.00 Hz.

A frequency command in the deadband will be converted to the bottom value of the deadband, e.g. a command of 33.00 Hz would result in a run frequency of 30.00 Hz.



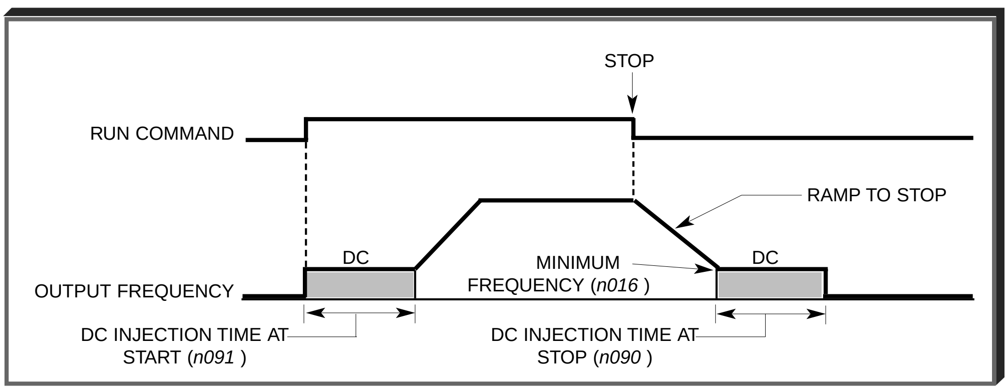
NOTE: n083 > n084 > n085 - The highest prohibit frequency required needs to be in n083. The next highest prohibit frequency needs to be in n084, and the lowest prohibit frequency needs to be in n085.

5.7 DC INJECTION BRAKING

n016 **:** Minimum Frequency	Range: 0.1 to 10.0 Hz
n089 **:** DC Injection Braking Current (% of Drive Rated Current)	Factory setting: ***50*** %
	Range: 0 to 100 %
n090 **:** DC Injection Time at Stop	Factory setting: ***0.5*** sec
	Range: 0.0 to 25.5 sec
n091 **:** DC Injection Time at Start	Factory setting: ***0.0*** sec
	Range: 0.0 to 25.5 sec

DC injection can be used to stop a motor whose rotational direction is uncertain at start-up, or to help stop a coasting motor.

With ramp to stop enabled (***n005*** = " 0 "), after a STOP command is received the Drive controls motor deceleration according to the Decel Time setting, until output frequency reaches the DC injection braking start frequency (or Minimum Frequency, ***n016***). Then the Drive output is turned off and DC injection current is applied to the motor. The effective DC injection time and current should be set to provide adequate stopping without excessive motor heating. The DC injection voltage is determined by the DC injection braking current and motor impedance.



DC Braking Sequence

5.8 FREQUENCY REFERENCE UPPER & LOWER LIMITS

n033 **:** Frequency Reference Upper Limit

Factory setting: ***100*** %
Range: 0 to 110 %

n034 **:** Frequency Reference Lower Limit

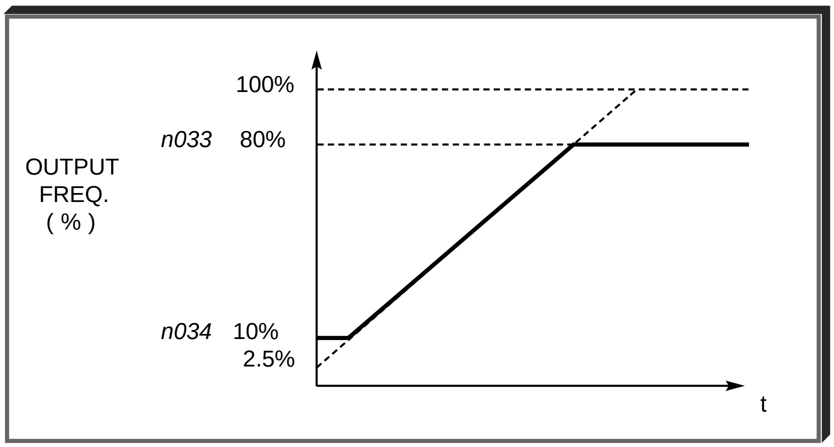
Factory setting: ***0*** %
Range: 0 to 110 %

These two parameters set the range for the frequency command signal. Each is set, in increments of 1%, as a percentage of maximum frequency (Fmax; ***n011***) as established by either the selected standard V/f pattern or custom V/f pattern.

NOTE: All references are affected by the upper and lower limit points.

EXAMPLE:

n011 = " ***60*** " Hz (100%)
n033 = " ***80*** " % = 48Hz – Max. speed
n034 = " ***10*** " % = 6Hz – Min. speed



NOTE: n033 must be set to a higher value than n034.

5.9 FREQUENCY REFERENCE RETENTION

n100 **:** Up/Down Hold Memory

Factory setting: ***0***
Range: 0 or 1

Used with the Up/Down command. To retain the held frequency reference when a stop command is issued or when power is removed, set ***n100*** to " 1 ".

Setting	Description
0	Not retained
1	Held reference retained Note: Frequency reference value must remain unchanged for a minimum of 5 seconds to be retained.

5.10 FREQUENCY REFERENCE SELECTION

The Drive allows selection of up to nineteen frequency references. One is an analog input, sixteen are digital presets (selected with multi-function inputs), one is a jog input, and one is via DeviceNet communications (see paragraph 5.32).

A. Frequency Reference via Analog Input

In order to set the Drive so the frequency reference comes from the analog input CN2 connector on the digital operator, set parameter **n004** as shown in the table below:

PARAMETER	SETTING	DESCRIPTION
n004	**7**	Sets CN2 for a voltage input (0 to 10V)
	8	Sets CN2 for a current input (4 to 20mA)

The Analog Input Connector/Cable Assembly Option (DS082) is required for interface with CN2 on the digital operator.

B. Frequency Reference via Digital Presets

In order to set the Drive so the frequency reference comes from the digital presets, the following parameters need to be set:

PARAMETER	SETTING	DESCRIPTION
n024 thru n031	User Set	Eight Frequency References
n050 thru n056	6, 7, 8, and/or 9	Sets the multi-function inputs so selection of the various references is possible with contact closures.
n120 thru n127	User Set	Eight More Frequency References

Depending upon how many preset references are required determines the actual settings of **n050** thru **n056**. Several examples are listed below.

5.10 FREQUENCY REFERENCE SELECTION
Continued

Example 1 - Four preset references
Programming: **n054 = 6** and **n055 = 7**

DIGITAL PRESET	S6	S5
Selectable Reference (2)	Open	Open
n025	Open	Closed
n026	Closed	Open
n027	Closed	Closed

Example 2 - Eight preset references
Programming: **n054 = 6, n055 = 7** and **n056 = 8**

DIGITAL PRESET	S7	S6	S5
Selectable Reference (2)	Open	Open	Open
n025	Open	Open	Closed
n026	Open	Closed	Open
n027	Open	Closed	Closed
n028	Closed	Open	Open
n029	Closed	Open	Closed
n030	Closed	Closed	Open
n031	Closed	Closed	Closed

Example 3 - Sixteen preset references
Programming: **n053 = 6, n054 = 7, n055 = 8** and **n056 = 9**

DIGITAL PRESET	S7	S6	S5	S4
Selectable Reference (2)	Open	Open	Open	Open
n025	Open	Open	Open	Closed
n026	Open	Open	Closed	Open
n027	Open	Open	Closed	Closed
n028	Open	Closed	Open	Open
n029	Open	Closed	Open	Closed
n030	Open	Closed	Closed	Open
n031	Open	Closed	Closed	Closed
n120	Closed	Open	Open	Open
n121	Closed	Open	Open	Closed
n122	Closed	Open	Closed	Open
n123	Closed	Open	Closed	Closed
n124	Closed	Closed	Open	Open
n125	Closed	Closed	Open	Closed
n126	Closed	Closed	Closed	Open
n127	Closed	Closed	Closed	Closed

(2) The Selectable Reference is chosen from the following list:

REFERENCE SOURCE	PROGRAMMING
Digital Operator Speed Pot	**n004** = 0
Digital Preset Reference parameter **n024**	**n004** = 1
N/A	**n004** = 2, 3, 4, 5, 6
Voltage reference from CN2 V Auxiliary reference terminal (0-10V)	**n004** = 7
Current reference from CN2 I Auxiliary reference terminal (4-20mA)	**n004** = 8
DeviceNet	**n004** = 9

C. Jog Reference - See paragraph 5.12

NOTE: Terminals S5-S7 are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

D. Frequency Reference via DeviceNet Communications

In order to set the Drive so that the frequency reference comes from DeviceNet communications, verify the setting of the following parameters:

PARAMETER	SETTING	DESCRIPTION
n004	**9**	Sets reference source via DeviceNet
n035	**Number of motor poles**	Sets the number of motor poles to input and output motor speed in RPMs on DeviceNet control and digital operator display. Default value is 0 for frequency reference in Hz.

5.11 JOG REFERENCE

n032 **:** Jog Reference

Factory setting: ***6.00*** Hz	
Range: 0.00 to 400.0 Hz	

n050 thru ***n056*** **:** Multi-function Inputs (Term. S1 - S7)

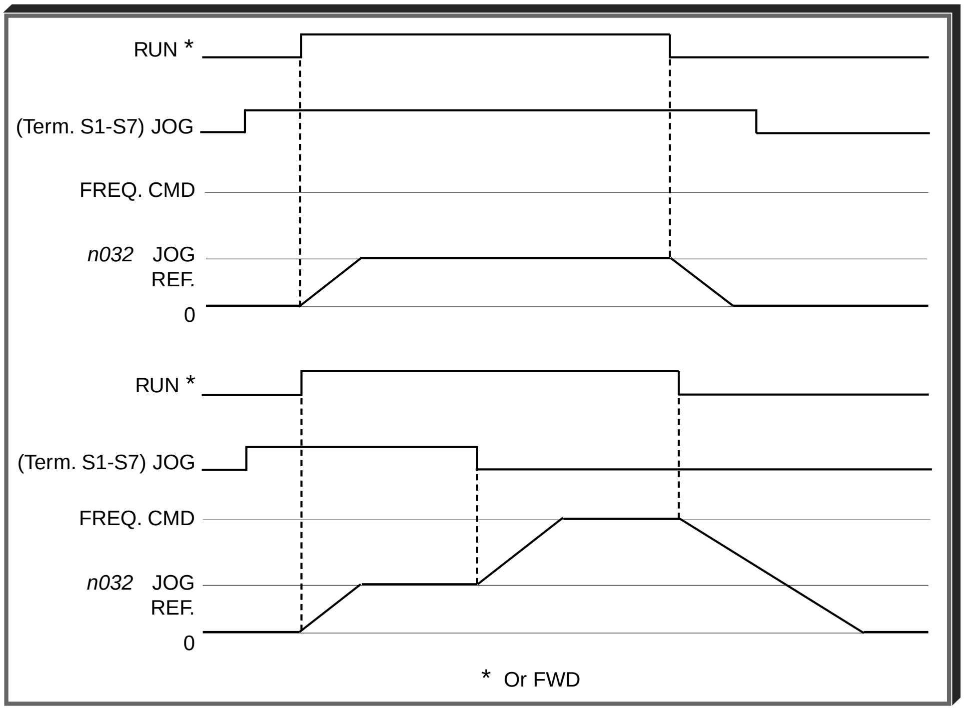
Data ***10*** : Jog Selection

When jog operation is selected (by external Jog and Run signals), the Drive output will ramp to the output level set by this parameter.

When an external Jog signal is present, it will override the existing operation mode and the Drive will ramp to the level set by this parameter.

EXAMPLE:

OPERATION BY REMOTE SIGNAL INPUT (RUN & JOG)



Also see descriptions of **MULTI-FUNCTION INPUT TERMINALS**, paragraph 5.18.

NOTE: Terminals S5-S7 are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

5.12 LOCAL/REMOTE REFERENCE & SEQUENCE SELECTION

The Drive has the ability to have either a local or a remote reference and sequence selection.

Local - Run and stop functions are controlled by the buttons on the digital operator (**n007**). The frequency reference can come from a digital preset reference (**n024** & **n009**) or the digital operator pot (**n008**).

Remote - Run and stop functions are determined by parameter **n003**. The frequency reference is determined by parameter **n004**.

Switching between local and remote is accomplished either by the LO/RE LED on the digital operator or by the use of a multi-function input terminal programmed to data "**17**" (see paragraph 5.18A).

n003 : Operation Method Selection

Factory setting: ***1***

SETTING	DESCRIPTION
0	Run and stop is controlled by the RUN and STOP RESET buttons on the digital operator.
1	Run and stop is controlled by the multi-function input terminals 2-Wire control - Run Forward (**n050** is set to a data of "**1**") Run Reverse (**n051** is set to a data of "**2**") 3-Wire control - Parameter **n052** needs to be set to a data of "**0**" Run is controlled by a momentary closure on terminal S1 Stop is controlled by a momentary open on terminal S2 Forward/Reverse is controlled by terminal S3
2	N/A
3	Run and stop is controlled by DeviceNet communications

n004 : Reference Selection

Factory setting: ***2***

SETTING	DESCRIPTION
0	Frequency reference is controlled by the digital operator potentiometer.
1	Frequency reference is controlled by a digital preset speed (**n024**) and is affected by **n009**.
2	N/A
3	N/A
4	N/A
5	N/A
6	N/A
7	Frequency reference is controlled by voltage reference of CN2 V auxiliary reference (0-10V).
8	Frequency reference is controlled by current reference of CN2 I auxiliary reference (4-20 mA).
9	Frequency reference is controlled by DeviceNet communications.

n007 : Stop Key Function

Factory setting: ***0***
Range: 0 or 1

SETTING	DESCRIPTION
0	STOP RESET key is effective at all times (regardless of programming of **n003**)
1	STOP RESET key is effective only when the run/stop command is from the digital operator (**n003 = 0**)

5.12 LOCAL/REMOTE REFERENCE & SEQUENCE SELECTION

Continued

n008 : Reference Selection - Digital Operator

Factory setting: ***0***
Range: 0 or 1

This parameter is only effective when the Drive is in the local mode.

SETTING	DESCRIPTION
0	Frequency reference is controlled by the digital operator potentiometer
1	Frequency reference is controlled by a digital preset speed (**n024**) and is affected by **n009**.

n009 : Frequency Reference Setting Method From Digital Operator

Factory setting: ***0***
Range: 0 or 1

This parameter is only effective when the frequency reference is controlled by a digital preset (**n024**).

SETTING	DESCRIPTION
0	DATA ENTER key must be pressed in order for the drive to accept the frequency reference.
1	DATA ENTER key does not have to be pressed. The Drive responds immediately to the  and  keys.

5.13 MISCELLANEOUS PROTECTIVE FUNCTIONS

n010 **:** Operator Connection Fault Detection Selection

Factory Setting: ***0***
Range: 0 or 1

Set this parameter to " 1 " only if the drive should shut down immediately if the Digital Operator is disconnected while the drive is running. When set to " 0 ", the fault will not occur until after the drive has been stopped.

5.14 MOMENTARY POWER LOSS RIDE-THRU

n081 : Momentary Power Loss Ride-thru Protection

0 = Disabled (Factory setting)
1 = Enabled – 2 sec. power loss ride-thru
2 = Enabled – indefinite power loss ride-thru, provided control power is maintained

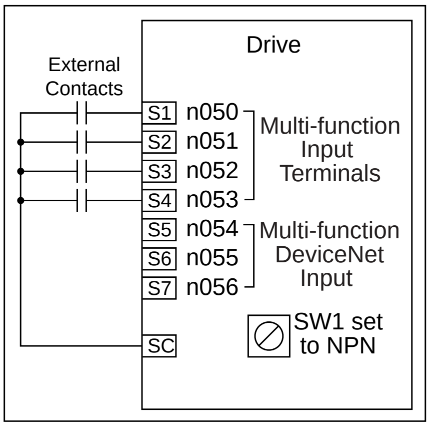
The setting of this parameter either enables or disables the ride-thru feature of the Drive. If disabled, the unit will stop immediately whenever a power loss occurs. If enabled, the Drive will continue to operate during a momentary power loss of up to 80%, but if the loss exceeds the identified time period, the Drive will stop.

5.15 MULTI-FUNCTION INPUT TERMINALS (Term. S1-S4)

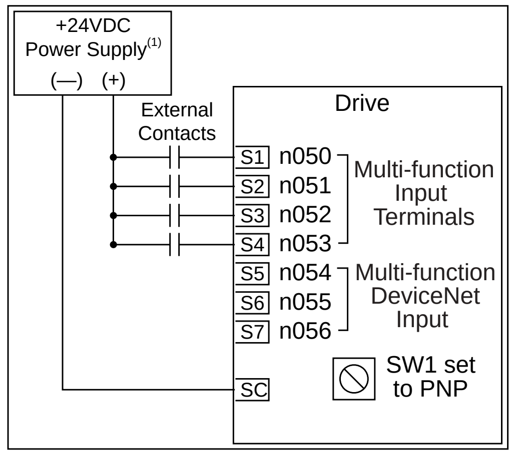
The multi-function input terminals S1-S4 can be activated in one of two ways:

Type of input	Description
NPN (Factory Setting)	A contact closure must be made between a multi-function terminal (S1 to S4) and SC in order to activate that input.
PNP	A DC voltage (+24v, 8mA max. current) must be present on a multi-function input terminal (S1 to S4) in order to activate that input. NOTE: The minus (-) side of the 24 VDC supply must be connected to SC.

The multi-function inputs are configured using rotary switch SW1, which is located above the upper row of control circuit terminals and can be set with a small screwdriver.
NOTE: All power must be removed from the Drive before SW1 can be set.



External wiring for NPN inputs



External wiring for PNP inputs

(1) Customer supplied component

n050 **:** Terminal S1 Function
n051 **:** Terminal S2 Function
n052 **:** Terminal S3 Function
n053 **:** Terminal S4 Function
n054 **:** Terminal S5 Function*
n055 **:** Terminal S6 Function*
n056 **:** Terminal S7 Function*

Factory settings:	2-Wire control	3-Wire control
n050	***1***	***1***
n051	***2***	***2***
n052	***3***	***0***
n053	***5***	***5***
n054	***6***	***6***
n055	***7***	***7***
n056	***10***	***10***

These seven parameters select the input signal function for terminals S1 thru S7, and can be independently set.

Parameter settings are checked whenever the enter key is pressed. A parameter set failure (**Err**) will occur if any of the following conditions are detected:

- Two parameters contain the same value (**n050** thru **n056**).
- Both the Accel/Decel Hold (data **16**) and the Up/Down (data **34**) functions have been selected.

Table 5-2 lists the possible data setting values and their descriptions for these parameters.

* Terminals S5-S7 are not physical terminals, but they are multi-function inputs that are controlled via DeviceNet communications.

n079 **:** Multi-function Digital Input Scan Rate Selection

Factory Setting: ***0***
Range: 0 to 1

This parameter allows the user to select the scan time that the Drive reads the status of the multi-function digital inputs S1-S7. The drive scans S1-S7 two times according to the selected scan rate to confirm the first scan before registering in the drive.

SETTING	DESCRIPTION
0	Scans twice with 8 msec scan rate
1	Scans twice with 2 msec scan rate

Table 5-2. *n050* thru *n056* Data Settings

DATA	FUNCTION	DESCRIPTION*
0	FWD/REV selection (for 3-wire control)	MUST BE SET ONLY IN ***n052*** . Redefines terminals: S1 = Run; S2 = Stop; S3 = FWD/REV select
1	Forward Run/Stop command (for 2-wire control)	Closed = Run Forward (2-wire control) Open = Stop
2	Reverse Run/Stop command (for 2-wire control)	Closed = Run Reverse (2-wire control) Open = Stop
3	External fault (N.O. contact input)	Drive trips; Digital Operator displays " ***EFX*** ", where X is 1-7, corresponding to the terminal, S2-S6, which is receiving the fault input signal
4	External fault (N.C. contact input)	
5	Fault Reset	Resets fault, only if RUN command is not present
6	Multi-step frequency ref. select A	**See paragraph 5.10B**
7	Multi-step frequency ref. select B	
8	Multi-step frequency ref. select C	
9	Multi-step frequency ref. select D	
10	Jog selection	Closed = Jog selected **See paragraph 5.12**
11	Accel/decel time selection 1	Open = Accel/decel by ***n019*** / ***n020*** Closed = Accel/decel by ***n021*** /***n022*** **See paragraph 5.2**
12	External base block (N.O. contact input)	Closed = Shuts off the Drive output (frequency command is held) **See paragraphs 5.15B, 5.15C**
13	External base block (N.C. contact input)	
14	Speed Search 1	Closed * = Speed Search operation from maximum frequency **See paragraph 5.15D**
15	Speed Search 2	Closed * = Speed Search operation from set frequency **See paragraph 5.15D**
16	Accel/Decel Hold	**See paragraph 5.15F**
17	Remote/Local selection	**See paragraph 5.15A**
18	Drive operation & reference/ DeviceNet communication selection	Open = Operates according to setting of ***n003*** & ***n004*** Closed = Operates from serial communication **See paragraph 6.3.1**
19	Fast Stop - Fault (Normally Open Contact)	Open = No effect Closed = If ***n005*** = 0, ramp to stop using ***n022*** If ***n005*** = 1, coast to stop
20	Fast Stop - Alarm (Normally Open Contact)	Open = No effect Closed = If ***n005*** = 0, ramp to stop using ***n022*** If ***n005*** = 1, coast to stop
21	Fast Stop - Fault (Normally Closed Contact)	Open = If ***n005*** = 0, ramp to stop using ***n022*** If ***n005*** = 1, coast to stop Closed = No effect
22	Fast Stop - Alarm (Normally Closed Contact)	Open = If ***n005*** = 0, ramp to stop using ***n022*** If ***n005*** = 1, coast to stop Closed = No effect
23	PID Control Off	**See paragraph 5.25F**
24	I Value Reset (PID)	**See paragraph 5.25F**
25	I Value Hold (PID)	**See paragraph 5.25F**
26	Overheat Pre-Alarm OH3	Open = No effect Closed = OH3 alarm
27	Accel/Decel Time Select 2	**See paragraph 5.2**
28	Data input from DeviceNet Communications	No effect on the drive - this input is used solely for the purpose of the input/output monitoring by the DeviceNet Network
34	Up/Down function	**See paragraph 5.15E** (can only be set in ***n056***)

* All contact closures must be maintained, except for speed search, which may be momentary (see paragraph 5.15D).

A. Data ***17*** **:** Remote/Local

The use of a Remote/Local command input allows switching between the Digital Operator control and the external terminal input signals or serial communications, without the need to re-program ***n003*** or ***n004***. If the status of the Remote/Local command input is changed while the drive is running, the Remote/Local operation selection is not completed until the next time the Drive is stopped.

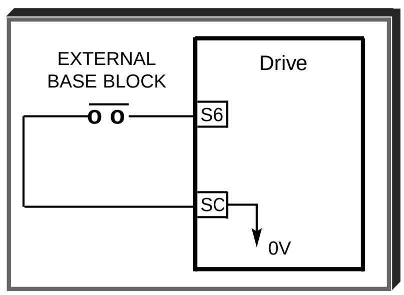
Closed = Controlled locally (Digital Operator)
NOTE: Parameter ***n008*** determines if the frequency reference will come from the digital operator potentiometer or parameter ***n024***.

Open = Controlled remotely (external terminal inputs, for Start/Stop and frequency reference, or serial communications).

NOTE: When a multi-function input terminal is programmed for Local/Remote, the LO/RE LED will only display local or remote status. Local/Remote cannot be adjusted from the digital operator.

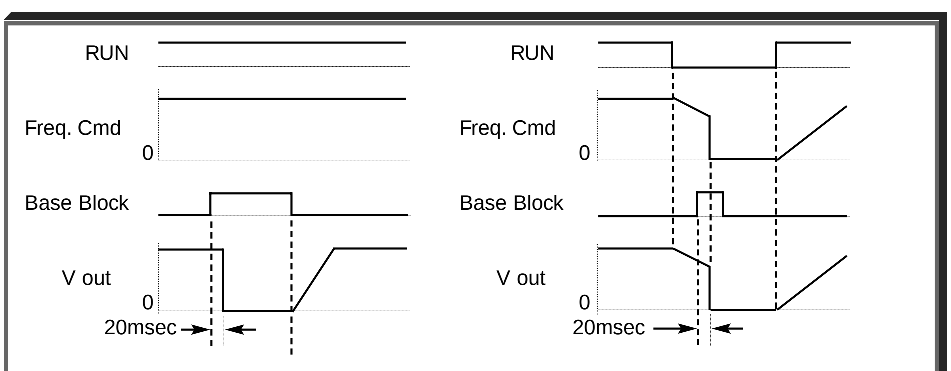
B. Data ***12*** **:** External Base Block by N.O. Contact

- When either the Forward Run command or Reverse Run command is present, and the external Base Block command is applied (i.e. contact closed), coast stop is accomplished (after a 20 msec delay), while the frequency command is maintained. When the Base Block command is removed, the drive will recover in a manner similar to that of Speed Search operation.



- When both the Forward Run command and Reverse Run command are open, and the external Base Block command is applied (i.e. contact closed), coast stop is accomplished and after a 20 msec delay the frequency command is changed to 0Hz. When the Base Block command is removed, the drive will remain in stopped condition until Forward Run command or Reverse Run command is again applied.

- When external Base Block command is active, a blinking " ***b b*** " will be displayed on the Digital Operator.



(A) Base Block With Run Active (B) Base Block After Stop Command

C. Data ***13* :** External Base Block by N.C. Contact

Base block operation is the same as described above, except that the Base Block contact must be *open* to be recognized.

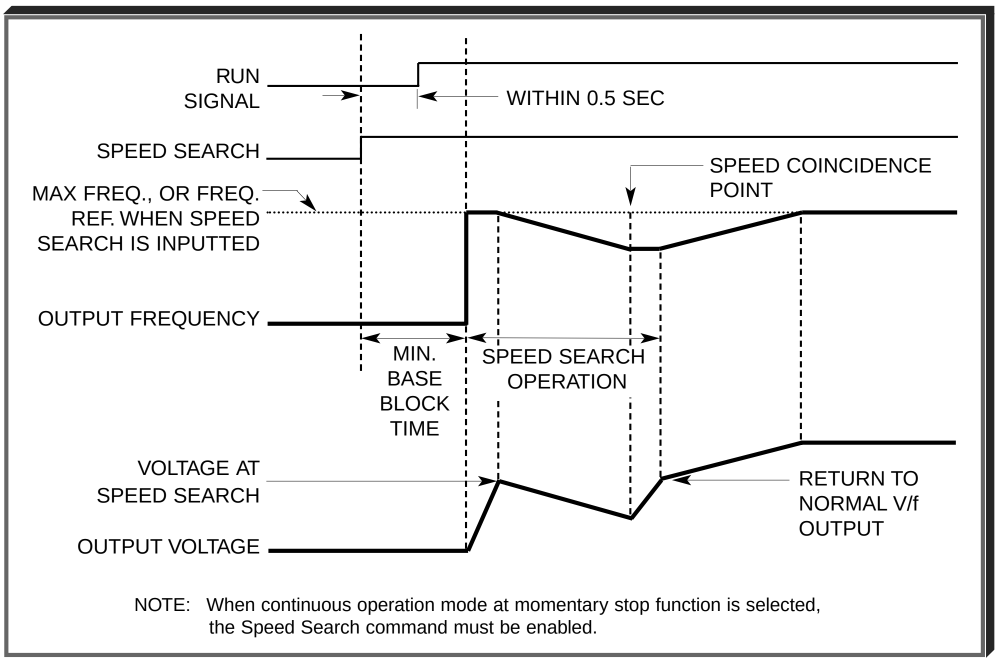
D. Data ***14*** : Speed Search From Max Frequency
Data ***15*** : Speed Search From Set Frequency

A multi-function input terminal is utilized to activate speed search. When the external speed search command is closed, the base is blocked for the min. base block time, then the speed search is made. The operation depends on the set value.

IMPORTANT

Set values ***14*** and ***15*** CANNOT be selected in combination.

- When ***14*** is set, the speed search begins with the maximum frequency.
- When ***15*** is set, the speed search begins with the frequency command command that has been set after the search command was received.



Speed Search Operation Timing

n101 : Speed Search Deceleration Time

Factory setting: **2.0**
Range: 0.0 to 10.0 seconds

Deceleration time during a speed search

n102 : Speed Search Operation Level

Factory setting: **2.0**
Range: 0.0 to 10.0 seconds

Speed search starts if the drive’s output current >= speed search operation level.

E. Data ***34*** : Up/Down Function

Programming data " 34 " for ***n056*** (multi-function input terminal) allows the S6 / S7 inputs to be used for Up/Down frequency setting.

NOTES:

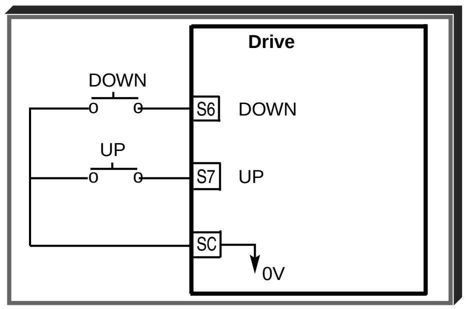
1. Parameter ***n055*** will not be valid when ***n056*** is set to " 34 ".
2. Jog has priority over Up/Down.
3. Up/Down has priority over Multi-step Frequency inputs.
4. Upper limit speed is set by the formula:

$$\textbf{\textit{n011}}\text{ (Fmax) x }\frac{\textbf{\textit{n033}}\text{ (Freq. Ref. Upper Limit)}}{100}$$

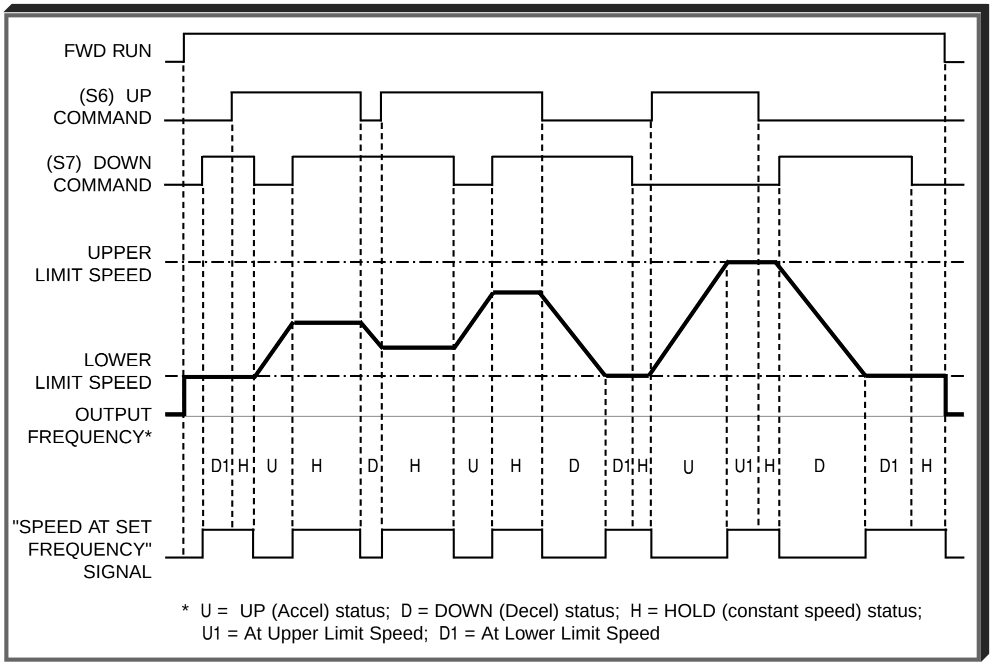
5. Lower limit speed is from ***n034*** , Frequency Reference Lower Limit.
6. See section 5.10 for information on the Up/Down hold memory.

EXAMPLE:

n056 Data ***34***: Up/Down function



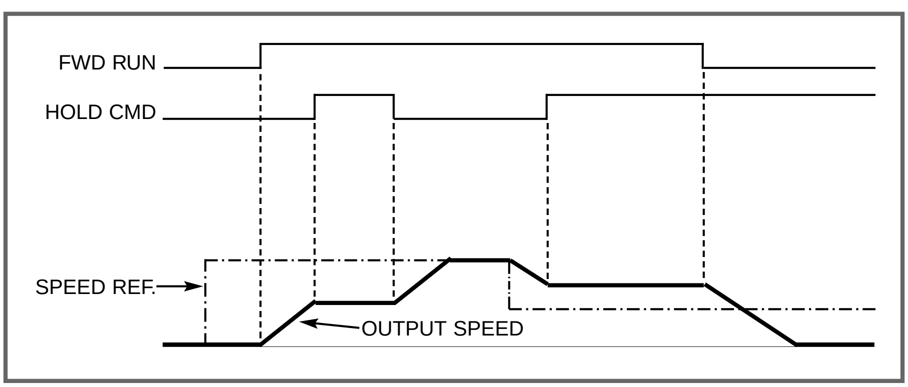
INPUT SIGNAL Term. S6 DOWN	 Term. S7 UP	FUNCTION
Open	Open	HOLD
Open	Closed	DOWN (Frequency command approaches minimum output frequency or frequency command lower limit, whichever is larger)
Closed	Open	UP (Frequency command approaches frequency command upper limit)
Closed	Closed	HOLD



Up/Down Frequency Setting Timing

F. Data **16** : Accel/Decel Hold

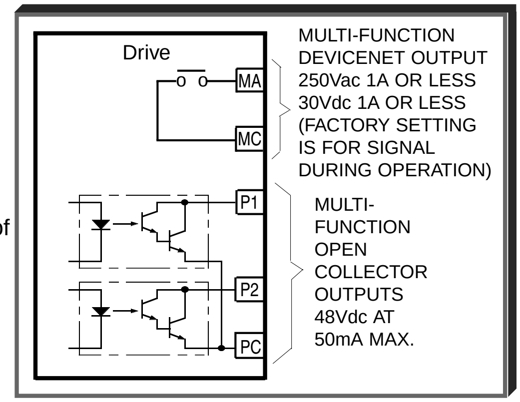
By programming data " 16 " into one of the multifunction input parameters (***n050*** thru ***n057***), one of the multi-function input terminals (S1 thru S7) becomes a HOLD command input. As long as the HOLD command is present, accel and decel are in a prohibit state, and the output speed is held at the level it was at the time the HOLD command was input. When the HOLD command is removed while the system is still in Run condition, accel or decel will again become active to allow output to reach set speed. If Stop is initiated while the HOLD command is present, the prohibit state is cancelled and the system enters stop operation.



HOLD Function Timing

n057 : DeviceNet Output (DeviceNet terminals MA & MC)
n058 : Open Collector Output (external terminals P1 & PC)
n059 : Open Collector Output (external terminals P2 & PC)

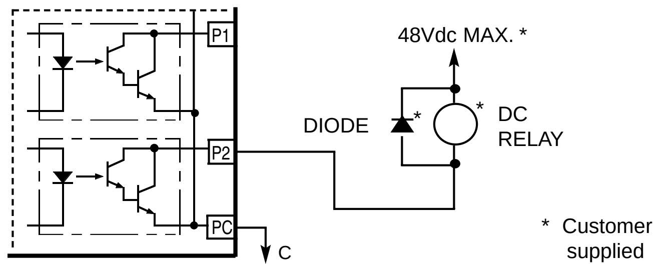
A contact, or two different open collector outputs, can be programmed to change states during any of the conditions indicated in Table 5-3.



IMPORTANT

If an open collector output is applied to a DC relay, the relay MUST be diode protected, as shown in the recommended configuration below.

Recommended Configuration for DC Relays



Terminal MA is not a physical terminal, but it is a multi-function output that is controlled via DeviceNet communications.

5.16 MULTI-FUNCTION OUTPUT TERMINALS (Term. MA & MC; P1, P2 & PC)

Table 5-3. Multi-function Output Terminals

Set Value	Description	
	Condition	Signal Level
0	Fault	Closed = Drive fault has occurred (except CPF00, CPF01)
1	During operation	Closed = Drive is operating
2	Speed at set frequency	Closed = Frequency Reference = output frequency **See paragraph 5.16A**
3	Zero Speed	Closed = Drive is at zero Hz.
4	Frequency detection - low	Closed = Output frequency ≤ ***n095***. **See paragraph 5.16B**
5	Frequency detection - high	Closed = Output frequency ≥ ***n095***. **See paragraph 5.16C**
6	Overtorque detection (N.O. contact)	Closed = Overtorque detected **See paragraph 5.17**
7	Overtorque detection (N.C. contact)	Open = Overtorque detected **See paragraph 5.17**
8	Under torque detection (NO)	Closed if under torque is detected
9	Under torque detection (NC)	Open if under torque is detected
10	Alarm (minor fault)	Closed = Alarm condition is present
11	During coast to stop	Closed = Drive output base block is active; motor is coasting
12	Local/Remote	Open = Frequency and Run Command by ext. input; Closed = Frequency and Run Command by Digital Operator
13	Operation ready	Closed = Drive is ready for operation (not faulted)
14	Auto-restart	Closed = During auto-restart operation
15	During Undervoltage	Closed = Drive has an undervoltage fault or warning.
16	During Reverse run	Closed = Drive operation in reverse
17	During Speed Search	Closed = Drive performing a speed search
18	Serial communication	Closed = Command from serial communication
19	PID Feedback Loss	Closed = Loss of feedback
20	Frequency reference is missing	Closed if frequency reference is missing
21	Inverter overheating pre-alarm OH3	Closed if drive overheat pre-alarm is input at a Multi-function Input. Digital operator display is “OH3” (blinking)

n095 **:** Speed Coincidence Frequency / Frequency Detection Level

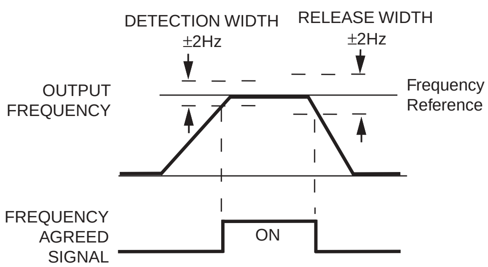
Factory setting: ***0.0*** Hz	
Range: 0.00 to 400.0 Hz	

Speed coincidence is used to control a DeviceNet output at terminal MA (with respect to terminal MC), or terminals P1, P2 & PC, when selected by ***n057, n058*** and ***n059***.

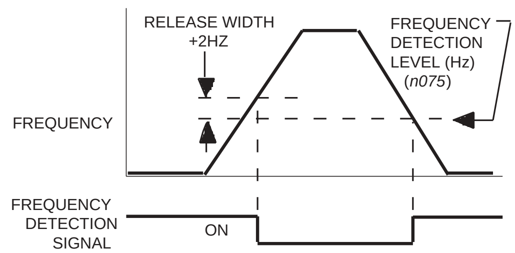
n057, n058 or ***n059*** — Data ***2*** , ***4*** or ***5***

The output contact will close, dependent upon the data programmed into ***n057, n058*** or ***n059*** . See the appropriate figure below for operation.

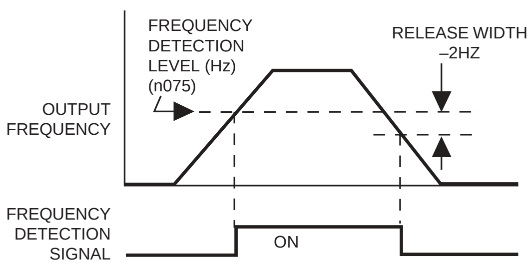
A. Speed at Set Frequency (setting: *n057, n058* or *n059* = " 2 ")



B. Frequency Detection – Low (setting: *n057, n058* or *n059* = " 4 ")



C. Frequency Detection – High (setting: *n057, n058* or *n059* = " 5 ")



5.17 OVERTORQUE DETECTION

Overtorque detection is used to compare Drive rated output current/torque with the overtorque detection level. When the output current is equal to or greater than the defined level, an overtorque condition exists. This will be indicated as an ***oL3*** fault on the Digital Operator. This feature can be selected to operate over a wide range of conditions.

A. ***n096*** **:** Overtorque Detection — Factory setting: ***0***

This constant determines whether the overtorque detection function of the Drive is enabled, under what conditions it will detect for overtorque, and what operation it will perform after detecting an overtorque.

Setting	Overtorque Disabled	Operation After Detection	Detection Condition
0	Disabled	——	——
1	Overtorque	Continues	Only at set frequency
2	Overtorque	Coast to stop	Only at set frequency
3	Overtorque	Continues	At all times except during stopping or DC injection braking
4	Overtorque	Coast to stop	At all times except during stopping or DC injection braking

— For overtorque detection during accel or decel, set to " 3 " or " 4 ".

— For continuous operation after overtorque detection, set to " 1 " or " 3 ". During detection, the Digital Operator displays and " ***oL3*** " alarm (blinking).

— To stop the drive at an overtorque detection fault, set to " 2 " or " 4 ". At detection, the Digital Operator displays an " ***oL3*** " fault.

— To output an overtorque detection signal, set output terminal function selection (***n057, n058*** or ***n059***) to " 6 " or " 7 ".

B. ***n098*** **:** Overtorque Detection Level — Factory setting: ***160*** %
Range: 30 to 200 %

This is the reference point for determining that an overtorque condition exists. Set as a percent of Drive rated current or as a percent of motor rated torque.

C. ***n097*** **:** Overtorque Detection Selection During Open Loop Vector Control — Factory setting: ***0***

This parameter is only effective when the drive is in the Open Loop Vector control method.

D. ***n099*** **:** Overtorque / Undertorque Detection Time — Factory setting: ***0.1*** sec.
Range: 0.0 to 10.0 seconds

Determines how long an overtorque condition must exist before another event will occur, e.g. coast to stop, multi-function output change of state, or ***oL3*** warning or fault display.

5.17 OVERTORQUE DETECTION Continued

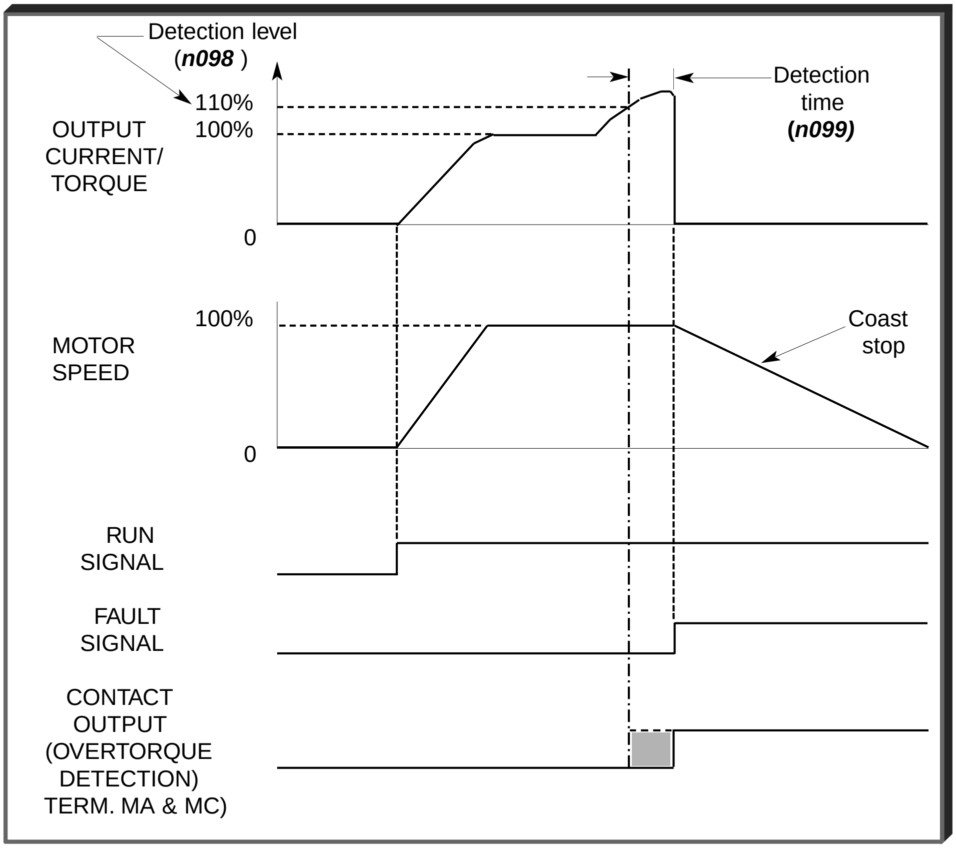
E. ***n057* :** Multi-function Output 1 (terminals MA & MC)
***n058* :** Multi-function Output 2 (terminals P1 & PC)
***n059* :** Multi-function Output 3 (terminals P2 & PC)

Data **6** or **7** : Overtorque Detection

A DeviceNet output, or an open collector output, can be programmed to change states during an overtorque detection condition.

EXAMPLE OF OVERTORQUE DETECTION

n096 setting:	***2***	— Overtorque enabled, only at set frequency, coast to stop
n057 setting:	***6***	— Output contact programmed for overtorque detection
n096 setting:	***110*** %	— Level at which overtorque is sensed
n099 setting:	***1.0*** s	— Time delay before overtorque event occurs



Overtorque Detection Timing Diagram

5.18 RESET CODES: 2-WIRE, 3-WIRE INITIALIZATION

n001 **:** Parameter Selection / Initialization

Factory setting: ***1***
Range: 0 to 9

The following table shows which parameters can be programmed (displayed & changed) or only displayed when ***n001*** is selected.

Setting	Function
0	***n001*** can be read and set; ***n002*** - ***n179*** read only
1	***n001*** - ***n039*** can be read and set
2	***n001*** - ***n067*** can be read and set
3	***n001*** - ***n113*** can be read and set
4	***n001*** - ***n179*** can be read and set
5	***n001*** - ***n179*** can be read and set – Run Command accepted during Program Mode
6	Clear Fault Record Only
7	Not Used
10	Initialization: 2-Wire control
11	Initialization: 3-Wire control

⚠ CAUTION

Entering a "5" into n001 will allow a RUN command to be accepted even if the drive is in Program mode (PRGM function LED on) or the LO/RE function LED is on. This condition may cause the motor to run; equipment damage or personal injury may result.

WARNING

By entering a "10" or an "11" into n001, all parameters in the Drive will return to their factory settings.

Parameter	Terminal	Factory Configuration for 2-Wire Control	3-Wire Control
n050	S1	1 = Forward Run	1 = Start
n051	S2	2 = Reverse Run	2 = Stop
n052	S3	3 = External Fault (N.O.)	0 = Fwd/Rev Command
n053	S4	5 = Fault Reset	5 = Fault Reset
n054	S5	6 = Multi Step Ref. Cmd. A	6 = Multi Step Ref. Cmd. A
n055	S6	7 = Multi Step Ref. Cmd. B	7 = Multi Step Ref. Cmd. B
n056	S7	10 = JOG Selection	10 = JOG Selection

Terminals S5-S7 are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

⚠ CAUTION

Know your application before using either Initialization function of *n001* .
This parameter must be set to " 0 " to " 5 " for operation.
" 10 " = Factory 2-Wire Control Initialization (Maintained RUN Contact)
" 11 " = Factory 3-Wire Control Initialization (Momentary START/STOP Contact)
Entering either Initialization code resets all parameters to factory settings, and automatically returns *n001* setting to " 1 ". If the Drive is connected for 3-Wire control and this parameter is set to " 10 " (2-Wire Control Initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

IMPORTANT

After " 10 " or " 11 " has been entered in ***n001*** , the Motor Rated Current (***n036***) MUST BE REPROGRAMMED to the correct setting for the application.

5.19 SLIP COMPENSATION

n111 : Slip Compensation Gain

Factory setting: See Table A3-1
Range: 0.0 to 2.5

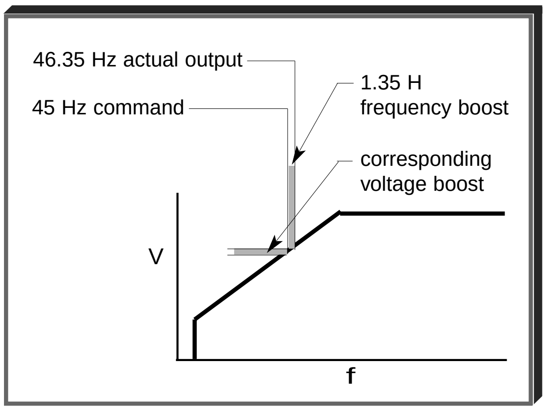
Slip compensation is used to increase motor speed to account for slip; the drive accomplishes this by automatically boosting output frequency, with a corresponding boost in output voltage.

The slip compensation gain (***n111***) determines how much compensation frequency is added. If using the Drive in Open Loop Vector, typically no adjustment is necessary. The equation below illustrates how the compensation frequency is generated.

NOTE: A slip compensation gain setting of 0.0 disables slip compensation.

$$\textit{Compensation Frequency} = \frac{\textit{Output Current} - \dfrac{\mathbf{(n110 * n036)}}{100}}{\text{n036} - \dfrac{\mathbf{(n110 * n036)}}{100}} * \mathbf{n106 * n111}$$

Slip Compensation Equation



n110 : Motor No-Load Current

Factory setting: See Table A3-1
Range: 0 to 99%

Motor no-load current (***n110***) is set as a percentage of motor full-load current (***n036***). It is used as shown in the slip compensation equation.

n112 : Slip Compensation Primary Delay
Time Constant

Factory setting: ***2.0*** sec.
Range: 0.0 to 25.5 sec.

Parameter ***n112*** can be increased to improve stability or decreased to improve response to load changes.

n113 : Slip Compensation Selection
During Regen

Factory setting: ***0***
Range: 0 or 1.

Parameter ***n113*** determines whether the slip compensation gain will be enabled or disabled during regeneration.

Setting	Description
0	Disabled - No slip compensation will be added when regenerating
1	Enabled - Slip compensation will be added when regenerating

5.20 STALL PREVENTION

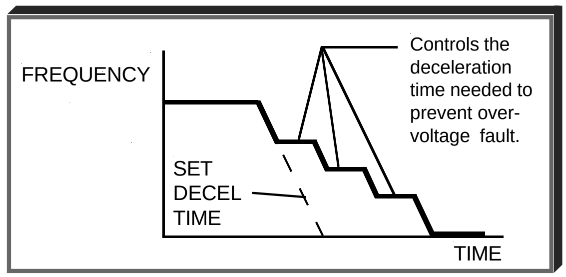
A. ***n092* :** Stall Prevention During Deceleration

Factory setting: ***0***

SETTING	FUNCTION
0	Stall prevention during deceleration enabled
1	Stall prevention during deceleration disabled

Stall prevention during deceleration automatically adjusts the deceleration rate while monitoring the DC bus voltage to prevent overvoltage during deceleration.

When the motor load is large or decel time is short, actual decel time may be longer than the set value because of stall prevention.



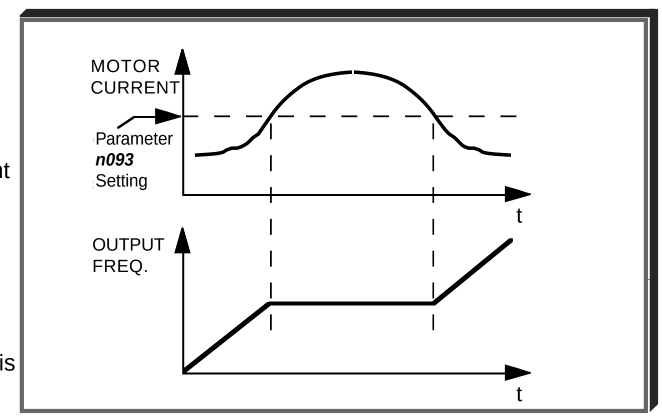
B. ***n093* :** Stall Prevention Level During Acceleration

Factory setting: See Table A3-1
Range: 30 - 200 %

This parameter determines the actual Drive output current level during an acceleration condition. Set in percent of Drive rated output current.

A setting of " 200 " disables stall prevention during acceleration. During acceleration, if the output current exceeds the value in ***n093*** , acceleration stops and frequency is maintained. When the output current goes below the value set in ***n093*** , acceleration resumes.

In the constant horsepower region [actual output frequency ≥ max. voltage frequency (***n013***)], the stall prevention level during acceleration is changed by the following formula:



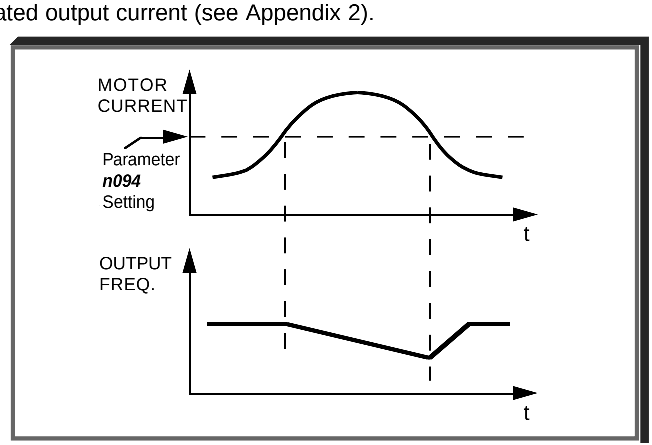
$$\text{Stall prevention level during accel (constant horsepower)} = \text{Stall prevention level during accel} \times \frac{\text{Max. voltage frequency}}{\text{Actual output frequency}}$$

C. ***n094* :** Stall Prevention Level At Set Speed

Factory setting: ***160%***
Range: 30 - 200 %

This parameter determines the actual Drive output current level while operating at set speed (frequency). Set in percent of Drive rated output current (see Appendix 2).

A setting of " 200 " disables stall prevention at set speed. During running at set speed, if the output current exceeds the value set in ***n094*** , the drive will begin to decelerate. When the output current goes below the value set in ***n094*** , acceleration begins, up to the set frequency.



D. ***n115*** **:** Stall Prevention Above Base Speed During Running

Factory setting: ***0***
Range: 0 or 1

SETTING	FUNCTION
0	Disabled (level is based on setting of ***n094***)
1	Enabled (level at Fmax, ***n011***, is ***n094*** x 0.4)

E. ***n116*** **:** Stall Prevention During Run, Accel/Decel Time Select

Factory setting: ***0***
Range: 0 or 1

SETTING	FUNCTION
0	Follows accel/decel #1 (***n019, n020***) or accel/decel #2 (***n021, n022***) Note: Multi-Function input selectable
1	Follows accel/decel #2 (***n021, n022***) always

5.21 STOPPING METHOD

***n005* : Stopping Method**

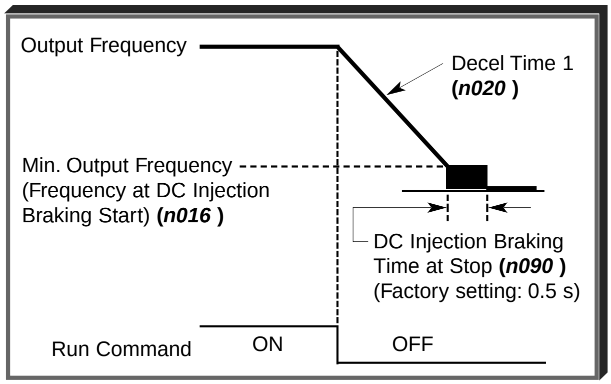
Factory setting: ***0***
Range: 0 to 1

Selects the stopping method suitable for the application.

SETTING	DESCRIPTION
0	Deceleration (ramp) to stop
1	Coast to stop

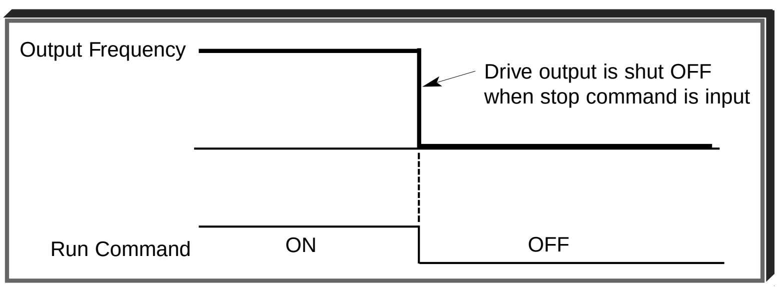
A. Data ***0*** : Deceleration to Stop

Upon removal of the FWD (REV) Run command, the motor decelerates at the deceleration rate determined by the time set in Decel Time 1 (***n020***), and DC injection braking is applied immediately before stop. If the decel time is too short or the load inertia is too large, an overvoltage (OV) fault may occur on a stop command — the decel time must be increased.



B. Data ***1*** : Coast to Stop

Upon removal of the FWD (REV) Run command, the motor coasts to rest.



5.22 THERMAL OVERLOAD PROTECTION

***n036* :** Motor Rated Current

Factory setting: See Table A3-1
Range: see description

This parameter should be set, in increments of 0.1 A, to the rated current (FLA) value shown on the motor nameplate; this value MUST BE between 10% and 150% of the *drive rated current*. If the motor FLA does not fall within this range, a different Model No. drive must be used.

NOTE: Setting ***n036*** to " 0.0 " disables the motor overload protection function, regardless of the setting of ***n037*** or ***n038*** .

n037 : Electronic Thermal Motor Protection

Factory setting: ***0***
Range: 0 to 2

SETTING	ELECTRONIC THERMAL CHARACTERISTICS
0	Short term rating
1	Standard rating
2	Electronic thermal overload protection disabled

***n038* :** Electronic Thermal Overload Protection Time Constant

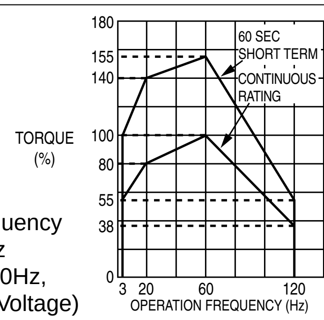
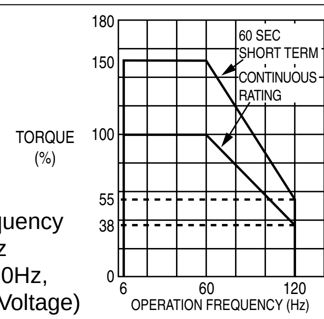
Factory setting: ***8***
Range: 1 to 60 min.

This parameter sets the electronic thermal overload relay protection time when when 150% of overload is applied after the motor is operated continuously at rated current.

The Drive protects against motor overload with a UL-recognized, built-in electronic thermal overload relay.

The electronic thermal overload function monitors motor temperature, based on drive output current and time, to protect the motor from overheating. When the electronic thermal overload trips, an " **oL1** " error occurs, shutting OFF the drive output and preventing excessive overheating of the motor.

When operating with one drive connected to only one motor, an external thermal relay is not needed. When operating several motors with one drive, install a thermal overload relay on each motor.

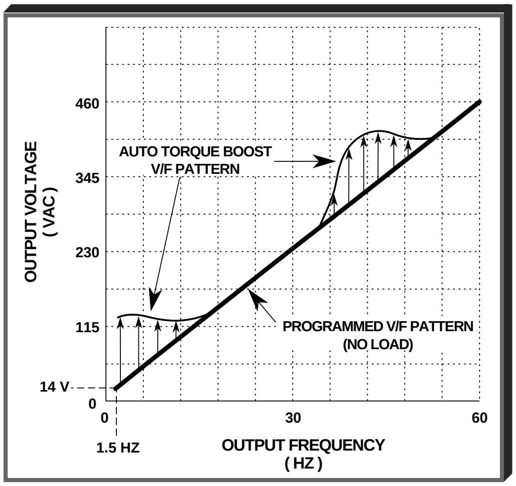
<table>
<tr><th></th><th>Cooling Effect</th><th>Current Characteristics</th><th>Electronic Thermal Overload</th></tr>
<tr><td>Short Term Rating</td><td>Effective when operated at 60Hz from a commercial power supply</td><td>Base Frequency 60Hz (V/f for 60Hz, 230V Input Voltage)

</td><td>" oL1 " error (motor overload protection) occurs when continuously operated at less than 60Hz at 100% load.</td></tr>
<tr><td>Standard Rating</td><td>Effective when operated at low speed (approx. 6Hz)</td><td>Base Frequency 60Hz (V/f for 60Hz, 230V Input Voltage)

</td><td>Electronic thermal overload protection not activated even when continuously operated at less than 60Hz at 100% load.</td></tr>
</table>

5.23 TORQUE COMPENSATION

n103 **:** Torque Compensation Gain (KT)

Factory setting: ***1.0***
Range: 0.0 to 2.5

Torque Compensation Gain (***n103***) adjusts how much the output voltage is boosted when motor load increases. It is used to compensate for resistive losses in the motor and the wiring between the drive and the motor.



Example of Torque Compensation Operation

n104 **:** Torque Compensation Time Constant

Factory setting: See Table A3-2
Range: 0.0 to 2.5 (sec)

This parameter adjusts a time delay for the torque compensation gain. Increase to add torque stability, decrease to improve torque response.

n105 **:** Torque Compensation Iron Loss

Factory setting: See Table A3-1
Range: 0.0 to 6550 W

This parameter should be adjusted only when motor capacity and drive capacity are different.

n109 **:** Torque Compensation Limit

Factory setting: 150%
Range: 0 - 250%

This parameter sets the upper voltage limit used by torque compensation.

Except for the most demanding of high starting torque applications, the factory settings of these parameters will be adequate. The factory settings are set up to match the performance of typical AC motors.

5.24 V/f PATTERN

The V/f pattern can be tailored to suit your specific application and load characteristics by adjusting parameters ***n011*** to ***n017*** (see the V/f characteristics figure on the following page).

Table 5-4. Recommended V/f Patterns

Max. Freq.	Starting Torque	Load Type[1]	n011 (Hz)	n012 (V)[3]	n013 (Hz)	n014 (Hz)	n015 (V)[3]	n016 (Hz)	n017 (V)[3]
50	Normal	VT	50	230	50	25.0	40.2	1.3	9.2
50	High[2]	VT	50	230	50	25.0	57.5	1.3	11.5
60	Normal	VT	60	230	60	30.0	40.2	1.5	9.2
60	High[2]	VT	60	230	60	30.0	57.5	1.5	11.5
50	Normal	CT	50	230	50	3.0	17.2	1.5	11.5
50	Medium	CT	50	230	50	2.5	23.0	1.3	13.8
50	High[2]	CT	50	230	50	2.5	28.7	1.3	16.1
60	Normal	CT	60	230	60	3.0	17.2	1.5	11.5
60	Medium	CT	60	230	60	3.0	20.7	1.5	13.8
60	High[2]	CT	60	230	60	3.0	28.7	1.5	23.0
72	Normal	CT	72	230	60	3.0	17.2	1.5	11.5
90	Normal	CT	90	230	60	3.0	17.2	1.5	11.5
120	Normal	CT	120	230	60	3.0	17.2	1.5	11.5
180	Normal	CT	180	230	60	3.0	17.2	1.5	11.5

NOTES:

1 VT = Variable Torque, typically used for blowers, centrifugal pumps, and fans.
CT = Constant Torque, most other applications. Consult the manufacturer for further assistance.

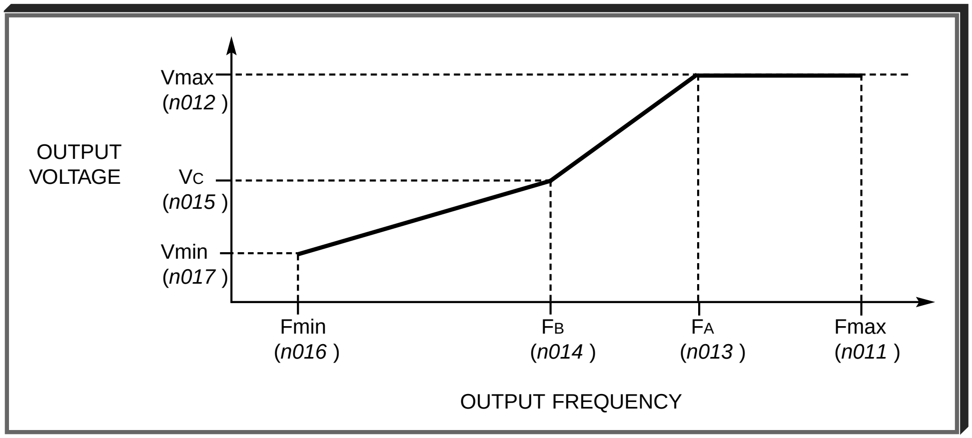
The following conditions must be considered when selecting a V/f pattern:
- Pattern matches the voltage-frequency characteristics of the motor.
- Maximum motor speed.

2 V/f pattern for high starting torque should be selected for:
- Long wiring distance.
- Large voltage drop at start
- AC reactor connected to Drive input or output.
- Use of motor rated below Drive max. output.

3 Voltages shown are for 230V motors; for other motor voltages, multiply all voltage (V) values by (Vmtr/230).
i.e., for a 460V motor, multiply by 460/230 = 2.

n011 : Frequency – Max. (Fmax)
n012 : Voltage – Max. (Vmax)
n013 : Frequency – Max. Voltage point (F_A)
n014 : Frequency – Midpoint (F_B)
n015 : Voltage – Midpoint (V_C)
n016 : Frequency – Min. (Fmin)
n017 : Voltage – Min. (Vmin)

These seven parameters define the V/f pattern. The illustration below shows how these constants relate to each other in establishing the custom V/f pattern.



V/f Characteristics Set by n011 thru n017

NOTE: To establish a V/f pattern with a straight line from Fmin to F_A, set F_B = Fmin. The setting of V_C is then disregarded and does not affect the V/f pattern.

IMPORTANT

The V/f parameter settings are checked each time the **ENTER** key is pressed while programming the V/f parameters. A parameter set value failure (***Err***) will occur if any part of the following relationships among ***n011*** thru ***n017*** is not TRUE:

(a) Fmax $\geq F_A \geq F_B \geq$ Fmin

(b) Vmax $\geq V_C \geq$ Vmin

5.25 PID CONTROL

The Proportional, Integral and Derivative control function provides closed-loop control, or regulation, of a system process variable (pressure, temperature, etc.). This regulation is accomplished by comparing a feedback signal to a setpoint reference, which results in an error signal. The PID control algorithm then performs calculations, based upon the PID parameter settings (***n128 – n138***, ***n163*** and ***n164***), on this error signal. The result of the PID algorithm is then used as the new frequency reference, or is added to the existing speed reference.

A. ***n128*** : PID Control Selection

Factory Setting: ***0***
Range: 0 to 8

Using this parameter, PID control can be enabled, and the type of PID control can be selected.

Setting	Description
0	PID Disabled
1	PID Enabled (D = Feed forward)
2	PID Enabled (D = Feedback)
3	PID Enabled, Reference + PID (D = Feed forward)
4	PID Enabled, Reference + PID (D = Feedback)
5	Inverse PID Enabled (D = Feed forward)
6	Inverse PID Enabled (D = Feedback)
7	Inverse PID Enabled, Reference + PID (D = Feed forward)
8	Inverse PID Enabled, Reference + PID (D = Feedback)

B. Setpoint Reference Selection

n004 : Reference Selection

Factory Setting: ***0***
Range: 0 to 6

n024 thru ***n032***: Multi-step Frequency Presets

Factory Settings: ***n032 = 6.0*** all others = ***0.0***
Range (each): 0.0 to 400.0 Hz

The frequency reference becomes the PID setpoint.

C. Feedback Signal Selection

***n164*:** PID Feedback Selection

Factory setting: ***0***
Range: 0 to 5

Setting	Description
0	Not Used
1	Not Used
2	Not Used
3	Multi-Function Analog Input CN2 V (0 – 10V)
4	Multi-Function Analog Input CN2 I (Current 4 – 20mA)
5	Not Used

* Set SW2(2) to “I” (ON). SW2 consists of two separate slide switches and can be found just above the upper row of control circuit terminals. The switch towards the bottom (labeled "2") connects a 250Ω resistor from terminal FR to FC when set to the “I” (ON) position (to the right). NOTE: All power must be removed from the Drive before SW2 can be set. See Figure 1-1 for the location of SW2.

D. PID Settings

***n130*: PID Proportional Gain**

Factory setting: ***1.00***	
Range: 0.00 to 10.00	

Proportional gain is the value by which the error signal is multiplied to generate a new PID controller output. A higher setting will result in a more responsive system. A lower setting will result in a more stable system.

***n131*: PID Integral Time**

Factory setting: ***1.00***
Range: 0.00 to 360.0 sec.

This parameter determines how fast the PID controller will seek to eliminate any steady-state error. The lower the setting, the faster the error will be eliminated. To eliminate the integral function entirely, set this parameter to 0.0 seconds. A lower setting will result in a more responsive system. A higher setting will result in a more stable system.

***n134*: Integral Value Limit (1)**

Factory setting: ***100.00***
Range: 0.00 to 100.0%

This parameter will limit the effect that the integrator can have. It works whether the PID controller output is positive or negative. It can also be used to prevent integrator "wind-up".

***n132*: Derivative Time**

Factory setting: ***0.00***
Range: 0.00 to 10.0 sec.

This parameter can be adjusted to increase system response to fast load or reference changes, and to reduce overshoot upon startup. To eliminate the differential function entirely, set this parameter to 0.00 seconds.

***n163*: PID Output Gain (1)**

Factory setting: ***1.0***
Range: 0.00 to 25.0

This parameter is a multiplier in the output of the PID controller. Increasing this parameter will make the PID controller more responsive. Be careful not to increase this parameter too much or the drive / system will become unstable.

***n133*: PID Offset Adjustment (1)**

Factory setting: ***0.0***
Range: -100.00 to 100.0%

This parameter will add a fixed percentage to the PID output. It can be used to tune out small system offsets. NOTE: This parameter is set as a percentage of maximum output frequency (n011).

***n135*: PID Output Lag Filter Time (1)**

Factory setting: ***0.00***
Range: 0.00 to 10.00 sec.

This parameter adds a filter to the PID output to keep it from changing too quickly. The higher the setting, the slower the PID output will change.

All of these parameters are interactive, and will need to be adjusted until the control loop is properly tuned, i.e. stable with minimal steady-state error. A general procedure for tuning these parameters is as follows:

1. Adjust Proportional Gain until continuous oscillations in the Controlled Variable are at a minimum.

2. The addition of Integral Time will cause the steady-state error to approach zero. The time should be adjusted so that this minimal error is attained as fast as possible, without making the system oscillate.

3. If necessary, adjust derivative time to reduce overshoot during startup. The drive's accel and decel rate times can also be used for this purpose.

(1) These parameters are factory set for optimum results for most applications, and generally don't need to be changed.

E. Feedback Loss Detection

***n136*: Feedback Loss Detection Selection**

Factory setting: ***0***	
Range: 0 to 2	

Proportional gain is the value by which the error signal is multiplied to generate a new PID controller output. A higher setting will result in a more responsive system. A lower setting will result in a more stable system.

Setting	Description
0	Feedback loss detection is disabled
1	Feedback loss detection is enabled – alarm only (drive continues running)
2	Feedback loss detection is enabled – fault (drive coasts to stop)

***n137*: Feedback Loss Detection Level (PID)**

Factory setting: ***0***	
Range: 0 to 100 %	

***n138*: Feedback Loss Detection Delay Time (PID)**

Factory setting: ***1.0***	
Range: 0.0 to 25.5	

When feedback loss detection is enabled (***n136*** = data "1" or "2"), the drive will detect if the feedback signal falls below the ***n137*** level for more than the ***n138*** delay time and respond according to the setting of ***n136***.

F. Multi-Function Input Terminals

n050 thru ***n056*****:** Multi-function Inputs (Term. S1 thru S6)

Data ***23*** : PID Control Off

By programming data "23" into one of the multi-function input parameters (***n050*** thru ***n056***), the corresponding multi-function input terminal (S1 thru S6) will disable the PID control. At the same time the PID setpoint will become the output frequency and the PID's integrator will reset to zero.

n050 thru ***n056*****:** Multi-function Inputs (Term. S1 thru S6)

Data ***24*** : PID Integral Reset

By programming data "24" into one of the multi-function input parameters (***n050*** thru ***n056***), the corresponding multi-function input terminal (S1 thru S6) will immediately reset the integrator's value to zero.

n050 thru ***n056*****:** Multi-function Inputs (Term. S1 thru S6)

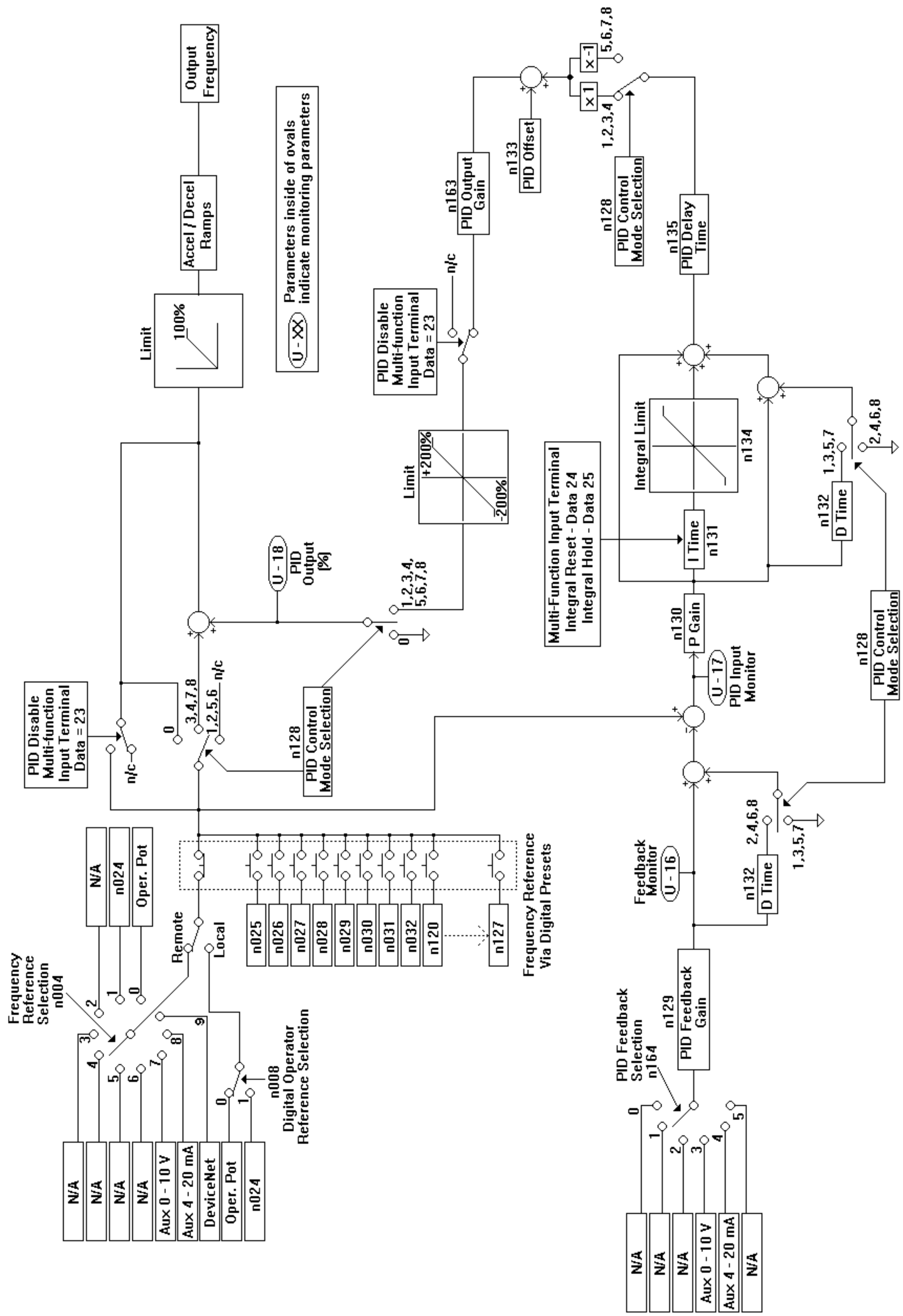
Data ***25*** : PID Integral Hold

By programming data "25" into one of the multi-function input parameters (***n050*** thru ***n056***), the corresponding multi-function input terminal (S1 thru S6) will hold the integrator's output value. When the contact is closed (on the Multi-Function Input Terminal), whatever value the integrator is outputting will remain the same until the contact is opened.

Terminals S5-S6 are not physical terminals, but they are multi-function inputs and outputs that are controlled via DeviceNet communications.

 Continued

PID Block Diagram



5.26 COPY FUNCTION

The standard digital operator JVOP-140 of the V7N can be used to store (upload) parameters from one drive, and copy (download) parameters to another drive. Parameters are stored in an EEPROM on the digital operator therefore no backup power supply is necessary. The copy function can be used in most cases except the following.

(1) *Different drive types* – The user may not copy parameters from a V7N to a J7 drive.
(2) *Different voltage class* – The user may not copy parameters from a 230V drive to a 460V drive.
(3) *Different control mode* – The user may not copy parameters from a drive operating in the Volts per hertz mode (n002=0) to a drive in the Open loop vector mode (n002=1).

The following parameters are not copied when capacities are different.

Parameter No.	Parameter Name	Parameter No.	Parameter Name
n011 to n017	V/f Settings	n108	Motor Leakage Inductance
n036	Motor Rated Current	n109	Torque Boost
n080	Carrier Frequency	n110	Motor No-load Current
n105	Torque Comp Iron Loss	n140	Energy Saving Gain K2
n106	Motor Rated Slip		
n107	Motor Line-to-line Resistance	n158	Motor Code (Energy Saving)

Parameters ***n176, n177, n178*** and ***n179*** are not read into the digital operator during a read command.

***n176*: Parameter Copy Function Selection**

Factory Setting: **rdy**

Setting	Description
rdy	Drive is ready to use Copy Function
rEd	Read (or upload) all parameters from the drive and store them in the Digital Operator
Cpy	Copy (or download) all parameters stored in the Digital Operator to the drive
uFy	Verify that parameters stored in the Digital Operator and the drive are the same
uA	Displays the voltage and kW rating of the drive whose parameters are stored in the Digital Operator
Sno	Displays the software number of the drive whose parameters are stored in the Digital Operator

***n177*: Parameter Copy Access Selection**

Factory Setting: ***0***
Range: 0 or 1

Setting	Description
0	Copying Disabled
1	Copying Allowed

The Copy Function can be enabled or disabled using parameter ***n177*** – parameters cannot be uploaded when this parameter is disabled (***n177*** = 0), preventing the accidental overwriting of parameters stored in the Digital Operator.

If ***n177*** = 0 and an upload is attempted (***n176*** = rEd or Cpy), a "PrE" error message will blink on the Digital Operator display – press **DSPL** or **DATA/ENTER** to clear the message.

5.26 COPY FUNCTION Continued

A. Read Function (rEd)

The Read function reads the available parameter data from the drive and stores them in a EEPROM in the digital operator. When the Read function is executed the previously stored parameter data is cleared and replaced with newly read parameters.

Table 5-5. Reading Drive Parameters

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the highest parameter access level. This will allow all parameters to be viewed and set.	Press the DSPL key until the PRGM LED is lit on the digital operator.	PRGM n001
	Press DATA ENTER.	PRGM 1
	Press Λ three times.	PRGM 4
	Press DATA ENTER.	PRGM n001
Set Parameter Copy Access Selection (n177) = 1	Press and hold V until n177 is displayed on the digital operator.	PRGM n177
	Then press DATA ENTER.	PRGM 0
	Use the Λ key to set a "1" in the display.	PRGM 1
	Then press DATA ENTER.	PRGM n177
Execute upload (Read) Using Parameter Read Function Selection (n176)	Press the V key once.	PRGM n176
	Then press DATA ENTER.	PRGM rdY
	Press the Λ key once.	PRGM rEd
	Press DATA ENTER. "rED" will blink on the display while reading.	PRGM End

5.26 COPY FUNCTION Continued

B. Copy Function (Cpy)

The Copy function writes the parameters stored in the digital operator's EEPROM into the drives non-volatile memory. The Copy function is possible only for drives of the same type (i.e. from one GPD 315/V7 to another), voltage rating, and control method (V/f or open loop vector).

Table 5-6. Writing Drive Parameters

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the highest parameter access level. This will allow all parameters to be viewed and set.	Press the [DSPL] key until the [PRGM] LED is lit on the digital operator.	PRGM n001
	Press [DATA ENTER].	PRGM 1
	Press [Λ] three times.	PRGM 4
	Press [DATA ENTER].	PRGM n001
Set Parameter Copy Access Selection (n177) = 1	Press and hold [V] until n177 is displayed on the digital operator.	PRGM n177
	Then press [DATA ENTER].	PRGM 0
	Use the [Λ] key to set a "1" in the display.	PRGM 1
	Then press [DATA ENTER].	PRGM n177
Execute upload (Copy) Using Copy Function Selection (n176)	Press the [V] key once.	PRGM n176
	Then press [DATA ENTER].	PRGM rdY
	Press the [Λ] key twice.	PRGM CPY
	Press [DATA ENTER]. "CPY" will blink on the display while writing.	PRGM End

C. Verify Function (uFy)

Compares the parameter data stored in the operator with the parameter data in the drive. VERIFY is possible only for drives of the same type (i.e. from one V7N to another), voltage rating, and control method (V/f or open loop vector).

When the parameters stored in the digital operator match those in the drive, “uFy” will blink in the display for several seconds, and then "End" will be displayed. When they don’t match “uAE” will be displayed. Press stop to interrupt the execution of verify, or press Data/Enter to display a list of parameters that do not match.

Table 5-7. Verifying Drive Parameters

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY
Set the highest parameter access level. This will allow all parameters to be viewed and set.	Press the DSPL key until the PRGM LED is lit on the digital operator.	PRGM n001
	Press DATA ENTER.	PRGM 1
	Press ∧ three times.	PRGM 4
	Press DATA ENTER.	PRGM n001
Execute upload (Copy) Using Copy Function Selection (n176)	Press and hold ∨ until n176 is displayed on the digital operator.	PRGM n176
	Then press DATA ENTER.	PRGM rdy
	Press the ∧ key three times.	PRGM uFy
	Press DATA ENTER. “Vfy” will blink on the display while verifying.	PRGM End

D. Drive Capacity Function (uA)

The Drive Capacity function allows the user to verify that the parameter data stored in the digital operator are from the same capacity and voltage class as the drive being written too. The voltage and the drive capacity whose parameters are stored in the digital operator are displayed on the digital operator. When “uA” is selected and Data/Enter is pressed. The value that is displayed indicates the voltage and drive capacity in kilowatts. This value can be compared to the drive specification number on the drive data nameplate.

Display	Model
	CIMR-V7NU ☐
20.1	20P1
20.2	20P2
20.4	20P4
20.7	20P7
21.5	21P5
22.2	22P2
23.7	23P7
25.5	25P5
27.5	27P5
40.2	40P2
40.4	40P4
40.7	40P7
41.5	41P5
42.2	42P2
43.7	43P7
45.5	45P5
47.5	47P5

E. Software Number Display

The software number display allows the user to check the software revision number of the parameter data stored in the digital operator. This value can be compared to the PRG number on the drive data nameplate.

F. Copy Function message list

Operator display	Description	Corrective action
rdy	Drive is ready to perform a Copy Function	-
rEd	Read selected Flashing: Read is being performed	-
Cpy	Writing (COPY) selected Flashing: Write (Copy) is being performed	-
uFy	Verify selected Flashing: Verify is being performed	-
uA	Drive capacity selected	-
Sno	Software number displayed	-
End	Read, Copy or Verify completed	-
PrE	Flashing: Attempt to execute Read while parameter Copy Access Selection (n177) is set to " 0"	Set Parameter n177 to a value of “1”
rdE	Flashing: Parameter could not be read properly by the Read function, or, an under voltage is detected during Read	Confirm that the main circuit power supply voltage is correct, then re-execute a Read
CSE	Flashing A check sum error occurred in the parameter data stored in the digital operator	The parameter data stored in the digital operator is invalid and cannot be used. Re-execute Read to store the parameters in the digital operator
dpS	Flashing: Parameter data in the drive and in the digital operator do not match. (Ex.) Copying from a V7N and writing to a J7	Check to see if the drives are the same type
ndr	Flashing: No parameter data is stored in the digital operator	Execute a Read
CPE	Flashing: Attempt to execute a Copy or Verify between different voltage drives or a different Control Mode	Verify Voltage and Control Modes
CyE	Flashing: An under voltage is detected during a Copy execution	Confirm that the main circuit power supply voltage is correct, then-execute a Copy
F04	A check sum error occurs in the parameter data stored in the inverter	Initialize the constants. If an error occurs again, replace the inverter due to a failure of parameter memory element (EEPROM) in the drive
uAE	Flashing: Attempt Execute Verify between different drive capacities	Press the Data/Enter key to continue the execution of Verify. Press stop to interrupt the execution of Verify
.FE	Flashing: A communication error has occurred between the digital operator and the drive	Check the connection between the drive and the digital operator. If a communication error occurs be sure to re-execute Read or Copy

5.27 DIGITAL OPERATOR DISPLAY SELECTION

n035 **:** Operator Display Mode Reference and Indication

Factory setting: ***0***
Range: 0 to 3999

This parameter determines the scaling of the Digital Operator display, for both Output Frequency and all Frequency References, including DeviceNet communications. Set the number of motor poles in ***n035*** = 2~39, to match input and output motor speed in RPMs per DeviceNet specifications.

DATA	DISPLAY
0 (factory setting)	Output frequency, in increments of 0.1 Hz.
1	Output frequency, in increments of 0.1 %.
2 to ***39*** (no. of motor poles)	Motor synchronous speed ($P = \frac{120 \times F}{N_S}$) in increments of 1 RPM (3999 max). P = no. of motor poles F = Frequency N_S = motor synchronous speed NOTE: If motor synchronous speed exceeds 3999 RPM, display holds at ***3999*** .
40 to ***3999***	Line speed or other parameter. X X X X Parameter value at maximum frequency (***n011***) (include leading zeroes if necessary) Location of decimal point: _ = _ X X X ***1*** = _ X X.X ***2*** = _ X.X X ***3*** = 0.X X X **EXAMPLE:** To display Line Speed, based on 54.3 FPM at 60 Hz: ***n035*** setting = " ***1543*** "

5.28 ENERGY SAVING CONTROL

n139: Energy Saving Selection
(V/f control mode)

Factory Setting: ***0***
Range: 0 or 1

To enable energy saving control, ***n139*** must be set to "1"

Since the parameters used in energy saving mode have been preset to the optimum values, it is not necessary to adjust them under normal operation. If the motor characteristics differ greatly from those of a standard motor, refer to the following description to change the parameters.

A. Energy Saving Control Mode

n140: Energy Saving Gain

Factory Setting: ***See Table A3-1***
Range: 0.0 to 6550

This gain is used when running in energy saving control mode to calculate the voltage at which motor efficiency will be greatest, and is set as the output voltage reference. This value is preset to a typical standard motor value. As energy saving increases, output voltage also increases.

n141: Energy Saving Voltage Lower Limit (60 Hz)

Factory Setting: ***50%***
Range: 0 to 120%

n142: Energy Saving Voltage Lower Limit (6 Hz)

Factory Setting: ***12%***
Range: 0 to 25%

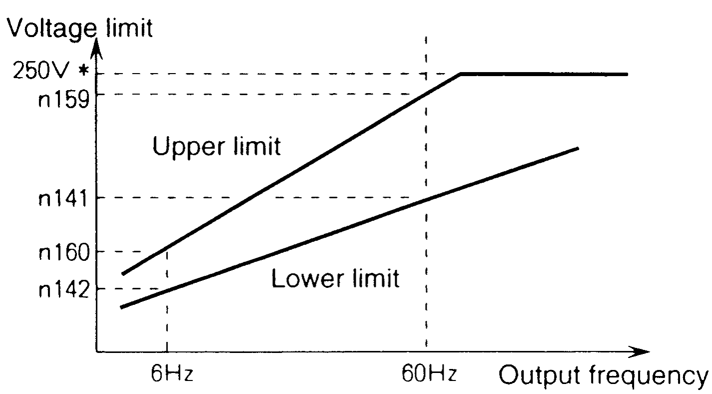
n159: Energy Saving Voltage Upper Limit (60 Hz)

Factory Setting: ***120%***
Range: 0 to 120%

n160: Energy Saving Voltage Upper Limit (6 Hz)

Factory Setting: ***16%***
Range: 0 to 25%

These parameters are used to set the output voltage upper and lower limits. If the voltage reference value calculated in the energy saving is below the lower limit or above the upper limit, the lower or upper limit value is used as the voltage reference value. The lower limit value is set to prevent stalling at light loads, and the upper limit is set to prevent over-excitation. Set voltage limits at 6Hz and 60Hz; a value obtained by linear interpolation should be set to any limit values other than 6Hz or 60Hz. Setting is made as a percentage of motor rated voltage.



*Doubled for 460V Drives

B. Energy Saving Search Operation

In energy saving control mode, the maximum applicable voltage is calculated using the output power. However, a temperature change will change the fixed constants and the maximum applicable voltage may not be obtained.

***n144*:** Voltage limit of tuning

Factory Setting: ***0%***
Range: 0 or 100%

Limits the range where the voltage can be controlled. Search operation is disabled when ***n144*** is set to ***0***.

***n145*:** Step Voltage of tuning to 100 % output voltage

Factory Setting: ***.5%***
Range: 0.1 or 10%

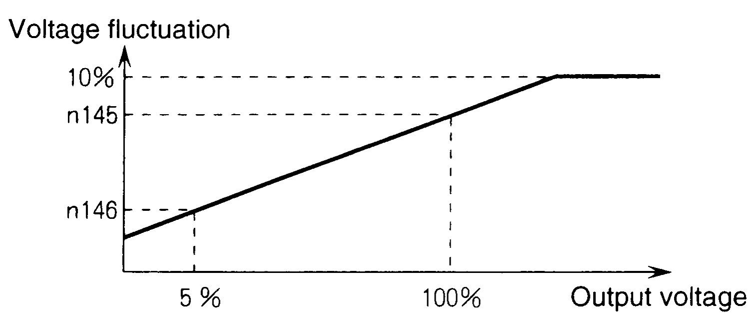
***n146*:** Step voltage of tuning to 5 % output voltage

Factory Setting: ***.2%***
Range: 0.1 or 10%

***n143*:** Time of average KW

Factory Setting: ***1 (x24)***
Range: 1 to 200 (x24)

Parameter ***n145*** & ***n146*** sets the voltage fluctuation for one cycle of the search operation. Increasing the values will also increase the fluctuation of the rotation speed. The value calculated by linear interpolation is set for voltages other than above.



5.28 ENERGY SAVING CONTROL Continued

***n161*:** Power Supply Detection Hold Width

Factory Setting: ***10%***
Range: 0 to 100%

When the power fluctuation is less then this value, the output voltage is held for three seconds and then the search operation mode is activated.

***n162*:** Power Supply Detection Filter Time Constant

Factory Setting: ***5 (x4ms)***
Range: 0 to 255 (x4ms)

Decreasing this value increases response during a load fluctuation. However, at low frequency, unstable operation will occur when this value is set too low.

5.29 MULTI-FUNCTION ANALOG INPUT SELECTION

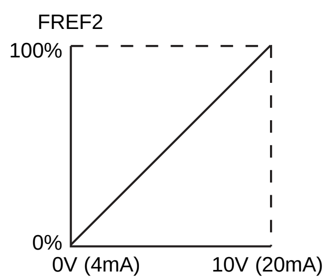
***n077*:** Multi-Function Analog Input Selection

Factory Setting: ***0***
Range: 0 to 4

The CN2 input terminal on the digital operator can be used as an auxiliary analog input (0 –10V or 4 – 20 mA). The Analog Input Connector/Cable Assembly option (DS082) is required for interface with CN2 on the digital operator.

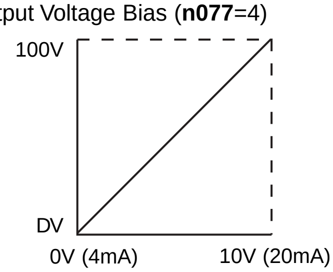
Setting	Description
0	Multi- Function Analog Input is disabled
1	Auxiliary Frequency Reference (FREF2)
2	N/A
3	N/A
4	Output Voltage Bias (VBIAS)

1) Auxilary Frequency Reference (**n077**=1)



When multi-function analog input (**n004** = 7 or 8) is selected, CN2 on the digital operator becomes the speed reference input. If **n004** is set to any other data value, the CN2 auxiliary analog input is determined by the selection of Command A.

4) Output Voltage Bias (**n077**=4)



Values are for a 230V drive

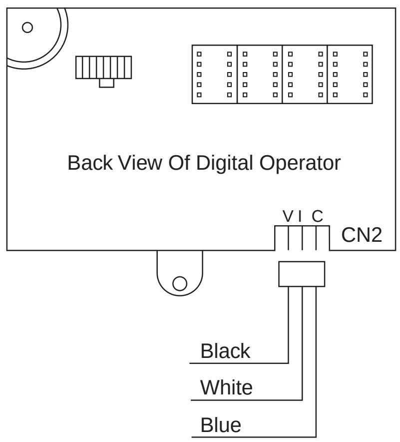
VBIAS is added to output voltage after V/f pattern is established

5.29 MULTI-FUNCTION ANALOG INPUT SELECTION Continued

***n078*:** Multi Function Analog Input Signal Selection

Factory Setting: ***0***
Range: 0 or 1

SETTING	DESCRIPTION
0	CN2 input terminal (0-10V input)
1	CN2 input terminal (4-20mA input)



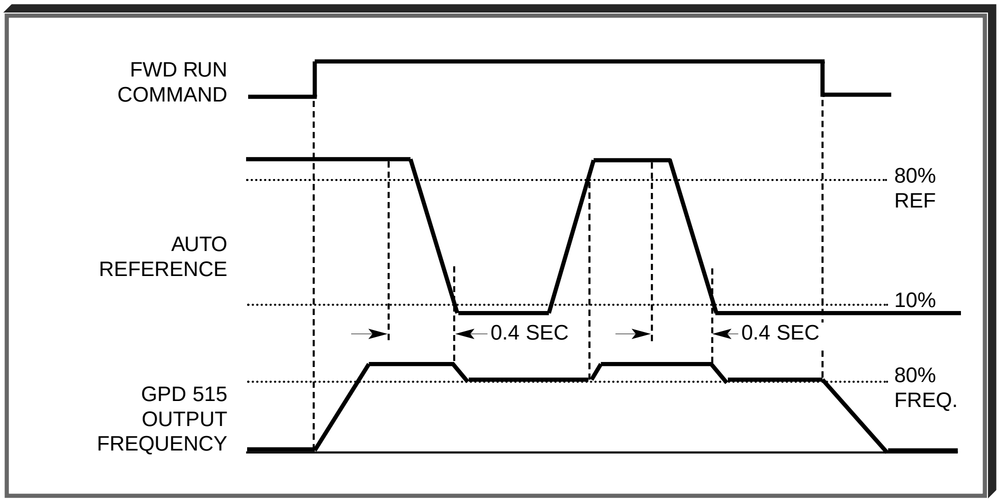
CN2 V: 0-10V
CN2 I: 4-20mA
CN2 C: Common

5.30 FREQUENCY REFERENCE LOSS DETECTION

n064: Frequency Reference Loss Detection

Factory setting: **0** (disabled)
Range: 0 or 1

The reference loss detection function is either enabled or disabled, based on the setting of **n064**. When enabled (data " 1 "), the reference loss detection compares the change in reference with respect to time. If the reference decreases by 90% in more than 0.4 seconds, the drive will decelerate to the set reference; if the reference decreases by 90% in less than 0.4 seconds, the drive will continue to operate at 80% of the output frequency. To regain control of output frequency, either exceed the set reference (80% of reference) or initiate a STOP command. If Auto Reference is less than Fmax (**n011**) x .05, this function is not performed.



Timing Chart

Note: This function applies to frequency references at terminal **2CN (Multi-Function Analog Input)**.

5.31 UNDERTORQUE DETECTION

Undertorque detection is used to compare Drive output current/torque with the undertorque detection level. When the output current is equal to or less than the defined level, an undertorque condition exists. This will be indicated as a ***UL3*** fault on the Digital Operator. This feature can be selected to operate over a wide range of conditions.

A. ***n117*** **:** Undertorque Detection

Factory setting: ***0***

This constant determines whether the undertorque detection function of the Drive is enabled, under what conditions it will detect for undertorque, and what operation it will perform after detecting an undertorque.

Setting	Overtorque Disabled	Operation After Detection	Detection Condition
0	Disabled	——	——
1	Undertorque	Continues	Only at set frequency
2	Undertorque	Coast to stop	Only at set frequency
3	Undertorque	Continues	At all times except during stopping or DC injection braking
4	Undertorque	Coast to stop	At all times except during stopping or DC injection braking

— For undertorque detection during accel or decel, set to " 3 " or " 4 ".
— For continuous operation after undertorque detection, set to " 1 " or " 3 ". During detection, the Digital Operator displays and " ***UL3*** " alarm (blinking).
— To stop the drive at an undertorque detection fault, set to " 2 " or " 4 ". At detection, the Digital Operator displays an " ***UL3*** " fault.
— To output an undertorque detection signal, set output terminal function selection (***n057, n058*** or ***n059***) to " 8 " or " 9 ".

5.31 UNDERTORQUE DETECTION Continued

B. ***n118*** **:** Undertorque Detection Level

Factory setting: ***10*** %
Range: 0 to 200 %

This is the reference point for determining that an undertorque condition exists. Set as a percent of Drive rated current or as a percent of motor rated torque.

C. ***n119*** **:** Undertorque Detection Time

Factory setting: ***0.1*** sec.
Range: 0.1 to 10.0 seconds

Determines how long an undertorque condition must exist before another event will occur, e.g. coast to stop, multi-function output change of state, or ***UL3*** warning or fault display.

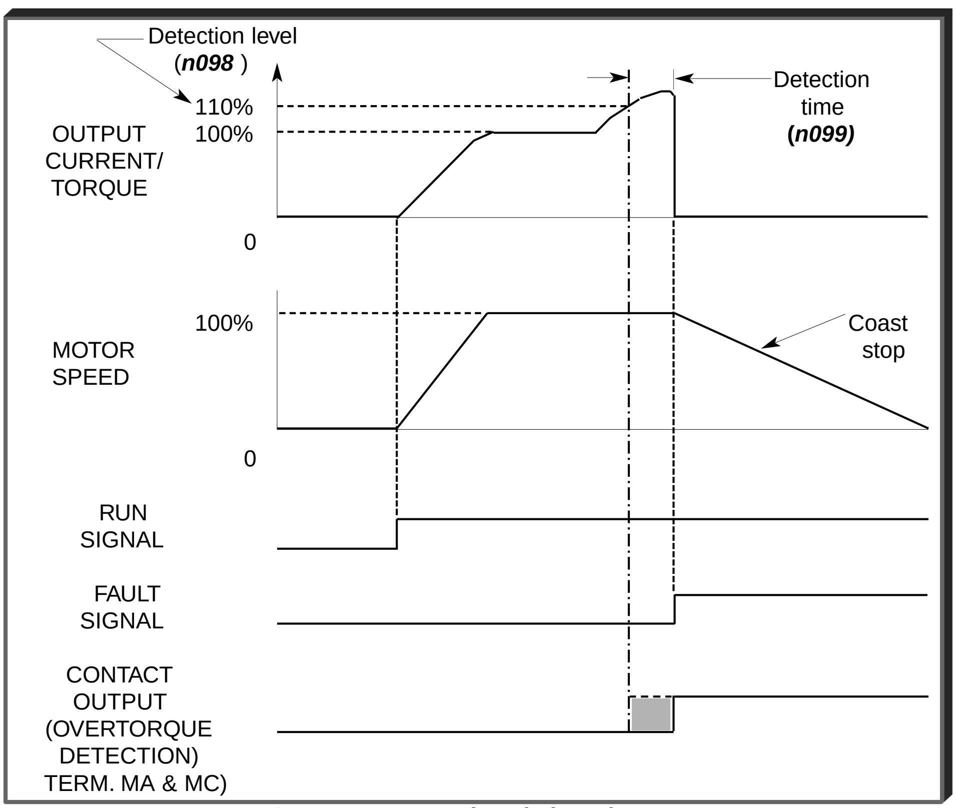
D. ***n057*** **:** Multi-function Output 1 (terminals MA & MC)
n058 **:** Multi-function Output 2 (terminals P1 & PC)
n059 **:** Multi-function Output 3 (terminals P2 & PC)

Data ***6*** or ***7*** :	Overtorque Detection
Data ***8*** or ***9*** :	Undertorque Detection

A Form-C contact, or an open collector output, can be programmed to change states during an overtorque/undertorque detection condition.

EXAMPLE OF OVERTORQUE DETECTION

n096 setting:	***2***	— Overtorque enabled, only at set frequency, coast to stop
n057 setting:	***6***	— Output contact programmed for overtorque detection
n096 setting:	***110*** %	— Level at which overtorque is sensed
n099 setting:	***1.0*** s	— Time delay before overtorque event occurs



Overtorque Detection Timing Diagram

5.32 ELAPSED TIMER

Elapsed Timer parameters ***n087*** and ***n088*** and monitor U-13 are available only in CIMR-V7NU25P5, 27P5, 45P5, and 47P5 drives.

n087: Elapsed Timer Selection

Factory setting: **0**
Range: 0 or 1

This parameter determines whether the timer is active whenever power is applied to the drive or whenever the drive is in run mode.

SETTING	DESCRIPTION
0	Timer active whenever power is applied to the drive
1	Timer active whenever drive is in “run” mode

n088: Elapsed Timer Setting

Factory setting: **0** hours
Range: 0 or 6550

This parameter allows the user to preset a starting value for the elapsed timer. Elapsed time is accumulated according to the setting of ***n087***. Unit 1 = 10 hours

Section 6. DEVICENET COMMUNICATIONS

6.1 INTRODUCTION

This area of the V7N Embedded DeviceNet Drive manual is intended to provide information necessary to set-up and operate drive via DeviceNet. It assumes knowledge of the parameters and functions of the Yaskawa V7N drive as well as the DeviceNet Industrial Networks and DeviceNet AC Drive profile. For more information on DeviceNet contact the Open DeviceNet Vendor Association (ODVA).

Yaskawa's V7N Embedded DeviceNet Drive is capable of being connected to the DeviceNet open field network to achieve data communication to the DeviceNet master. The Embedded DeviceNet drive assembly supports 7 different Input Assemblies (4 to 8 bytes) and 7 different Output Assemblies (4 to 8 bytes), which 5 of the Input and 5 of the Output are vendor specific. All DeviceNet objects required to meet the AC Drive profile are supported. The V7N communicates through DeviceNet as a Group 2 only server.

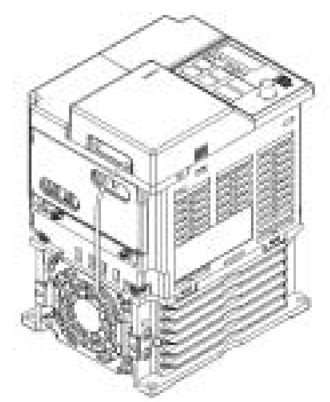
Supported Message Types:

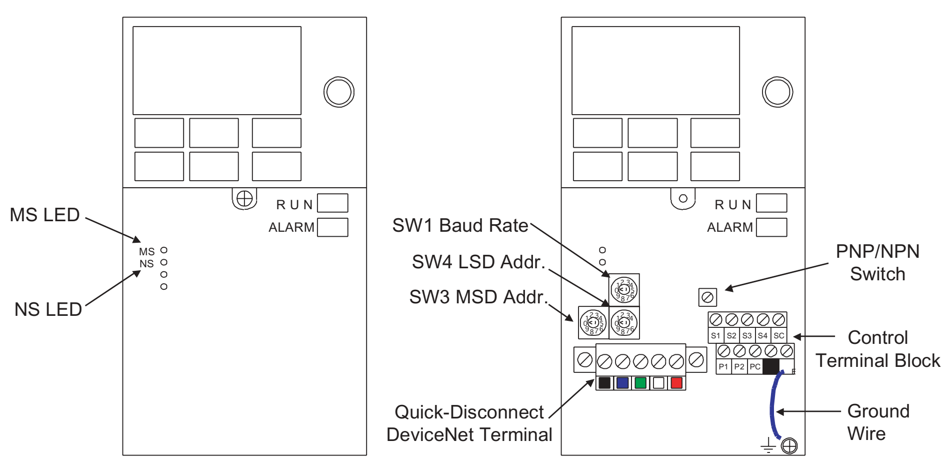
Explicit Messages:	Fragmentation is supported.
	Up to 32 bytes can be input and output.
Polled I/O Messages:	Fragmentation is not supported.
	Up to 8 bytes can be input and output.

6.2 DEVICENET SET-UP

6.2.1 Embedded DeviceNet Drive Overview

The figure below illustrates the DeviceNet communications related components on the V7N Embedded DeviceNet Drive.



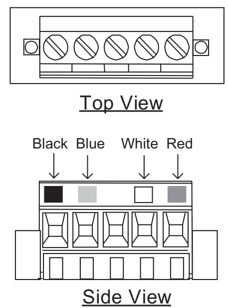


With Front Cover   Without Front Cover

6.2.2 DeviceNet Connectors and Cabling

This removable terminal block connects DeviceNet communication line. The following table lists the function of each DeviceNet terminal.

Terminal Color	Name	Wiring Color	Content
Black	V-	Black	Communication power supply GND
Blue	CAN_L	Blue	Communication data low side
-	Shield	Bare	Shield wire
White	CAN_H	White	Communication data high side
Red	V+	Red	Communication power supply DC+24V



6.2.2.1 DeviceNet Thick Cable

Thick 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 trunk line 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

6.2.2.2 DeviceNet Thin Cable

Thin Cable is smaller and more flexible than Thick Cable. It is commonly used for drop lines, but can also be used, for shorter distances, as trunk line.

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

6.2.2.3 Cable Vendors

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

Belden Wire & Cable Company				
Belden 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	

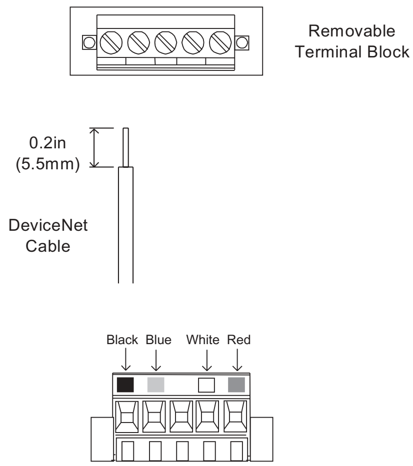
Berk-Tek				
Berk-Tek Part #	**Pair**	**AWG**	**Insulation**	**Outer Jacket**
210051 thick	Data	18	FPE/HDPE	Lt. Gray PVC
	Power	15	PVC/Nylon	
210144 thin	Data	24	FPE/HDPE	Lt. Gray PVC
	Power	22	PVC/Nylon	

6.2.3 Cable Installation

Wire the DeviceNet communication cable to the terminal block according to the following procedures:

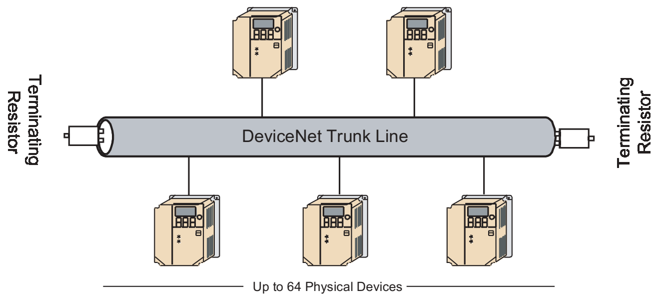
1) Loosen terminal screws using a slotted screwdriver.
2) Insert the DeviceNet wires into corresponding terminals.
3) Fasten wires by tightening terminal screws.
4) Secure the removable terminal by tightening down the terminal block screws.
(Tightening torque: 0.22~0.25 [N • m])

Note: The shield is daisy chained between devices and should be grounded at the 24 VDC power supply as specified by the Open DeviceNet Vendor Association (ODVA).



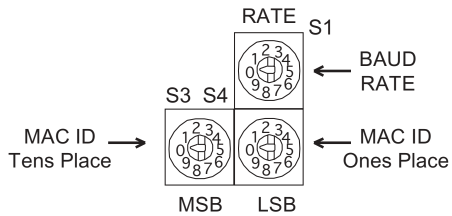
6.2.4 Terminating Resistors

Terminating resistors must be mounted on the first and last node in a DeviceNet network, at both furthest ends of the cable. The value of the terminating resistor is specified by the ODVA (Open DeviceNet Vendors Association) and is a value of 121 Ohms, 1% tolerance, and 1/4 watt. Terminating resistors can be found in the ODVA product catalogue.



6.2.5 Baud Rate and Address Configuration

The board is equipped with one rotary switch S1 for baud rate and two rotary switches S3 and S4 for node address set-up. The rotary switches are located next to the DeviceNet connector.



6.2.5.1 Baud Rate Setting Switch

The Drive's DeviceNet baud rate can be set in two different ways.

The baud rate can be set using the rotary switch RATE (S1). Setting the switch to position 0, 1, or 2 enables the rotary switch to set the Drive's baud rate for 125kbps, 250kbps, or 500kbps, respectively.

The baud rate can also be set through parameter **n152** when the rotary switch S1 is set to 3 to 9.

S1 Switch Setting	0	1	2	3-9	
Baud Rate	125 kbps	250 kbps	500 kbps	Parameter **n152**	0: 125 kbps 1: 250 kbps 2: 500 kbps

6.2.5.2 MAC ID Setting Switch

The Drive's MAC ID can be set in two different ways.

The MAC ID can be set using the rotary switches MSD (S3) and LSD (S4).

MAC ID = (MSD x 10) + LSD

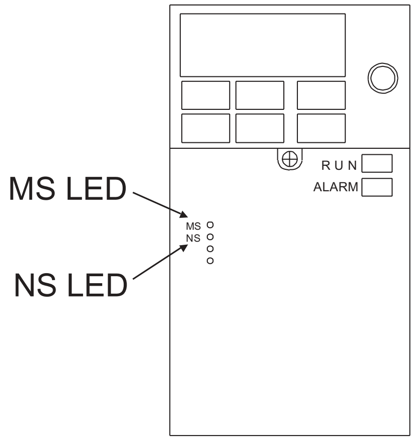
Setting range of 0 to 63 on the rotary switches enables the rotary switches to set the Drive's MAC ID.

Setting range of 64 to 99 on the rotary switches activates parameter **n150** to set the Drive's MAC ID.

S3 + S4 Switch Setting	0-63	64-99	
MAC ID	MAC ID = (S3 x 10) + S4	Parameter **n150**	Setting Range: 0 to 63

6.2.6 DeviceNet Indication LEDs

The V7N Embedded DeviceNet Drive has two ODVA standard DeviceNet LED's on the cover to indicate DeviceNet communications status.



V7N With Front Cover

The table below describes the function of DeviceNet specific LED's. See Section 5.1 DeviceNet Communication LED Faults and Operation for more details.

LED Name	Display		Operation Status	Description
	Color	Status		
MS	Green	Lit	During drive operation	The drive is operating normally.
	Green	Flashing	During drive initialization	Initial setting status or communication not ready.
	Red	Lit	Unrecoverable fault	An unrecoverable fault occurred in the drive.
	Red	Flashing	Recoverable fault	A recoverable fault occurred, such as switch setting error.
	-	Not lit	Power OFF	Power not being supplied to the drive.
NS	Green	Lit	DeviceNet communication taking place	DeviceNet communicating normally.
	Green	Flashing	DeviceNet communication not taking place	DeviceNet network normal, but not communicating with the master.
	Red	Lit	Communication fault	A fault that makes it impossible for the DeviceNet to communicate occurred. • Duplicate MAC ID • Bus-off detection
	Red	Flashing	Communication timeout	Communication timeout with master occurred. Data length sent by the PLC matches the data length expected by the drive.
	-	Not lit	Offline, Power OFF	DeviceNet not set to Online. Power not being supplied to the interface card. Mismatch of baud rate.

Note: The LED's will flash red once (100ms) during power up initialization. This is used in the internal testing process to verify that the red LED is working properly.

6.2.7 EDS File

The EDS files for the V7N are required for DeviceNet configuration. DeviceNet configuration refers to the parameter settings of the V7N Embedded DeviceNet Communication Drive. Reading the EDS file into the DeviceNet configuration tool makes it possible to read and set each parameter of the drive from the configuration tool. Two examples of DeviceNet configuration tools from Rockwell Software are DeviceNet Manager and RSNetWorx. See Appendix 9 for details on installing EDS files and configuration on DeviceNet Manager and RSNetWorx.

The V7N Model Number or drive capacity is necessary to select the correct EDS file. The Model Number can be found on the nameplates on the side of the drive.

To obtain the EDS file for the V7N, use the CD-ROM that came with the V7N drive, go to www.odva.org in the "Downloads" area, or www.drives.com in the "Our Products" - "Literature Library" - "Software Downloads" area and download the EDS file for the proper drive Model Number or drive capacity. Each V7N drive capacity has its own EDS file, so it is very important to download the EDS file that matches the drive capacity for correct scaling of parameters. The table below lists all of the V7N drive capacities and their respective EDS file names.

Drive Model Number	Drive Description	EDS File Names	Drive Capacity V7N Parameter n210 Modbus Register No. 1D2H	Product Code Class 01 Instance 01 Attribute 03	Product Name
CIMR-V7*20P1	3 Phase 230V, 0.13HP, 0.8A	V7NU20P1.EDS	00 (00h)	12288 (3000h)	CIMR-V7NU20P1
CIMR-V7*20P2	3 Phase 230V, 0.25HP, 1.6A	V7NU20P2.EDS	01 (01h)	12289 (3001h)	CIMR-V7NU20P2
CIMR-V7*20P4	3 Phase 230V, 0.5HP, 3A	V7NU20P4.EDS	02 (02h)	12290 (3002h)	CIMR-V7NU20P4
CIMR-V7*20P7	3 Phase 230V, 0.75&1HP, 5A	V7NU20P7.EDS	03 (03h)	12291 (3003h)	CIMR-V7NU20P7
CIMR-V7*21P5	3 Phase 230V, 2HP, 8A	V7NU21P5.EDS	04 (04h)	12292 (3004h)	CIMR-V7NU21P5
CIMR-V7*22P2	3 Phase 230V, 3HP, 11A	V7NU22P2.EDS	05 (05h)	12293 (3005h)	CIMR-V7NU22P2
CIMR-V7*23P7	3 Phase 230V, 5HP, 17.5A	V7NU23P7.EDS	07 (07h)	12295 (3007h)	CIMR-V7NU23P7
CIMR-V7*24P0	3 Phase 230V, 5HP, 17.5A	V7NU24P0.EDS	08 (08h)	12296 (3008h)	CIMR-V7NU24P0
CIMR-V7*25P5	3 Phase 230V, 7.5HP, 25A	V7NU25P5.EDS	09 (09h)	12297 (3009h)	CIMR-V7NU25P5
CIMR-V7*27P5	3 Phase 230V, 10HP, 33A	V7NU27P5.EDS	10 (0Ah)	12298 (300Ah)	CIMR-V7NU27P5
CIMR-V7*40P1	3 Phase 460V, 0.25HP, 1.2A	V7NU40P1.EDS	40 (28h)	12329 (3029h)	CIMR-V7NU40P2
CIMR-V7*40P2	3 Phase 460V, 0.5HP, 1.2A	V7NU40P2.EDS	41 (29h)	12230 (302Ah)	CIMR-V7NU40P4
CIMR-V7*40P4	3 Phase 460V, .75HP, 1.8A	V7NU40P4.EDS	42 (2Ah)	12231 (302Bh)	CIMR-V7NU40P7
CIMR-V7*40P7	3 Phase 460V, 1&2HP, 3.4A	V7NU40P7.EDS	43 (2Bh)	12232(302Ch)	CIMR-V7NU41P5
CIMR-V7*41P5	3 Phase 460V, 3HP, 4.8A	V7NU41P5.EDS	44 (2Ch)	12233 (302Dh)	CIMR-V7NU42P2
CIMR-V7*42P2	3 Phase 460V, 3HP, 5.5A	V7NU42P2.EDS	45 (2Dh)	12234 (302Eh)	CIMR-V7NU43P0
CIMR-V7*43P0	3 Phase 460V, 4HP, 7.2A	V7NU43P0.EDS	46 (2Eh)	12235 (302Fh)	CIMR-V7NU43P7
CIMR-V7*43P7	3 Phase 460V, 5HP, 8.6A	V7NU43P7.EDS	47 (2Fh)	12236 (3030h)	CIMR-V7NU44P0
CIMR-V7*44P0	3 Phase 460V, 5.3HP, 9.2A	V7NU44P0.EDS	48 (30h)	12237 (3031h)	CIMR-V7NU45P5
CIMR-V7*45P5	3 Phase 460V, 7.5&10HP, 14.8A	V7NU45P5.EDS	49 (31h)	12238 (3032h)	CIMR-V7NU47P5
CIMR-V7*47P5	3 Phase 460V, 10HP, 18A	V7NU47P5.EDS	50 (32h)	12239 (3033h)	CIMR-V7NU40P2
CIMR-V7*B0P1	1 Phase 230V, 0.13HP, 0.8A	V7NUB0P1.EDS	20 (14h)	12308 (3014h)	CIMR-V7NUB0P1
CIMR-V7*B0P2	1 Phase 230V, 0.25HP, 1.6A	V7NUB0P2.EDS	21 (15h)	12309 (3015h)	CIMR-V7NUB0P2
CIMR-V7*B0P4	1 Phase 230V, 0.5HP, 3A	V7NUB0P4.EDS	22 (16h)	12310 (3016h)	CIMR-V7NUB0P4
CIMR-V7*B0P7	1 Phase 230V, 1HP, 5A	V7NUB0P7.EDS	23 (17h)	12311 (3017h)	CIMR-V7NUB0P7
CIMR-V7*B1P5	1 Phase 230V, 2HP, 8A	V7NUB1P5.EDS	24 (18h)	12312 (3018h)	CIMR-V7NUB1P5
CIMR-V7*B2P2	1 Phase 230V, 3HP, 11A	V7NUB2P2.EDS	25 (19h)	12313 (3019h)	CIMR-V7NUB2P2
CIMR-V7*B3P7	1 Phase 230V, 5HP, 17.5A	V7NUB3P7.EDS	27 (1Bh)	12315 (301Bh)	CIMR-V7NUB3P7
CIMR-V7*B4P0	1 Phase 230V, 5HP, 17.5A	V7NUB4P0.EDS	28 (1Ch)	12316 (301Ch)	CIMR-V7NUB4P0

Note: All of the EDS files are in one zip file, so you must un-zip the file before installing in the configuration tool.

6.3 DEVICENET PARAMETERS

There are some parameters in the drive that need to be verified in order to ensure proper DeviceNet communication.

6.3.1 n003 Run/Stop and n004 Frequency Selection

The run/stop commands and frequency reference command can originate from DeviceNet communication, the digital operator, or the external terminals. The origin of the run/stop command does not have to be the same as the origin for the frequency reference command. Parameter **n003** (Operation Method Selection) sets up the origin of the run/stop commands. Parameter **n004** (Reference Selection) allows you to set up the origin of the frequency reference. Parameter **n003** is Modbus register number 103h, and parameter **n004** is Modbus register number 104h (see Appendix A V7N Modbus Registers). When the DeviceNet network is connected to the V7N Embedded DeviceNet Communication Drive, the motor speed and the status of the drive can be monitored via DeviceNet while controlling the drive from another source specified by parameters **n003** and **n004**. The chart shown below illustrates the possible frequency reference and run/stop selections.

Parameter n003 (103h) Setting	Operation Method Selection (Run/Stop)
0	Digital Operator
1	External Terminals
2	Reserved
3	**DeviceNet**

The default setting of parameter **n003** is ‘3’

Parameter n004 (104h) Setting	Frequency Reference Selection
0	Digital Operator Pot
1	Digital Operator
2	Reserved
3	Reserved
4	Reserved
5	Reserved
6	Reserved
7	Multi-Function Analog Input CN2 (0 to 10V)
8	Multi-Function Analog Input CN2 (4 to 20mA)
9	**DeviceNet**

The default setting of parameter **n004** is ‘9’

Note: When either Operation Method Selection or Frequency Reference Selection is set for DeviceNet control and DeviceNet communication to the drive has not begun, the operator will flash "CAL". This alarm indicates that the drive is waiting for DeviceNet communication to operate the drive. Once DeviceNet communication to the drive begins, the "CAL" alarm will cease.

6.3.2 n035 – Digital Operator Display Mode

Since the V7N Embedded DeviceNet Communication Drive utilizes the AC drive for many of its calculations, such as speed please check the following parameters to verify the correct setting.

Setting No.	Name	Description
n035	Frequency reference set / display unit selection	Make sure to set number of motor poles (2 ~ 39) to input and output motor speed in RPM’s on DeviceNet control and operator display. DeviceNet indicates the motor speed unit as RPM. **n035** setting value is used since the drive converts frequency to RPM. Default value is 4 for frequency reference in RPM for a 4-pole motor.

Note: The V7N requires power to be cycled to the drive for the changed parameter to take affect. Please perform a power cycle to store DeviceNet parameter changes.

6.3.3 n050 thru n056 : Multi-function Inputs (Terminals S1-S4 and DeviceNet Inputs S5-S7)

Setting of "18" selects operation by DeviceNet communications or by external terminal. If the status of this command input is changed while the drive is running, the selection is ignored until the next time the drive is stopped.

Open : Run according to the setting of Operation Method Selection (***n003***) and Reference Selection (***n004***).
Closed : Run by frequency reference and run command from DeviceNet communications.

This input (setting of 18) does not have to be programmed in the drive for DeviceNet communications. It is only used in applications where run source and reference source is switched frequently from DeviceNet communications.

Example: n003 setting is " 1 " and n004 setting is " 7 ".
n053 setting is " 18 ".
Terminal S6 Open: Frequency reference from CN2 Analog Input (0-10V) and run command from control circuit terminals S1, S2.
Terminal S6 Closed: Frequency reference and run command from DeviceNet communications.

6.3.4 n148 : DeviceNet I/O Polled Producing Attribute

Parameter ***n148*** determines the polled producing attribute (PPA) or output to master in DeviceNet communications. The following table shows the PPA selections available.

Parameter	Name	Setting Range	Factory Setting
n148	DeviceNet I/O Polled Producing Attribute	70: Basic Speed Control Output Instance 71: Extended Speed Control Output Instance 150: V7N Memobus I/O Control Output Instance 151: V7N Standard Drive Control Output Instance 152: V7N Accel/Decel Time Control Output Instance 155: Expanded I/O MEMOBUS Output Instance	71

6.3.5 n149 : DeviceNet I/O Polled Consuming Attribute

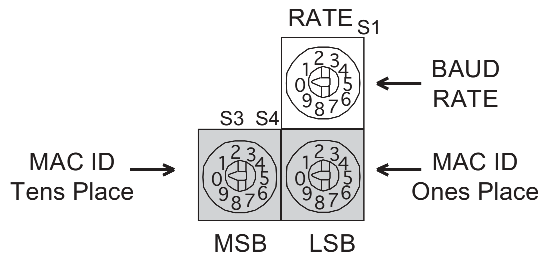
Parameter ***n149*** determines the polled consuming attribute (PCA) or input to Drive in DeviceNet communications. The following table shows the PCA selections available.

Parameter	Name	Setting Range	Factory Setting
n149	DeviceNet I/O Polled Consuming Attribute	20: Basic Speed Control Input Instance 21: Extended Speed Control Input Instance 100: V7N Memobus I/O Control Input Instance 101: V7N Standard Drive Control Input Instance 102: V7N Accel/Decel Time Control Input Instance 105: Expanded I/O MEMOBUS Input Instance	21

6.3.6 n150 : DeviceNet MAC ID

The Drive's MAC ID can be set in two different ways. The MAC ID can be set using the rotary switches MSB (S3) and LSB (S4).
MAC ID = (MSB x 10) + LSB
Setting range of 0 to 63 on the rotary switches enables the rotary switches to set the Drive's MAC ID.
Setting range of 64 to 99 on the rotary switches activates parameter ***n150*** to set the Drive's MAC ID.

Parameter	Name	Setting Range	Factory Setting
n150	DeviceNet I/O MAC ID	0-63	0



6.3.7 n151 : DeviceNet Timeover Detection Selection

If the time between DeviceNet messages from the master exceeds the timeover value set by the master, drive will function according to parameter ***n151***.

Parameter	Name	Setting Range	Factory Setting
n151	DeviceNet Timeover Detection Selection	0: Coast to stop 1: Decel to stop using Decel Time 1 (n020) 2: Decel to stop using Decel Time 2 (n022) 3: Operation continues with Alarm 4: Disabled	0

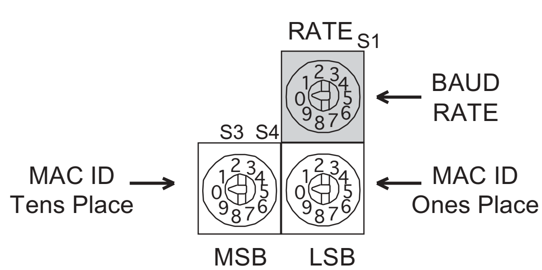
6.3.8 n152 : DeviceNet Baud Rate Selection

The Drive's baud rate can be set in two different ways. The baud rate can be set using the rotary switches RATE (S1). Setting the switch to position 0, 1, or 2 enables the rotary switch to set the Drive's baud rate.

Switch Setting	Baud Rate
0	125 kbps
1	250 kbps
2	500 kbps
3-9	Parameter n152 sets the baud rate

Setting the switch to position 3 to 9 enables parameter ***n152*** to set the Drive's baud rate.

Parameter	Name	Setting Range	Factory Setting
n152	DeviceNet Baud Rate Selection	0: 125 kbps 1: 250 kbps 2: 500 kbps	2



6.3.9 n153 : DeviceNet Speed Scale

Parameter ***n153*** sets the data coefficient of speed (frequency reference and output frequency) in DeviceNet communications.

Parameter	Name	Description	Setting Range	Factory Setting
n153	DeviceNet Speed Scale	1 [RPM] x $1/2^{SS}$	-15 - 15	0

6.3.10 n154 : DeviceNet Current Scale

Parameter ***n154*** sets the data coefficient of motor current (output current) in DeviceNet communications.

Parameter	Name	Description	Setting Range	Factory Setting
n154	DeviceNet Current Scale	1 [Amp] x $1/2^{CS}$	-15 - 15	0

6.3.11 n155 : DeviceNet Electric Power Scale

Parameter ***n155*** sets the data coefficient of output power in DeviceNet communications.

Parameter	Name	Description	Setting Range	Factory Setting
n155	DeviceNet Electric Power Scale	1 [Watt] x $1/2^{PS}$	-15 - 15	0

6.3.12 n156 : DeviceNet Voltage Scale

Parameter ***n156*** sets the data coefficient of time in voltage (input/output voltage) in DeviceNet communications.

Parameter	Name	Description	Setting Range	Factory Setting
n156	DeviceNet Voltage Scale	1 [Volt] x $1/2^{VS}$	-15 - 15	0

6.3.13 n157 : DeviceNet Time Scale

Parameter ***n157*** sets the data coefficient of time in DeviceNet communications.

Parameter	Name	Description	Setting Range	Factory Setting
n157	DeviceNet Time Scale	1 [msec] x $1/2^{TS}$	-15 - 15	0

6.3.14 n170 : Modbus Frequency Unit Selection

When using the Modbus area of the DeviceNet communications, the frequency (speed) units can be selected using parameter ***n170***.

Parameter	Name	Setting Range	Factory Setting
n170	Modbus Frequency Unit Selection	0: 0.1Hz 1: 0.01Hz 2: 30,000/100% 3: 0.1%	0

6.4 DEVICENET POLLED I/O MESSAGING

The V7N Embedded DeviceNet Communication Drive complies with the AC Drive profile designated by the DeviceNet Specification and the ODVA. It allows communication with a Master (PLC or PC) for AC drive control functions, such as drive operation, parameter adjustment and monitoring. The DeviceNet interface works as a Group 2 Only Server (DeviceNet Slave) on the control network. Polled I/O based messaging and Explicit messaging are supported when communicating to the master controller or PLC.

DeviceNet Communications between a Master (PLC or PC) and the V7N Drive (Slave) uses Polled I/O messaging, based from the following I/O Assemblies to transfer control and diagnostic information to and from the V7N. The "Input Data Assemblies" or "Polled Consuming Assemblies (PCA)"refers to a message sent from the Master to the V7N. The "Output Data Assemblies" or "Polled Producing Assemblies (PPA)" refers to the response from the drive back to the Master. The factory default of the V7N Embedded DeviceNet Communication Drive is Extended Speed Control Input Instance 21 and Extended Speed Control Output Instance 71 (see section 3.3 and 3.4). Changing the PCA and PPA (Input/Output Data Assemblies) can be done in two ways.

The first way to change the PCA and PPA is to use the EDS file with the configuration software. By accessing the EDS file through configuration software, the PCA and PPA can be accessed under the DeviceNet Parameter Group "Polled Consuming Assembly" and "Polled Producing Assembly". Set the appropriate value using the table below and save changes to device.
The second way to change the PCA and PPA is change parameter n148 for PPA and n149 for PCA through the digital operator.

Be sure to power down the V7N, then power up to store the changes made to the PCA and PPA.

The following sections describe the format and structure of the I/O Assemblies.

Class	Instance	Attribute	Type	Number of Data Bytes	Assembly	Description
100 (64Hex)	1	148 (94Hex)	PPA (Output Data Assembly)	4	70 (46Hex)	Basic Speed Control Output Instance 70 (Section 3.2)
				4	71 (47Hex)	Extended Speed Control Output Instance 71 (Section 3.4) ****default***
				5	150 (96Hex)	V7N Modbus I/O Control Output Instance 150 (Section 3.6)
				8	151 (97Hex)	V7N Standard Drive Control Output Instance 151 (Section 3.8)
				8	152 (98Hex)	V7N Accel/Decel Time Control Output Instance 152 (Section 3.10)
				8	155 (9BHex)	V7N Extended I/O Modbus Output Instance 155 (Section 3.12)
				8	156 (9CHex)	V7N General Purpose DI/DO Output Instance 156 (Section 3.14)
		149 (95Hex)	PCA (Input Data Assembly)	4	20 (14Hex)	Basic Speed Control Input Instance 20 (Section 3.1)
				4	21 (15Hex)	Extended Speed Control Input Instance 21 (Section 3.3) ****default***
				5	100 (64Hex)	V7N Modbus I/O Control Input Instance 100 (Section 3.5)
				8	101 (65Hex)	V7N Standard Drive Control Input Instance 101 (Section 3.7)
				8	102 (66Hex)	V7N Accel/Decel Time Control Input Instance 102 (Section 3.9)
				8	105 (69Hex)	V7N Extended I/O Modbus Input Instance 105 (Section 3.11)
				8	106 (6AHex)	V7N General Purpose DI/DO Input Instance 106 (Section 3.13)

Note: Regardless if I/O Data Exchange is enabled or disabled, communications will occur at the determined intervals set by the Master.

6.4.1 Basic Speed Control Input Instance 20 (14Hex)

This function is the basic I/O instance of Assembly Object Class (04Hex) Attribute (03Hex), which defines DeviceNet AC drive profile. Both input/output use 4 bytes each.

V7N Basic Speed Control Instance 20 (14Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	*Fault Reset*	-	*Fwd Run*
1	-	-	-	-	-	-	-	-
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Upper Byte)*							

Data	Name	Description
Byte 0, Bit 0	*Run Fwd*	The drive runs forward. 0: Stop 1: Fwd run
Byte 0, Bit 2	*Fault Reset*	The drive fault detection status is reset. 0: Fault reset off 1: Fault reset
Byte 2, 3	*Speed Reference*[3]	The drive speed reference is set. Speed command data: Frequency reference [RPM] X $1/2^{ss}$ ^{ss}: Speed Scale[1] Setting range: 0xFFFF Hex[2] Example: When setting 1800RPM reference and Speed scale = 0, Speed reference data: 1800 X $1/2^0$ = 0708 Hex Lower Byte (byte 2) = 08Hex, Upper Byte (byte 3) = 07Hex

(1) Speed scale can be set by explicit messaging communication AC/DC Drive Object (Class 2A Hex) attribute 16.
(2) Setting of a speed exceeding the drive maximum output frequency (n011) will be limited by the maximum output frequency (n011).
(3) When applying a speed reference make sure to set No. of poles (2 ~ 39) to drive parameter n035 (frequency reference set/display unit selection). See Section 2.10 for details.

6.4.2 Basic Speed Control Output Instance 70 (46Hex)

This function is the basic I/O instance of Assembly Object Class (04Hex) Attribute (03Hex), which defines DeviceNet AC drive profile. Both input/output use 4 bytes each.

V7N Basic Speed Control Instance 70 (46Hex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	*During Fwd Run (Fwd)*	-	*Fault*
1	-	-	-	-	-	-	-	-
2	*Speed Monitor (Lower Byte)*							
3	*Speed Monitor (Upper Byte)*							

Data	Name	Description
Byte 0, Bit 0	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 0, Bit 2	*During Fwd*	The drive run status is displayed. 0: During Stop/Rev. 1: During Fwd/AC braking
Byte 2, 3	*Speed Monitor*[2]	The drive speed is displayed (monitor U-02). Speed monitor data: Frequency monitor [RPM] X $1/2^{ss}$ ^{ss}: Speed Scale[1] Example: If speed monitor data is 1000RPM (03E8Hex) and speed scale = 0, Frequency monitor: 03E8Hex X $1/2^0$ X = 1000RPM Lower Byte (byte 2) = E8Hex, Upper Byte (byte 3) = 03Hex

(1) Speed scale can be set by explicit messaging communication AC/DC Drive Object (Class 2A Hex) attribute 16.
(2) When applying a speed reference make sure to set No. of poles (2 ~ 39) to drive parameter n035 (frequency reference set/display unit selection). See Section 2.10 for details.

6.4.3 Extended Speed Control Input Instance 21 (15Hex)

This function is the basic I/O instance of Assembly Object Class (04Hex) Attribute (03Hex), which is defined by the DeviceNet AC drive profile. This is the Factory Default V7N I/O Assemblies and use 4 bytes.

V7N Extended Speed Control Instance 21 (15Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	*NetRef*	*NetCtrl*	-	-	*Fault Reset*	*Rev Run*	*Fwd Run*
1	-	-	-	-	-	-	-	-
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Upper Byte)*							

Data	Name	Description
Byte 0, Bit 0	*Fwd Run*	The drive runs forward. 0: Stop 1: Fwd run
Byte 0, Bit 1	*Rev Run*	The drive runs reverse. 0: Stop 1: Rev run
Byte 0, Bit 2	*Fault Reset*	The drive fault detection status is reset. 0: Fault reset off 1: Fault reset
Byte 0, Bit 5	*NetCtrl*	Run command selection is set. 0: Run command input is set by run command selection (n003) 1: Run command (Byte 0 - Bit 0, 1) through DeviceNet enabled.
Byte 0, Bit 6	*NetRef*	Frequency reference selection set. 0: Frequency reference input is set by frequency reference selection (n004) 1: Frequency reference (Byte 2, 3) through DeviceNet enabled.
Byte 2, 3	*Speed Reference*	The drive speed reference is set. This function is the same as the Speed Reference in Section 3.1 Basic Speed Control Input Instance 20 (14Hex).

6.4.4 Extended Speed Control Output Instance 71 (47Hex)

This function is the basic I/O instance of Assembly Object Class (04Hex) Attribute (03Hex), which is defined by the DeviceNet AC drive profile. This is the Factory Default V7N I/O Assemblies and use 4 bytes.

V7N Extended Speed Control Instance 71 (47Hex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Speed Agree*	*Ref From Net*	*Ctrl From Net*	*Drive Ready*	*During Reverse Run*	*During Forward Run*	*Alarm*	*Fault*
1	-	-	-	-	-	-	-	-
2	*Speed Monitor (Lower Byte)*							
3	*Speed Monitor (Upper Byte)*							

Data	Name	Description
Byte 0, Bit 0	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 0, Bit 1	*Alarm*	The drive alarm detection status is displayed. 0: Normal 1: During alarm detection
Byte 0, Bit 2	*During Fwd Run*	The drive run status is displayed. 0: During Stop/Reverse Run/DC Injection @ rev run on 1: During Forward run/DC Injection @ rev run off
Byte 0, Bit 3	*During Rev Run*	The drive run status is displayed. 0: During stop/forward run/DC Injection @ rev run off 1: During reverse run/DC Injection @ rev run on
Byte 0, Bit 4	*Drive Ready*	The drive ready status is displayed. 0: During fault detection/ready 1: Ready
Byte 0, Bit 5	*Ctrl From Net*	The drive run command input selection status is displayed. 0: Run command input is enabled other than the DeviceNet. 1: Run command input is enabled from the DeviceNet.
Byte 0, Bit 6	*Ref From Net*	The drive frequency input selection status is displayed. 0: Run command input is enabled other than the DeviceNet. 1: Run command input is enabled from the DeviceNet.
Byte 0, Bit 7	*Speed Agree*	The drive frequency agree detection status is displayed. 0: During stop/acceleration deceleration 1: Frequency agree
Byte 2, 3	*Speed Monitor*	The drive speed is displayed (monitor U-02). This function is the same as the Speed Monitor in Section 3.2 Basic Speed Control Output Instance 70 (46Hex).

6.4.5 V7N Modbus I/O Control Input Instance 100 (64Hex)

This I/O instance allows all drive parameters and monitors to be read/set. This instance is for V7N series drives only and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input/output use 5 bytes each. Refer to the Appendix A for a list of Modbus Registers for V7N.

V7N Modbus I/O Control Instance 100 (64Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Function Code*							
1	*Register Number (Upper Byte)**							
2	*Register Number (Lower Byte)**							
3	*Register Data (Upper Byte)**							
4	*Register Data (Lower Byte)**							

Data	Name	Description
Byte 0	*Function Code*	Modbus (reference message) function code is set. 03 Hex: Read 10 Hex: Write 00 Hex: Undetermined
Byte 1, 2	*Register Number (Upper and Lower Byte)*	The drive Modbus register number is set.
Byte 3, 4	*Register Data (Upper and Lower Byte)*	The write data at Modbus write command is set to the defined register number.

Note: Depending on PLC used the upper and lower designator may be reversed.

6.4.6 V7N Modbus I/O Control Output Instance 150 (96Hex)

This I/O instance allows all drive parameters and monitors to be read/set. This instance is for V7N series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input/output use 5 bytes each. Refer to the Appendix A for a list of Modbus Registers for V7N.

V7N Modbus I/O Control Instance 150 (96Hex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Function Code*							
1	*Register Number (Upper Byte)*							
2	*Register Number (Lower Byte)*							
3	*Register Data (Upper Byte)*							
4	*Register Data (Lower Byte)*							

Data	Name	Description
Byte 0	*Function Code*	The Modbus (response message) function code No. is displayed. 00 Hex: No command executed 03 Hex: Read normal 10 Hex: Write normal 83 Hex: Read fault 90 Hex: Write fault
Byte 1, 2	*Register Number (Upper and Lower Byte)*	The processed Modbus register No. is displayed. For Read/write faults, Modbus error code is displayed.
Byte 3, 4	*Register Data (Upper and Lower Byte)*	The read data at Modbus read command is displayed. If writing the same data to the same address, the Register Data will respond with 00,00 without executing the command.

Note: Yaskawa's V7N drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of Modbus registers are stored in different areas of memory. V7N Modbus monitor and command registers 001-03Dhex (Appendix A) are always stored in Volatile memory. Any data read or written from these registers will not be retained during a power loss situation. Modbus parameter registers 101h to 1D2h (Appendix A) are stored in Volatile memory until the 'ENTER' command is applied. When writing new data to parameter registers, the 'ENTER' command must be given for the new data to become stored in Non-Volatile memory. If the 'ENTER' command is not used, the changed data will not be retained during power loss. An 'ENTER' command is executed by writing the value of '0' to Modbus register 0900h (Class 64h, Instance 09h, Attribute 00h). If a power loss occurs after the ENTER command has been issued and accepted, the data will be retained in the V7N.

⚠ WARNING

Use the ENTER command 0900h only when necessary! The life of the EEPROM (Non-Volatile memory) on the V7N will support a finite number of operations. This means that the ENTER command, value '0' written to register 0900h (Class 64h, Instance 09h, Attribute 00h), can only be used a maximum of a 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (ERR) requiring the V7N control board to be replaced.

6.4.7 V7N Standard Drive Control Input Instance 101 (65Hex)

This I/O instance applies to all V7N input / output functions as well as the extended speed control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Standard Drive Control Instance 101 (65Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	*DeviceNet Terminal S7* (1)	*DeviceNet Terminal S6* (1)	*DeviceNet Terminal S5* (1)	*Terminal S4*	*Terminal S3*	*Rev Run*	*Fwd Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA*(1)	-	-	-	*Fault Reset*	*External Fault*
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Upper Byte)*							
4	-							
5	-							
6	-							
7	-							

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

Data	Name	Description
Byte 0, Bit 0	*Forward Run*	The drive runs forward. 0: Stop 1: Forward run
Byte 0, Bit 1	*Reverse Run*	The drive runs reverse. 0: Stop 1: Reverse run
Byte 0, Bit 2	*Terminal S3*	Function set in the drive multi-function input terminal S3 is input. The drive parameter n052 sets multi-function input terminal S3 functions. 0: Terminal S3 multi-function OFF 1: Terminal S3 multi-function ON
Byte 0, Bit 3	*Terminal S4*	Function set in the drive multi-function input terminal S4 is input. The drive parameter n053 sets multi-function input terminal S4 functions. 0: Terminal S4 multi-function OFF 1: Terminal S4 multi-function ON
Byte 0, Bit 4	*Terminal S5* (1)	Function set in the drive parameter n054 multi-function DeviceNet input selection 5 is input. 0: DeviceNet Terminal S5 multi-function OFF 1: DeviceNet Terminal S5 multi-function ON
Byte 0, Bit 5	*Terminal S6* (1)	Function set in the drive parameter n055 multi-function DeviceNet input selection 6 is input. 0: DeviceNet Terminal S6 multi-function OFF 1: DeviceNet Terminal S6 multi-function ON
Byte 0, Bit 6	*Terminal S7* (1)	Function set in the drive parameter n056 multi-function DeviceNet input selection 7 is input. 0: DeviceNet Terminal S7 multi-function OFF 1: DeviceNet Terminal S7 multi-function ON
Byte 1, Bit 0	*External Fault*	External fault (EP0) is input from DeviceNet. 0: External Fault Off 1: External Fault (EF0)
Byte 1, Bit 1	*Fault Reset*	The drive fault detection status is reset. 0: Fault reset off 1: Fault reset
Byte 1, Bit 5	*DeviceNet Terminal MA* (1)	Function set in the drive parameter n057 multi-function DeviceNet ouput selection MA is ouput. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 is operated. Only when “18” is set to the drive parameter No. n058 becomes enabled. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 is operated. Only when “18” is set to the drive parameter No. n059 becomes enabled. 0: Terminal P2 OFF 1: Terminal P2 ON
Byte 2, 3	*Speed Reference*	Drive speed reference is set. Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

6.4.8 V7N Standard Drive Control Output Instance 151 (97Hex)

This I/O instance applies to all V7N input / output functions as well as the extended speed control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Standard Drive Control Instance 151 (97Hex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Fault*	*Alarm*	*Drive Ready*	*Speed Agree*	*During Reset*	*During Reverse*	*During Zero Speed*	*During Run*
1	-	-	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA*[1]	*Local/Remote*	*During UV*	*During OPE*
2	*Speed Actual (Lower Byte)*							
3	*Speed Actual (Upper Byte)*							
4	-							
5	-							
6	*Output Current Monitor (Lower Byte)*							
7	*Output Current Monitor (Upper Byte)*							

[1] Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

Data	Name	Description
Byte 0, Bit 0	*During Run*	The drive run status is displayed. 0: During stop 1: During Forward/reverse/DC injection
Byte 0, Bit 1	*During Zero Speed*	The drive run status is displayed. 0: During forward/reverse 1: During stop/DC injection
Byte 0, Bit 2	*During Reverse Run*	The drive run status is displayed. 0: During forward run/stop/DC injection @ rev run off 1: During reverse run/reverse command input/DC injection @ rev run on
Byte 0, Bit 3	*During Reset Input*	The drive fault reset signal input status is displayed. 0: Off 1: During reset signal input
Byte 0, Bit 4	*Speed Agree*	The drive frequency agree detection status is displayed. 0: During stop/acceleration and deceleration 1: Frequency agree
Byte 0, Bit 5	*Drive Ready*	The drive run prepare status is displayed. 0: During fault detection/prepare 1: Ready
Byte 0, Bit 6	*Alarm*	The drive alarm detection status is displayed. 0: Normal 1: During alarm detection
Byte 0, Bit 7	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 1, Bit 0	*During OPE*	The drive Modbus parameter setting error (OPE) detection status is displayed. 0: Normal 1: During OPE, (OP1-OP5) detection
Byte 1, Bit 1	*During UV*	The drive low voltage error (UV) detection status is displayed. 0: Normal 1: During UV detection
Byte 1, Bit 2	*Local/Remote*	The drive run command input selection status is displayed. 0: Run command input is enabled other than the DeviceNet. 1: Run command input is enabled from DeviceNet.
Byte 1, Bit 3	*DeviceNet Terminal MA* [1]	The DeviceNet multi-function output terminal MA output status is displayed. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 4	*Terminal P1*	The drive multi-function output terminal P1 output status is displayed. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 5	*Terminal P2*	The drive multi-function output terminal P2 output status is displayed. 0: Terminal P2 OFF 1: Terminal P2 ON
Byte 2, 3	*Speed Monitor*	The drive speed is displayed (monitor U-02). Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 6, 7	*Output Current Monitor*	The drive output current is displayed (monitor U-03). The unit (0.1A) is fixed. There is no effect on the current scale setting.

6.4.9 V7N Accel/Decel Time Control Input Instance 102 (66Hex)

This I/O instance applies to accel/decel time control as well as standard drive control I/O instance. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Accel/Decel Time Control Instance 102 (66Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	*DeviceNet Terminal S7* (1)	*DeviceNet Terminal S6* (1)	*DeviceNet Terminal S5* (1)	*Terminal S4* (2)	*Terminal S3* (2)	*Rev Run*	*Fwd Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA* (1)	-	-	-	*Fault Reset*	*External Fault*
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Higher Byte)*							
4	*Acceleration Time 1 (Lower Byte)*							
5	*Acceleration Time 1 (Higher Byte)*							
6	*Deceleration Time 1 (Lower Byte)*							
7	*Deceleration Time 1 (Higher Byte)*							

Data	Name	Description
Byte 0, Bit 0	*Forward Run*	The drive runs forward. 0: Stop 1: Forward run
Byte 0, Bit 1	*Reverse Run*	The drive runs reverse. 0: Stop 1: Reverse run
Byte 0, Bit 2	*Terminal S3* (2)	Functions set in the drive multi-function input terminal S3 is input. The drive parameter n052 sets multi-function input terminal S3 functions. 0: Terminal S3 multi-function OFF 1: Terminal S3 multi-function ON
Byte 0, Bit 3	*Terminal S4* (2)	Functions set in the drive multi-function input terminal S4 is input. The drive parameter n053 sets multi-function input terminal S4 functions. 0: Terminal S4 multi-function OFF 1: Terminal S4 multi-function ON
Byte 0, Bit 4	*Terminal S5* (1)	Functions set in the drive parameter n054 (multi-function DeviceNet input selection 5) is input. 0: DeviceNet Terminal S5 multi-function OFF 1: DeviceNet Terminal S5 multi-function ON
Byte 0, Bit 5	*Terminal S6* (1)	Functions set in the drive parameter n055 (multi-function DeviceNet input selection 6) is input. 0: DeviceNet Terminal S6 multi-function OFF 1: DeviceNet Terminal S6 multi-function ON
Byte 0, Bit 6	*Terminal S7* (1)	Functions set in the drive parameter n056 (multi-function DeviceNet input selection 7) is input. 0: DeviceNet Terminal S7 multi-function OFF 1: DeviceNet Terminal S7 multi-function ON
Byte 1, Bit 0	*External Fault*	External fault (EP0) is input from option. 0: External Fault Off 1: External Fault (EF0)
Byte 1, Bit 1	*Fault Reset*	The drive fault detection status is reset. 0: Fault reset off 1: Fault reset
Byte 1, Bit 5	*DeviceNet Terminal MA* (1)	The DeviceNet multi-function output terminal MA is operated. Only when “18” is set to the drive parameter No. n057 becomes enabled. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 is operated. Only when “18” is set to the drive parameter No. n058 becomes enabled. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 is operated. Only when “18” is set to the drive parameter No. n059 becomes enabled. 0: Terminal P2 OFF 1: Terminal P2 ON
Byte 2, 3	*Speed Reference*	Drive speed reference is set. Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 4, 5	*Acceleration Time 1*	The drive's acceleration time is set and adjustable during run. Units depend upon inverter parameter n018 setting. (Default: 0.1 sec). A set value here is not stored in the EEPROM. Does not affect the setting of time scale TS.
Byte 6, 7	*Deceleration Time 1*	The drive's deceleration time is set and adjustable during run. Units depend upon inverter parameter n018 setting. (Default: 0.1 sec). A set value here is not stored in the EEPROM. Does not affect the setting of time scale TS.

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.
(2) Multi-function input terminal S3 and S4 can be triggered on via control terminal block or via DeviceNet input. In other words, S3 and S4 on the control terminal block and S3 and S4 on DeviceNet are OR-ed together.

6.4.10 V7N Accel/Decel Time Control Output Instance 152 (98Hex)

This I/O instance applies to accel/decel time control as well as standard drive control I/O instance. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Accel/Decel Time Control Instance 152 (98Hex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Fault*	*Alarm*	*Drive Ready*	*Speed Agree*	*During Reset*	*During Reverse*	*During Zero Speed*	*During Run*
1	-	-	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA*(1)	*Local/Remote*	*During UV*	*During OPE*
2	*Speed Output (Lower Byte)*							
3	*Speed Output (Higher Byte)*							
4	*Speed Reference (Lower Byte)*							
5	*Speed Reference (Higher Byte)*							
6	*Output Current (Lower Byte)*							
7	*Output Current (Higher Byte)*							

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

Data	Name	Description
Byte 0, Bit 0	*During Run*	The drive operating status is displayed. 0: During stop 1: During forward run/reverse run/DC brake
Byte 0, Bit 1	*During Zero Speed*	The drive operating status is displayed. 0: During forward run/reverse run 1: During stop/DC brake
Byte 0, Bit 2	*During Reverse Run*	The drive operating status is displayed. 0: During forward run/stop/DC injection @ rev run off 1: During reverse run/During reverse run command input/DC injection @ rev run on
Byte 0, Bit 3	*During Reset Input*	The drive reset signal input status is displayed. 0: Off 1: During reset signal input
Byte 0, Bit 4	*Speed Agree*	The drive frequency agree detection status is displayed. 0: During stop/accel/decel 1: Frequency agree
Byte 0, Bit 5	*Drive Ready*	The drive operation status is displayed. 0: During fault detection/preparation 1: Ready
Byte 0, Bit 6	*Alarm*	The drive alarm detection status is displayed. 0: Normal 1: During alarm detection
Byte 0, Bit 7	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 1, Bit 0	*During OPE*	The drive Modbus parameter setting error (OPE) detection status is displayed. 0: Normal 1: During OPE, (OP1-OP5) detection
Byte 1, Bit 1	*During UV*	The drive low voltage error (UV) detection status is displayed. 0: Normal 1: During UV detection
Byte 1, Bit 2	*Local/Remote*	The drive run command input selection status is displayed. 0: Run command input is enabled other than the DeviceNet. 1: Run command input is enabled from DeviceNet.
Byte 1, Bit 3	*DeviceNet Output Terminal MA* (1)	The DeviceNet multi-function output terminal MA output status is displayed. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 4	*Terminal P1*	The drive multi-function output terminal P1 output status is displayed. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 5	*Terminal P2*	The drive multi-function output terminal P2 output status is displayed. 0: Terminal P2 OFF 1: Terminal P2 ON
Byte 2, 3	*Speed Output*	The drive speed output is displayed (monitor U-02). Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 4, 5	*Speed Reference*	The drive speed reference is displayed (monitor U-01). This function displays the speed reference set in bytes 2,3 in the input instance 102 (66Hex).
Byte 6, 7	*Output Current*	The drive output current is displayed (monitor U-03). The unit (0.1A) is fixed. There is no effect on the current scale [CS] setting.

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

6.4.11 V7N Extended I/O Modbus Input Instance 105 (69Hex)

This I/O instance applies to V7N Modbus I/O functions as well as the V7N standard drive control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Extended I/O Modbus Instance 105 (69 Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	*DeviceNet Terminal S7* [1]	*DeviceNet Terminal S6* [1]	*DeviceNet Terminal S5* [1]	*Terminal S4* [2]	*Terminal S3* [2]	*Rev Run*	*Fwd Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA* [1]	-	*Function Code 1*	*Function Code 2*	*Fault Reset*	*External Fault*
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Higher Byte)*							
4	*Register Number (Lower Byte)*							
5	*Register Number (Higher Byte)*							
6	*Register Data (Lower Byte)*							
7	*Register Data (Higher Byte)*							

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.
(2) Multi-function input terminal S3 and S4 can be triggered on via control terminal block or via DeviceNet input. In other words, S3 and S4 on the control terminal block and S3 and S4 on DeviceNet are OR-ed together.

Data	Name	Description
Byte 0, Bit 0	*Forward Run*	The drive runs forward. 0: Stop 1: Forward run
Byte 0, Bit 1	*Reverse Run*	The drive runs reverse. 0: Stop 1: Reverse run
Byte 0, Bit 2	*Terminal S3* (2)	Functions set in the drive multi-function input terminal S3 is input. The drive parameter n052 sets multi-function input terminal S3 functions. 0: Terminal S3 multi-function OFF 1: Terminal S3 multi-function ON
Byte 0, Bit 3	*Terminal S4* (2)	Functions set in the drive multi-function input terminal S4 is input. The drive parameter n053 sets multi-function input terminal S4 functions. 0: Terminal S4 multi-function OFF 1: Terminal S4 multi-function ON
Byte 0, Bit 4	*Terminal S5* (1)	Functions set in the drive parameter n054 (multi-function DeviceNet input selection 5) is input. 0: DeviceNet Terminal S5 multi-function OFF 1: DeviceNet Terminal S5 multi-function ON
Byte 0, Bit 5	*Terminal S6* (1)	Functions set in the drive parameter n055 (multi-function DeviceNet input selection 6) is input. 0: DeviceNet Terminal S6 multi-function OFF 1: DeviceNet Terminal S6 multi-function ON
Byte 0, Bit 6	*Terminal S7* (1)	Functions set in the drive parameter n056 (multi-function DeviceNet input selection 7) is input. 0: DeviceNet Terminal S7 multi-function OFF 1: DeviceNet Terminal S7 multi-function ON
Byte 1, Bit 0	*External Fault*	External fault (EP0) is input from option. 0: External Fault Off 1: External Fault (EF0)
Byte 1, Bit 1	*Fault Reset*	The drive fault detection status is reset. 0: Fault reset off 1: Fault reset
Byte 1, Bit 2	*Function Code 1*	Function Code 1 (Byte 1, Bit 2) / Function Code 2 (Byte 1, Bit 3) / Function 0 / 0 / None 0 / 0 / The data of byte 6, 7 is written in Modbus register No. designated by byte 4 and 5. 1 / 0 / The data of the Modbus register No. designated by byte 4 and 5 is read. 1 / 1 / None
Byte 1, Bit 3	*Function Code 2*	
Byte 1, Bit 5	*DeviceNet Terminal MA* (1)	The DeviceNet multi-function output terminal MA is operated. Only when "18" is set to the drive parameter No. n057 becomes enabled. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 is operated. Only when "18" is set to the drive parameter No. n058 becomes enabled. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 is operated. Only when "18" is set to the drive parameter No. n059 becomes enabled. 0: Terminal P2 OFF 1: Terminal P2 ON

6.4.11 V7N Extended I/O Modbus Input Instance 105 (69Hex) Continued

Data	Name	Description
Byte 2, 3	*Speed Reference*	Drive speed reference is set. Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 4, 5	*Register Number*	The drive Modbus register No. is set.
Byte 6, 7	*Register Data*	Write data at Modbus write command is set.

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.
(2) Multi-function input terminal S3 and S4 can be triggered on via control terminal block or via DeviceNet input. In other words, S3 and S4 on the control terminal block and S3 and S4 on DeviceNet are OR-ed together.

Note: Yaskawa's V7N drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of Modbus registers are stored in different areas of memory. V7N Modbus monitor and command registers 001-03Dhex (Appendix A) are always stored in Volatile memory. Any data read or written from these registers will not be retained during a power loss situation. Modbus parameter registers 101h to 1D2h (Appendix A) are stored in Volatile memory until the 'ENTER' command is applied. When writing new data to parameter registers, the 'ENTER' command must be given for the new data to become stored in Non-Volatile memory. If the 'ENTER' command is not used, the changed data will not be retained during power loss. An 'ENTER' command is executed by writing the value of '0' to Modbus register 0900h. If a power loss occurs after the ENTER command has been issued and accepted, the data will be retained in the V7N.

WARNING

Use the ENTER command 0900h only when necessary! The life of the EEPROM (Non-Volatile memory) on the V7N will support a finite number of operations. This means that the ENTER command, value '0' written to register 0900h (Class 64h, Instance 09h, Attribute 00h), can only be used a maximum of a 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (ERR) requiring the V7N control board to be replaced.

6.4.12 V7N Extended I/O Modbus Output Instance 155 (9BHex)

This I/O instance applies to V7N Modbus I/O functions as well as the V7N standard drive control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N Extended I/O Modbus Instance 155 (9BHex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Fault*	*Alarm*	*Drive Ready*	*Speed Agree*	*During Reset*	*During Reverse*	*During Zero Speed*	*During Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA*[1]	*Local/Remote*	*Function Code 2*	*Function Code 1*	*During UV*	*During OPE*
2	*Speed Actual (Lower Byte)*							
3	*Speed Actual (Higher Byte)*							
4	*Register Number (Lower Byte)*							
5	*Register Number (Higher Byte)*							
6	*Register Data (Lower Byte)*							
7	*Register Data (Higher Byte)*							

[1] Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.

Data	Name	Description
Byte 0, Bit 0	*During Run*	The drive operating status is displayed. 0: During stop 1: During forward run/reverse run/DC brake
Byte 0, Bit 1	*During Zero Speed*	The drive operating status is displayed. 0: During forward run/reverse run 1: During stop/DC brake
Byte 0, Bit 2	*During Reverse Run*	The drive operating status is displayed. 0: During forward run/stop/DC injection @ rev run off 1: During reverse run/During reverse run command input/DC injection @ rev run on
Byte 0, Bit 3	*During Reset Input*	The drive reset signal input status is displayed. 0: Off 1: During reset signal input
Byte 0, Bit 4	*Speed Agree*	The drive frequency agree detection status is displayed. 0: During stop/accel/decel 1: Frequency agree
Byte 0, Bit 5	*Drive Ready*	The drive operation preparation status is displayed. 0: During fault detection/preparation 1: Ready
Byte 0, Bit 6	*Alarm*	The drive alarm detection status is displayed. 0: Normal 1: During alarm detection
Byte 0, Bit 7	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 1, Bit 0	*During OPE*	The drive Modbus parameter setting error (OPE) detection status is displayed. 0: Normal 1: During OPE, (OP1-OP5) detection
Byte 1, Bit 1	*During UV*	The drive low voltage error (UV) detection status is displayed. 0: Normal 1: During UV detection
Byte 1, Bit 2	*Function Code 1*	<u>Function Code 1</u> (Byte 1, Bit 2) / <u>Function Code 2</u> (Byte 1, Bit 3) / <u>Function</u> 0 / 0 / None 0 / 1 / During Modbus command execution 1 / 0 / Modbus command execution error 1 / 1 / Modbus command execution end.
Byte 1, Bit 3	*Function Code 2*	
Byte 1, Bit 4	*Local/Remote*	The drive run command input selection status is displayed. 0: Run command input is enabled other than the DeviceNet. 1: Run command input is enabled from DeviceNet.
Byte 1, Bit 5	*DeviceNet Terminal MA* [1]	The DeviceNet multi-function output terminal MA output status is displayed. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 output status is displayed. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 output status is displayed. 0: Terminal P2 OFF 1: Terminal P2 ON

6.4.12 V7N Extended I/O Modbus Output Instance 155 (9BHex) Continued

Data	Name	Description
Byte 2, 3	*Speed Monitor*	The drive speed is displayed. Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 4, 5	*Register Number*	Actually processed Modbus register number is displayed. Read/Write fault displays Modbus error code.
Byte 6, 7	*Register Data*	Read data at Modbus read command is displayed.

Note: Yaskawa's V7N drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of Modbus registers are stored in different areas of memory. V7N Modbus monitor and command registers 001-03Dhex (Appendix A) are always stored in Volatile memory. Any data read or written from these registers will not be retained during a power loss situation. Modbus parameter registers 101h to 1D2h (Appendix A) are stored in Volatile memory until the 'ENTER' command is applied. When writing new data to parameter registers, the 'ENTER' command must be given for the new data to become stored in Non-Volatile memory. If the 'ENTER' command is not used, the changed data will not be retained during power loss. An 'ENTER' command is executed by writing the value of '0' to Modbus register 0900h. If a power loss occurs after the ENTER command has been issued and accepted, the data will be retained in the V7N.

WARNING

Use the ENTER command 0900h only when necessary! The life of the EEPROM (Non-Volatile memory) on the V7N will support a finite number of operations. This means that the ENTER command, value '0' written to register 0900h (Class 64h, Instance 09h, Attribute 00h), can only be used a maximum of a 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (ERR) requiring the V7N control board to be replaced.

6.4.13 V7N General Purpose DI/DO Input Instance 106 (6AHex)

This I/O instance applies to V7N control circuit terminals (S1-S4, P1 and P2) as well as the V7N standard drive control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N General Purpose DI/DO Instance 106 (6A Hex) (PCA: Master to V7N)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	*DeviceNet Terminal S7* (1)	*DeviceNet Terminal S6* (1)	*DeviceNet Terminal S5* (1)	*Terminal S4* (2)	*Terminal S3* (2)	*Rev Run*	*Fwd Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA* (1)	-	-	-	*Fault Reset*	*External Fault*
2	*Speed Reference (Lower Byte)*							
3	*Speed Reference (Higher Byte)*							
4	-							
5	-							
6	-							
7	-							

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.
(2) Multi-function input terminal S3 and S4 can be triggered on via control terminal block or via DeviceNet input. In other words, S3 and S4 on the control terminal block and S3 and S4 on DeviceNet are OR-ed together.

Data	Name	Description	
Byte 0, Bit 0	*Forward Run*	The drive runs forward. 0: Stop 1: Forward run	
Byte 0, Bit 1	*Reverse Run*	The drive runs reverse. 0: Stop 1: Reverse run	
Byte 0, Bit 2	*Terminal S3* (2)	Functions set in the drive multi-function input terminal S3 is input. The drive parameter n052 sets multi-function input terminal S3 functions. 0: Terminal S3 multi-function OFF 1: Terminal S3 multi-function ON	
Byte 0, Bit 3	*Terminal S4* (2)	Functions set in the drive multi-function input terminal S4 is input. The drive parameter n053 sets multi-function input terminal S4 functions. 0: Terminal S4 multi-function OFF 1: Terminal S4 multi-function ON	
Byte 0, Bit 4	*Terminal S5* (1)	Functions set in the drive parameter n054 (multi-function DeviceNet input selection 5) is input. 0: DeviceNet Terminal S5 multi-function OFF 1: DeviceNet Terminal S5 multi-function ON	
Byte 0, Bit 5	*Terminal S6* (1)	Functions set in the drive parameter n055 (multi-function DeviceNet input selection 6) is input. 0: DeviceNet Terminal S6 multi-function OFF 1: DeviceNet Terminal S6 multi-function ON	
Byte 0, Bit 6	*Terminal S7* (1)	Functions set in the drive parameter n056 (multi-function DeviceNet input selection 7) is input. 0: DeviceNet Terminal S7 multi-function OFF 1: DeviceNet Terminal S7 multi-function ON	
Byte 1, Bit 0	*External Fault*	External fault (EP0) is input from option.	0: External Fault Off 1: External Fault (EF0)
Byte 1, Bit 1	*Fault Reset*	The drive fault detection status is reset.	0: Fault reset off 1: Fault reset
Byte 1, Bit 5	*DeviceNet Terminal MA* (1)	The DeviceNet multi-function output terminal MA is operated. Only when “18” is set to the drive parameter No. n057 becomes enabled. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON	
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 is operated. Only when “18” is set to the drive parameter No. n058 becomes enabled. 0: Terminal P1 OFF 1: Terminal P1 ON	
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 is operated. Only when “18” is set to the drive parameter No. n059 becomes enabled. 0: Terminal P2 OFF 1: Terminal P2 ON	
Byte 2, 3	*Speed Monitor*	Drive speed is set. Units will change based on the settings of parameter n035. Does not affect the setting of speed scale SS.	

(1) Terminals S5, S6, S7, and MA are applicable only through DeviceNet communications. There are no physical external input or output terminals on the V7N drive.
(2) Multi-function input terminal S3 and S4 can be triggered on via control terminal block or via DeviceNet input. In other words, S3 and S4 on the control terminal block and S3 and S4 on DeviceNet are OR-ed together.

6.4.14 V7N General Purpose DI/DO Output Instance 156 (9CHex)

This I/O instance applies to V7N control circuit terminals (S1-S4, P1 and P2) as well as the V7N standard drive control I/O instance functions. This instance is for V7N Series drives only, and is not interchangeable with other DeviceNet drives, Assembly Object Class (04Hex) Attribute (03Hex). Both input and output use 8 bytes each.

V7N General Purpose DI/DO Output Instance 156 (9CHex) (PPA: V7N to Master)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	*Fault*	*Alarm*	*Drive Ready*	*Speed Agree*	*During Reset*	*During Reverse*	*During Zero Speed*	*During Run*
1	*Terminal P2*	*Terminal P1*	*DeviceNet Terminal MA*[1]	-	*Terminal S4*	*Terminal S3*	*Terminal S2*	*Terminal S1*
2	*Speed Actual (Lower Byte)*							
3	*Speed Actual (Higher Byte)*							
4	-							
5	-							
6	*Output Current (Lower Byte)*							
7	*Output Current (Higher Byte)*							

[1] Terminal MA is applicable only through DeviceNet communications. There are no physical external output terminal on the V7N drive.

Data	Name	Description
Byte 0, Bit 0	*During Run*	The drive operating status is displayed. 0: During stop 1: During forward run/reverse run/DC brake
Byte 0, Bit 1	*During Zero Speed*	The drive operating status is displayed. 0: During forward run/reverse run 1: During stop/DC brake
Byte 0, Bit 2	*During Reverse Run*	The drive operating status is displayed. 0: During forward run/stop/DC injection @ rev run off 1: During reverse run/During reverse run command input/DC injection @ rev run on
Byte 0, Bit 3	*During Reset Input*	The drive reset signal input status is displayed. 0: Off 1: During reset signal input
Byte 0, Bit 4	*Speed Agree*	The drive frequency agree detection status is displayed. 0: During stop/accel/decel 1: Frequency agree
Byte 0, Bit 5	*Drive Ready*	The drive operation preparation status is displayed. 0: During fault detection/preparation 1: Ready
Byte 0, Bit 6	*Alarm*	The drive alarm detection status is displayed. 0: Normal 1: During alarm detection
Byte 0, Bit 7	*Fault*	The drive fault detection status is displayed. 0: Normal 1: During fault detection
Byte 1, Bit 0	*Terminal S1*	The drive multi-function input terminal S1 input status is displayed. If S1 is used as a general-purpose digital input, set parameter n050 to “28”. 0: Terminal S1 OFF 1: Terminal S1 ON
Byte 1, Bit 1	*Terminal S2*	The drive multi-function input terminal S2 input status is displayed. If S2 is used as a general-purpose digital input, set parameter n051 to “28”. 0: Terminal S2 OFF 1: Terminal S2 ON
Byte 1, Bit 2	*Terminal S3*	The drive multi-function input terminal S3 input status is displayed. If S3 is used as a general-purpose digital input, set parameter n052 to “28”. 0: Terminal S3 OFF 1: Terminal S3 ON
Byte 1, Bit 3	*Terminal S4*	The drive multi-function input terminal S4 input status is displayed. If S4 is used as a general-purpose digital input, set parameter n053 to “28”. 0: Terminal S4 OFF 1: Terminal S4 ON
Byte 1, Bit 5	*DeviceNet Terminal MA* [1]	The DeviceNet multi-function output terminal MA output status is displayed. 0: DeviceNet Terminal MA OFF 1: DeviceNet Terminal MA ON
Byte 1, Bit 6	*Terminal P1*	The drive multi-function output terminal P1 output status is displayed. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, Bit 7	*Terminal P2*	The drive multi-function output terminal P2 output status is displayed. 0: Terminal P2 OFF 1: Terminal P2 ON
Byte 2, 3	*Speed Monitor*	The drive speed output is displayed (monitor U-02). Units will change based on the setting of parameter n035. Does not affect the setting of speed scale SS.
Byte 6, 7	*Output Current*	The drive output current is displayed (monitor U-03). The unit (0.1A) is fixed. There is no effect on the current scale [CS] setting.

6.5 DEVICENET EXPLICIT MESSAGING

The V7N DeviceNet communications may also be accomplished by utilizing an "Explicit Message" to communicate with the master PLC or controller. The Explicit messaging communications is performed differently than Polled I/O type messaging in that commands are not sent cyclically in the scan of the controlling master, but one message is sent and one response is received. See table below for details on Explicit Message Format.

• **Explicit Message Format**

Header	MAC ID	Service Code	Class	Instance	Attribute	Data	Footer

Item	Description
Header	Since it is automatically set, there is no need to do anything.
MAC ID	Master / slave MAC ID is input for communication.
Service Code	Code, which shows data write/read, is input in the requested message. Also, the requested service code MSB (the most significant bit) inputs “1” at normal response, and “94” at fault. Example) 0E: Read request 8E: Read normal response 10: Write request 90: Write normal response 94: Fault response
Class Instance Attribute	Each function of DeviceNet is classified by three codes. The data designation is determined by these three codes.
Data	Request: Write data is input. Response: Read data and error codes are input.
Footer	Since it is automatically set, there is no need to do anything.

The following sections define the supported DeviceNet implemented objects and services for the V7N DeviceNet Drive.

6.5.1 Identity Object Class (01Hex)

The Identity object stores DeviceNet product information.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
05	Reset	Option unit status is reset. (returns to initial status)

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	Identity object software revision is displayed.	0001	*		Word
01	01	*Vendor ID*	Manufacturer code No. is displayed. 44 (2CHex): Yaskawa Electric	002C	*		Word
	02	*Device Type*	Device profile of the compatible DeviceNet is displayed. The DeviceNet product is compatible with AC drive profile. 2: AC drive	0002	*		Word
	03	*Product Code*	Manufacturer’s code	(See Table of EDS Files and Product Codes in the following page)	*		Word
	04	*Revision*	Option unit software revision	03, 01	*		Byte x2
	05	*Status*	Option unit communication status is displayed.	0000	*		Word
	06	*Serial Number*	Option unit serial number	Depends on product	*		Long
	07	*Product Name*	Product model is displayed. V7N	(See Table of EDS Files and Product Codes in the following page)	*		String
	08	*Present Status*	Drive status is displayed. 3: Drive ready	03	*		Byte

6.5.1 Identity Object Class (01Hex) Continued

Table of EDS Files and Product Codes

Drive Model Number	Drive Description	EDS File Names	Drive Capacity V7N Parameter n210 Memobus Register No. 1D2H	Product Code Class 01 Instance 01 Attribute 03	Product Name
CIMR-V7*20P1	3 Phase 230V, 0.13HP, 0.8A	V7NU20P1.EDS	00 (00h)	12288 (3000h)	CIMR-V7NU20P1
CIMR-V7*20P2	3 Phase 230V, 0.25HP, 1.6A	V7NU20P2.EDS	01 (01h)	12289 (3001h)	CIMR-V7NU20P2
CIMR-V7*20P4	3 Phase 230V, 0.5HP, 3A	V7NU20P4.EDS	02 (02h)	12290 (3002h)	CIMR-V7NU20P4
CIMR-V7*20P7	3 Phase 230V, 0.75&1HP, 5A	V7NU20P7.EDS	03 (03h)	12291 (3003h)	CIMR-V7NU20P7
CIMR-V7*21P5	3 Phase 230V, 2HP, 8A	V7NU21P5.EDS	04 (04h)	12292 (3004h)	CIMR-V7NU21P5
CIMR-V7*22P2	3 Phase 230V, 3HP, 11A	V7NU22P2.EDS	05 (05h)	12293 (3005h)	CIMR-V7NU22P2
CIMR-V7*23P7	3 Phase 230V, 5HP, 17.5A	V7NU23P7.EDS	07 (07h)	12295 (3007h)	CIMR-V7NU23P7
CIMR-V7*24P0	3 Phase 230V, 5HP, 17.5A	V7NU24P0.EDS	08 (08h)	12296 (3008h)	CIMR-V7NU24P0
CIMR-V7*25P5	3 Phase 230V, 7.5HP, 25A	V7NU25P5.EDS	09 (09h)	12297 (3009h)	CIMR-V7NU25P5
CIMR-V7*27P5	3 Phase 230V, 10HP, 33A	V7NU27P5.EDS	10 (0Ah)	12298 (300Ah)	CIMR-V7NU27P5
CIMR-V7*40P1	3 Phase 460V, 0.25HP, 1.2A	V7NU40P1.EDS	40 (28h)	12329 (3029h)	CIMR-V7NU40P2
CIMR-V7*40P2	3 Phase 460V, 0.5HP, 1.2A	V7NU40P2.EDS	41 (29h)	12230 (302Ah)	CIMR-V7NU40P4
CIMR-V7*40P4	3 Phase 460V, .75HP, 1.8A	V7NU40P4.EDS	42 (2Ah)	12231 (302Bh)	CIMR-V7NU40P7
CIMR-V7*40P7	3 Phase 460V, 1&2HP, 3.4A	V7NU40P7.EDS	43 (2Bh)	12232(302Ch)	CIMR-V7NU41P5
CIMR-V7*41P5	3 Phase 460V, 3HP, 4.8A	V7NU41P5.EDS	44 (2Ch)	12233 (302Dh)	CIMR-V7NU42P2
CIMR-V7*42P2	3 Phase 460V, 3HP, 5.5A	V7NU42P2.EDS	45 (2Dh)	12234 (302Eh)	CIMR-V7NU43P0
CIMR-V7*43P0	3 Phase 460V, 4HP, 7.2A	V7NU43P0.EDS	46 (2Eh)	12235 (302Fh)	CIMR-V7NU43P7
CIMR-V7*43P7	3 Phase 460V, 5HP, 8.6A	V7NU43P7.EDS	47 (2Fh)	12236 (3030h)	CIMR-V7NU44P0
CIMR-V7*44P0	3 Phase 460V, 5.3HP, 9.2A	V7NU44P0.EDS	48 (30h)	12237 (3031h)	CIMR-V7NU45P5
CIMR-V7*45P5	3 Phase 460V, 7.5&10HP, 14.8A	V7NU45P5.EDS	49 (31h)	12238 (3032h)	CIMR-V7NU47P5
CIMR-V7*47P5	3 Phase 460V, 10HP, 18A	V7NU47P5.EDS	50 (32h)	12239 (3033h)	CIMR-V7NU40P2
CIMR-V7*B0P1	1 Phase 230V, 0.13HP, 0.8A	V7NUB0P1.EDS	20 (14h)	12308 (3014h)	CIMR-V7NUB0P1
CIMR-V7*B0P2	1 Phase 230V, 0.25HP, 1.6A	V7NUB0P2.EDS	21 (15h)	12309 (3015h)	CIMR-V7NUB0P2
CIMR-V7*B0P4	1 Phase 230V, 0.5HP, 3A	V7NUB0P4.EDS	22 (16h)	12310 (3016h)	CIMR-V7NUB0P4
CIMR-V7*B0P7	1 Phase 230V, 1HP, 5A	V7NUB0P7.EDS	23 (17h)	12311 (3017h)	CIMR-V7NUB0P7
CIMR-V7*B1P5	1 Phase 230V, 2HP, 8A	V7NUB1P5.EDS	24 (18h)	12312 (3018h)	CIMR-V7NUB1P5
CIMR-V7*B2P2	1 Phase 230V, 3HP, 11A	V7NUB2P2.EDS	25 (19h)	12313 (3019h)	CIMR-V7NUB2P2
CIMR-V7*B3P7	1 Phase 230V, 5HP, 17.5A	V7NUB3P7.EDS	27 (1Bh)	12315 (301Bh)	CIMR-V7NUB3P7
CIMR-V7*B4P0	1 Phase 230V, 5HP, 17.5A	V7NUB4P0.EDS	28 (1Ch)	12316 (301Ch)	CIMR-V7NUB4P0

Note: The EDS files will be zip format, so you must un-zip the file before installing in the configuration tool.

6.5.2 Message Router Object Class (02Hex)

The Message Router object has the function of routing DeviceNet communication information to the correct object. DeviceNet messages are routed to each function through this object. The Message Router object itself performs the internal processes only.

Supported Service

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	Message Router object software revision is displayed.		0001	*		Word

6.5.3 DeviceNet Object Class (03Hex)

This object is for the DeviceNet communication information / functions.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	DeviceNet object software revision is displayed.		0002	*		Word
01	01	*MAC ID*	MAC ID setting value is displayed according to the DIP switch setting.	0~63	00	*		Byte
	02	*Baud Rate*	Baud rate setting value is displayed according to the DIP switch settings. 0: 125kbps 1: 250kbps 2: 500kbps	0~02	00	*		Byte
	03	*Bus Off Interruption (BOI)*	The operation at a Bus off detection is shown. 00: The Off state of the Bus is maintained.	-	00	*		Byte
	04	*Bus Off Counter*	The number of Bus off detection is shown.	0~255	00	*		Byte
	05	*Allocation Information*	DeviceNet communication connection information is displayed.		00,00	*		Byte X 2

6.5.4 Assembly Object Class (04Hex)

This Assembly object is for the polled I/O message functions. For more details, see section 3 DeviceNet Polled I/O Messaging Communications.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	Assembly object software revision is displayed.		0002	*		Word
14	03	*I/O Data*	Same function as the Basic Speed Control Input Instance 20 (PCA: Master ≥ V7N)	*1		*	*	Byte X 4
15	03	*I/O Data*	Same function as the Extended Speed Control Input Instance 21 (PCA: Master ≥ V7N)	*1		*	*	Byte X 4
46	03	*I/O Data*	Same function as the Basic Speed Control Output Instance 70 (PPA: V7N ≥ Master)			*		Byte X 4
47	03	*I/O Data*	Same function as the Extended Speed Control Output Instance 71 (PPA: V7N ≥ Master)			*		Byte X 4
64	03	*I/O Data*	Same function as the V7N MEMOBUS I/O Control Input Instance 100 (PCA: Master ≥ V7N)	*1		*	*	Byte X 5
65	03	*I/O Data*	Same function as the V7N Standard Drive Control Input Instance 101 (PCA: Master ≥ V7N)	*1		*	*	Byte X 8
66	03	*I/O Data*	Same function as the V7N Accel/Decel Time Control Input Instance 102 (PCA: Master ≥ V7N)	*1		*	*	Byte X 8
69	03	*I/O Data*	Same function as the Extended I/O MEMOBUS Input Instance 105 (PCA: Master ≥ V7N)	*1		*	*	Byte X 8
6A	03	*I/O Data*	Same function as the V7N General Purpose DI/DO Input Instance 106 (PCA: Master ≥ V7N)	*1		*	*	Byte X 8
96	03	*I/O Data*	Same function as the V7N MEMOBUS I/O Control Input Instance 150 (PPA: V7N ≥ Master)			*		Byte X 5
97	03	*I/O Data*	Same function as the V7N Standard Drive Control Output Instance 151 (PPA: V7N ≥ Master)			*		Byte X 8
98	03	*I/O Data*	Same function as the V7N Accel/Decel Time Control Output Instance 152 (PPA: V7N ≥ Master)			*		Byte X 8
9B	03	*I/O Data*	Same function as Extended I/O MEMOBUS Output Instance 155 (PPA: V7N ≥ Master)			*		Byte X 8
9C	03	*I/O Data*	Same function as V7N General Purpose DI/DO Output Instance 156 (PPA: V7N ≥ Master)			*		Byte X 8

*1 Setting range is the same as the individual I/O message function.
*2 Enabling the I/O message communication writes the currently set data over the I/O message. If I/O message communication is ON, do not use this object.

6.5.5 DeviceNet Connection Object Class (05Hex)

The DeviceNet Connection object has the function of keeping track of the DeviceNet communication connection information/functions. On initialization the communication connection with the master is established by using information and functions from this object. Please note that Instance 2 of DeviceNet Object Class 05Hex supports only polled messaging.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	DeviceNet connection object software revision is displayed.		0001	*		Word
01 Explicit Message	01	*Instance State*	This instance status is displayed. 00: It does not exist in the Network yet, and being prepared. 01: On-line status and waiting for the connection from the master. 02: Waiting for the connection ID write. 03: Connection is completed. 04: Time out.		03	*		Byte
	02	*Instance type*	This instance type is displayed. 00: Explicit message 01: I/O message		00	*		Byte
	03	*Connection operation*	The option unit communication status is displayed by a code.		83	*		Byte
	04	*Output (PPA) connection ID*	The level used by the option unit communication header is displayed. This function is set when communication connection is completed.			*		Word
	05	*Input (PCA) connection ID*				*		Word
	06	*Message group*	The option unit communication status is displayed by a code.		21	*		Byte
	07	*No. of Max. output (PPA) bytes*	No. of Max output (PPA) bytes is displayed.		0020	*		Word
	08	*No. of Max. input (PCA) bytes*	No. of Max. input (PCA) bytes is displayed.		0020	*		Word
	09	*Timeout time*	Internal process timeout time is displayed when communication request is received. (Round up 10ms unit)	65535 (ms)	09C4 (2500ms)	*	*	Word
	0C	*Watchdog timeout process*	Timeout internal process regarding communication is displayed. 00: Holds until reset/shut off 01: Automatically shut off 02: Restart with connected status.		01	*		Byte
	0D	*No. of output (PPA) connection bus bytes*	No. of output (PPA) connection bus bytes is displayed.		0000	*		Word
	0E	*Ouput (PPA) connection bus*	The application object received the data through this instance is displayed.			*		Array
	0F	*No. of input (PCA) connection bus bytes*	No. of input (PCA) connection bus bytes is displayed.		0000	*		Word
	10	*Input (PCA) connection bus*	The application object received the data through this instance is displayed.			*		Array
	11	*Min. explicit send waiting time*	Minimum waiting time at which data is sent in explicit messaging		0000 (0mSec)	*		Word

6.5.5 DeviceNet Connection Object Class (05Hex) Continued

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
02 Polled Message Only	01	*Instance State*	This instance status is displayed. 00: It does not exist in the Network yet, and being prepared. 01: On-line status and waiting for the connection from the master. 02: Waiting for the connection ID write. 03: Connection is completed. 04: Time out.		03	*		Byte
	02	*Instance type*	This instance type is displayed. 00: Explicit message 01: I/O message		01	*		Byte
	03	*Connection operation*	The option unit communication status is displayed by a code.		82	*		Byte
	04	*Output (PPA) connection ID*	The level used by the option unit communication header is displayed. This function is set when communication connection is completed.			*		Word
	05	*Input (PCA) connection ID*				*		Word
	06	*Message group*	The option unit communication status is displayed by the code.		01	*		Byte
	07	*No. of Max. output (PPA) bytes*	No. of Max output (PPA) bytes is displayed.		0004	*		Word
	08	*No. of Max. input (PCA) bytes*	No. of Max. input (PCA) bytes is displayed.		0004	*		Word
	09	*Timeout time*	Internal process timeout time is displayed when communication request is received. (Round up 10ms unit)	65535 (ms)	0000 (0ms)	*	*	Word
	0C	*Watchdog timeout process*	Timeout internal process regarding communication is displayed. 00: Holds until reset/shut off 01: Automatically shut off 02: Restart with connected status.		01	*	*	Byte
	0D	*No. of output (PPA) connection bus bytes*	No. of output (PPA) connection bus bytes is displayed.		0003	*		Word
	0E	*Ouput communication path Polled Producing Assembly (PPA)*	The application object received the data through this instance is displayed.		62 34 37	*	*	Array
	0F	*No. of input (PCA) connection path bytes*	No. of input (PCA) connection bus bytes is displayed.		0003	*		Word
	10	*Input communication path Polled Consuming Assembly (PCA)*	The application object received the data through this instance is displayed.		62 31 35	*	*	Array
	11	*Min. polled send waiting time*	Minimum waiting time at which data is sent in polled messaging		0000 (0mSec)	*		Word

6.5.6 Motor Data Object Class (28Hex)

The motor data object is for the information and functions related to the motor connected to the drive. Motor rated current and rated voltage can be set and read.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	Motor Data object software revision is displayed.		0001	*		Word
01	03	*Motor Type*	Used motor type is displayed. 7: Squirrel-cage induction motor		07	*		Byte
	06	*Motor Rated Current*	Motor rated current can be set and read. Setting unit: 0.1A	10~150% of drive rated current	*1	*	*	Word
	07	*Motor Rated Voltage*	Motor rated voltage can be set and read. Setting unit: 1V	255V *2	00C8 *2	*	*	Word

[*1] The motor rated current initial value varies according to drive capacity.
[*2] The initial value and setting range are for the 230V class. For the 460V class, the value is twice that of the 230V class.

6.5.7 Control Supervisor Object Class (29Hex)

The control supervisor object is dedicated to the information and services related to the drive control functions. The basic control functions such as, drive run, stop, and fault detect are implemented. The control supervisor object functions are commonly used with polled I/O messaging functions.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.
05	Reset	Option unit status is reset. (returns to initial status)

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	Control supervisor object software revision is displayed.		0001	*		Word
01	03	*Forward Run*	The drive runs forward. 00: Stop 01: Forward run	00,01	00	*	*	Byte
	04	*Reverse Run*	The drive runs reverse. 00: Stop 01: Reverse run	00,01	00	*	*	Byte
	05	*NetCtrl*	Run command rights displayed. *1 00: Run command input method by run command selection (n003) 01: Run command (byte 0 - bit 0,1) is enabled through DeviceNet.	00,01	00	*	*	Byte
	06	*Drive Status*	The drive status is displayed. 02: Drive not ready 03: Drive ready during stop 04: Drive running 05: Decelerating to stop (normal) 06: Decelerating to stop during fault 07: Drive fault during stop		03	*		Byte
	07	*During Forward Run*	The drive run status is displayed. 00: During stop/reverse/DC injection @ rev run on 01: During forward run/DC injection @ rev run off		00	*		Byte
	08	*During Reverse Run*	The drive run status is displayed. 00: During stop/forward/DC injection @ rev run off 01: During reverse/DC injection @ rev run on		00	*		Byte
	09	*Drive Ready*	The drive operation preparing status is displayed. 00: During fault detection/preparation 01: Ready		00	*		Byte
	0A	*Fault*	The drive fault detection status is displayed. 00: Normal 01: During fault detection		00	*		Byte
	0B	*Alarm*	The drive alarm detection status is displayed. 00: Normal 01: During alarm detection		00	*		Byte
	0C	*Fault Reset*	The drive is reset through fault detection status. 00: Fault reset off 01: Fault reset	00,01	00	*	*	Byte
	0D	*Fault Code*	The drive fault detection content is displayed by the code listed in the table below. *3		0000	*		Word
	0F	*Ctrl From Net*	The drive run command input selection status is displayed. *1 00: Run command input other than the DeviceNet is enabled. 01: Run command input is enabled through DeviceNet.		00	*		Byte

Object Content Continued

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
01	10	*DeviceNet Fault Mode*	Mode selection is displayed when DeviceNet becomes fault. *2 02: Manufacturer		02	*		Byte
	11	*External Fault from Option*	External fault (EF0) is input 00: EF0 Not Active 01: External fault (EF0)	00,01	00	*	*	Byte
	12	*External Fault Input Status from Option*	External fault (EF0) input status is displayed. 00: EF0 Not Active 01: During external fault (EF0) input		00	*		Byte

6.5.7 Control Supervisor Object Class (29Hex) Continued

Notes:

*1 A setting during drive operation cannot be changed.
*2 DeviceNet communication fault cannot be set. The drive detects fault and stops at DeviceNet communication fault. The drive stopping method at communication fault can be selected by time-over detection selection parameter (n151).
*3 Fault Code (See below table for interpretation)

Table of DeviceNet Fault Codes

DeviceNet Fault Code No. (Hex)	Operator Fault Display	Content
0000	–	Drive normal
2220	OL2	Drive overload
2310	OL1	Motor overload
2300	OC	Overcurrent
2340	SC	Short Circuit*
3130	PF	Input phase loss
	LF	Output phase loss
3210	OV	Main circuit overvoltage
3220	UV1	Main circuit low voltage
4210	OH	Overheat fin
5110	UV2	Power fault
5210	F05	A/D convert error
5300	F07	Operator circuit error
	OPR	Operator disconnection
6320	F04	EEPROM error
7112	rH	Braking resistor overheat
8100	BUS	Option communication error
8200	FbL	PID feedback error
8311	OL3	Overtorque 1
8321	UL3	Undertorque
9000	EF3	External fault (Input terminal S3)
	EF4	External fault (Input terminal S4)
	EF5	External fault (Input terminal S5)
	EF6	External fault (Input terminal S6)
	EF7	External fault (Input terminal S7)
	EF0	Option external fault
	STP	Fast stop

* Applies to Drives 7.5 Hp and greater.

6.5.8 AC/DC Drive Object Class (2AHex)

The AC/DC drive object is also dedicated to the information and function related to the drive operation. Frequency reference settings, individual monitor parameters, and data unit settings can be changed. The AC/DC drive object function is commonly used with I/O message functions for setting or returning drive status information.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Object Content

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
00	01	*Object Software Revision*	AC/DC drive object software revision is displayed.		0001	*		Word
01	03	*Speed agree*	Drive frequency agree detection status is displayed. 00: During stop/decel/accel 01: Frequency agree		00	*		Byte
	04	*NetRef*	Frequency reference rights is set. *1 00: Frequency reference input method set by frequency reference selection (n004). 01: Frequency reference (byte 2, 3) through DeviceNet is enabled.	00,01	00	*	*	Byte
	06	*Control mode*	Drive control mode is set. *3 00: V/F control 01: Vector control	00,03	01	*	*	Byte
	07	*Speed monitor*	Drive speed is displayed. *2 Min. unit: [r/min/2^{SS}] ^{SS}: Speed scale: attribute 16		0000	*		Word
	08	*Speed reference*	Frequency Reference is set/read[*2] Min. unit: [r/min/2^{SS}] ^{SS}: Speed scale: attribute 16	0-n011	0000	*	*	Word
	09	*Output current*	Drive output current is displayed:[*2] Current Unit: [0.1A/2^{CS}] ^{CS}: Current scale: attribute 17		0000	*		Word
	0F	*Output power*	Drive output power is displayed:[*2] Power Unit: [W/2^{PS}] ^{PS}: Power scale: attribute 1A		0000	*		Word
	10	*Input Voltage*	Drive input voltage is displayed: Min. Unit: [V/2^{VS}] ^{VS}: Voltage scale: attribute 1B		0000	*		Word
	11	*Output Voltage*	Drive output voltage is displayed: Min. Unit: [V/2^{VS}] ^{VS}: Voltage scale: attribute 1B		0000	*		Word
	12	*Accel Time*	Acceleration time 1 is set / read. Min. Unit: [ms/2^{TS}] ^{TS}: TIme scale: attribute 1C	0-655.35s	0x2710 (10.0s)	*	*	Word
	13	*Decel Time*	Deceleration time 1 is set / read. Min. Unit: [ms/2^{TS}] ^{TS}: Time scale: attribute 1C	0-655.35s	0x2710 (10.0s)	*	*	Word
	14	*Low Speed Limit*	Drive Frequency Reference lower limit value is set / read. [*2 *3] Min. Unit: [r/min/2^{SS}] ^{SS}: Speed scale: attribute 16	0-100.0%	0000	*	*	Word
	15	*High Speed Limit*	Drive Frequency Reference upper limit value is set / read. [*2 *3] Min. Unit: [r/min/2^{SS}] ^{SS}: Speed scale: attribute 16	0-100.0%	0x0708 (1800r/m)	*	*	Word
	16	*Speed Scale*	Data unit coefficient regarding speed is set / read. Min. Unit: 1 [r/min] x 1/2^{SS} ^{SS}: Speed scale setting value	-15-15 (F1-0F)	00	*	*	Byte
	17	*Current Scale*	Data Coefficient regarding current is set / read. Current Unit: 0.1 [A] x 1/2^{CS} ^{CS}: Current scale setting value	-15-15 (F1-0F)	00	*	*	Byte

6.5.8 AC/DC Drive Object Class (2AHex) Continued

Instance (Hex)	Attribute (Hex)	Name	Description	Setting Range	Initial Value (Hex)	Read	Write	Size
	1A	*Power Scale*	Data Coefficient regarding power is set / read. Power Unit: 1 [W] x $1/2^{PS}$ PS: Power scale setting value	-15-15 (F1-0F)	00	*	*	Byte
	1B	*Voltage Scale*	Data unit coefficient regarding voltage is set / read. Voltage Unit: 1 [V] x $1/2^{VS}$ VS: Voltage scale setting value	-15-15 (F1-0F)	00	*	*	Byte
	1C	*Time Scale*	Data unit coefficient regarding time is set and read. Time Unit: 1 [ms] x $1/2^{TS}$ TS: Time scale setting value	-15-15 (F1-0F)	00	*	*	Byte
	1D	*Ref From Net*	Drive frequency reference input selection status is displayed [*1] 00: Frequency Reference input other than DeviceNet is enabled. 01: Frequency Reference input from DeviceNet is enabled.	00,01	00	*		Byte

[*1] A setting during drive operation can not be changed.
[*2] An application of speed command, speed monitor, speed lower limit value, and speed upper limit value must be set as a motor pole value (2~39) to the drive parameter no. n035 (frequency reference set/display unit selection)
[*3] Control mode, speed lower limit, and speed upper limit cannot be set during drive operation.
SS: Speed Scale (AC/DC Drive Object Attr. 22)
CS: Current Scale (AC/DC Drive Object Attr. 23)
PS: Power Scale (AC/DC Drive Object Attr. 26)
VS: Voltage Scale (AC/DC Drive Object Attr. 27)
TS: Time Scale (AC/DC Drive Object Attr. 28)

6.5.9 V7N Drive Parameters Object Class 100 (64Hex)

This Object Class is dedicated to accessing the parameters in the V7N drive. It allows all drive parameters to be read and set. This object class is for Yaskawa V7N drives only and is not interchangeable with other DeviceNet drives. After writing parameters through Class 100, an ENTER command must be issued.

6.5.9.1 Class 100 (64Hex), Instance 1

Object Class 100 Attribute, Instance 1 addresses are the same as the corresponding V7N drive parameter numbers converted to Hexadecimal value, except for parameter n128 and n129, which is D3h for parameter n128 and D4h for parameter n129. Appendix A in the back portion of this manual lists all the V7N parameter numbers and Object Class 100 Attribute Numbers. The data size for each Attribute is 2 bytes each. Refer to the V7N Technical Manual for description on the parameters.

Supported Services

Service Code (Hex)	Service Name	Description of Service
0E	Get_Attribute_Single	Designated attribute content is returned.
10	Set_Attribute_Single	Designated attribute content is changed.

Example 1:
To read parameter n002 Control Method Selection, send an explicit message with Service Code 0Ehex (Get Attribute Single) to Class 64hex / Instance 1 / Attribute 02hex. If the returned value is 0001hex, then the Control Method is set to Open Loop Vector.

Addr	Param	Class 100	Function	Data	Limits - Description	Default
102h	n002	02h	Control Method Selection	0	V/F Control	1
				1	Open Loop Vector	

Example 2:
To set parameter n019 Acceleration Time 1 to 3.5 seconds, send an explicit message with Service Code 10hex (Set Attribute Single) to Class 64hex / Instance 1 / Attribute 13hex, with the data field as 23hex (35). The data field does not recognize decimal places, so the data must be written as a whole number. Also, in reading and setting to parameters n019 to n022 and n041 to n044 Acceleration/Deceleration 1 - 4, be sure to check the setting of parameter n018 Accel / Decel Time Setting Unit. For instance, in this example, if n018 is set to value of 1 (0.01 – two decimal places) instead of the default value of parameter n018, which is 0 (0.1 - one decimal place), the data field to set acceleration time to 3.50 seconds would be 15Ehex (350).

Addr	Param	Class 100	Function	Data	Limits - Description	Default
112h	n018	12h	ACC / DEC Time Setting Unit	0	0.1	0
				1	0.01	
113h	n019	13h	Acceleration Time 1	-	0.00 to 600.00 or 0.0 to 6000.0 seconds[22]	10.0[1]

[1] Scaling is dependent on setting of n018, ACC/DEC time setting unit

6.5.9 V7N Drive Parameters Object Class 100 (64Hex) Continued

6.5.9.2 Enter Command

Yaskawa's V7N drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of Modbus registers are stored in different areas of memory. V7N Modbus monitor and command registers 001-03Dhex (Appendix A) are always stored in Volatile memory. Any data read or written from these registers will not be retained during a power loss situation. Modbus parameter registers 101h to 1D2h (Appendix A) are stored in Volatile memory until the 'ENTER' command is applied. When writing new data to parameter registers, the 'ENTER' command must be given for the new data to become stored in Non-Volatile memory. If the 'ENTER' command is not used, the changed data will not be retained during power loss.

An 'ENTER' command can be executed by writing the value of '0' to Class 64h, Instance 09h, Attribute 00h. If a power loss occurs after the ENTER command has been issued and accepted, the data will be retained in the V7N.

WARNING

Use the ENTER command only when necessary! The life of the EEPROM (Non-Volatile memory) on the V7N will support a finite number of operations. This means that the ENTER command, value '0' written to register 0900h (Class 64h, Instance 09h, Attribute 00h) can only be used a maximum of a 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (ERR) requiring the V7N control board to be replaced.

6.5.9.3 Class 100 (64Hex), Instance 16 (10Hex)

Object Class 100, Instance 16 (10hex) allows access to Drive monitor displays via Modbus Monitor Registers 20h to 3Dh. An explicit message can be sent from the PLC to the drive to monitor any drive status (Registers 20h to 3Dh) listed in Section 4.5 Monitor Displays.

Example 3:
To read the DC Bus Voltage, send an explicit message with Service Code 0Ehex (Get Attribute Single) to Class 64hex / Instance 16 / Attribute 31hex). The returned value will be the DC Bus Voltage.

Monitor	Contents	Display Example	Modbus Address (hex)
U-05	DC Bus Voltage VPN	325	31

Section 7. FAULT DIAGNOSIS AND CORRECTIVE ACTIONS

7.1 GENERAL

This section describes the alarm and fault displays, explanations for fault conditions and corrective actions to be taken if the Drive malfunctions.

A failure can fall into one of two categories, Drive or DeviceNet. A Drive failure can be either an Alarm or a Fault, as detailed below. A DeviceNet failure is detailed in paragraph 7.3.

A blinking “Alarm” indication is a warning that a Drive trouble condition will soon occur, or that a programming error has been made. The Drive will continue to operate during an “Alarm” indication.

A blinking “Minor Fault” indication is displayed during less serious faults, or when a problem exists in the external circuitry. The Drive will continue to operate, and a “Minor Fault” contact will be closed if a multi-function output is programmed for the condition.

A steady “Major Fault” indication is displayed when the Drive’s Fault relay has tripped. The motor coasts to a stop, and a fault signal output is present at control circuit terminals 18-20.

☼ : ON   ◎ : BLINKING   ● : OFF

Table 7-1. Alarm Displays and Corrective Actions

Alarm Display		Drive Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
Uu Blinking	◎ ◎	Warning only. Fault contacts do not change state.	UV (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the drive output is OFF. 230V: Stops at main circuit DC voltage below approx. 200V (160V for single-phase) 460V: Stops at main circuit DC voltage below approx. 400 V	Check the following: • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are securely tightened.
ou Blinking			OV (Main circuit overvoltage) Main circuit DC voltage exceeds the over voltage detection level while the drive output is OFF. Detection level: approx. 410V or more (approx. 820V for 460V class).	Check the power supply voltage.
oH Blinking			OH (Cooling fin overheat) Intake air temperature rises while the drive output is OFF.	Check the intake air temperature.
oH3 Blinking	◎ ◎	Warning. Fault contacts do not change state.	OH3 (Drive overheat pre-alarm) OH3 signal is input.	Release the input of inverter overheat pre-alarm signal.

Table 7-1. Alarm Displays and Corrective Actions - Continued

Alarm Display		Drive Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
CAL Blinking		Warning only. Fault contacts do not change state.	CAL (DEVICENET communications waiting) Data has not been received from the PLC when the parameter n003 (operation command selection) is 3 or n004 (frequency reference selection) is 9, and power is turned ON. MAC ID and/or Baud Rate is not matched to the PLC.	Check communication devices, and transmission signals. Check Baud Rate and MAC ID of drive and PLC.
OPE☐ Blinking			OPE☐ (Parameter setting error when the parameter setting is performed through the MODBUS communications) OPE1: Two or more values are set for multi-function input selection. (parameters n050 to n056) OPE2: Relationship among V / f parameters is not correct. (parameters n011, n013, n014, n016) OPE3: Setting value of electronic thermal standard current exceeds 150% of drive rated current. (parameter n036) OPE4: Upper / lower limit of frequency reference is reversed. (parameters n033, n034) OPE5: (parameters n083 to n085) OPE9: Carrier frequency setting is incorrect. (parameter n080)	Check the setting values.
oL3 Blinking			OL 3 (Overtorque detection) Motor current exceeded the preset value in parameter n098.	Reduce the load, and increase the accel / decel time.
SEr Blinking			SEr (Sequence error) Drive receives LOCAL / REMOTE select command or communication / control circuit terminal changing signals from the multi-function terminal while the drive output is ON.	Check the external circuit (sequence).

Table 7-1. Alarm Displays and Corrective Actions - Continued

Alarm Display: Digital Operator	Alarm Display: RUN (Green) ALARM (Red)	Drive Status	Explanation	Causes and Corrective Actions
bb Blinking		Warning only. Fault contacts do not change state.	BB (External baseblock) Baseblock command at multi-function terminal is active, the drive output is shut OFF (motor coasting). Temporary condition is cleared when input command is removed.	Check the external circuit (sequence).
EF Blinking	or		EF (Simultaneous FWD/ REV run commands) When FWD and REV run commands are simultaneously input for over 500ms, the drive stops according to parameter n005.	Check the external circuit (sequence).
STP Blinking			STP (Operator function stop) is pressed during running by the control circuit terminals FWD / REV command. The drive stops according to parameter n005. STP (Emergency stop) Drive receives emergency stop alarm signal. Drive stops according to parameter n005.	Open FWD/REV command of control circuit terminals. Check the external circuit (sequence).
UL3		Protective operation. Output is shut OFF and motor coasts to a stop.	When under torque is detected, drive performs operation according to the preset setting of constant n117.	Parameter n118 up to the lowest value allowed for the machine.
FAN Blinking			FAN (Cooling fan fault) Cooling fan is locked.	Check the following: • Cooling fan • Cooling fan wiring is not connected.
UL3 Blinking		Warning. Fault contacts do not change state.	UL3 (Under torque detection) V/f mode: Drive output current fell below the preset value in parameter n118. Vector mode: Motor current or torque fell below the preset value in parameter n097 and n118.	Load (output current or output torque) is too low. Check the driven machine and correct the cause of the fault, or decrease the value of parameter n118
rUn		Warning. Fault contacts do not change state.	After "bUS" fault or "EF0" faults are reset during RUN via DeviceNet, the drive will RUN and "rUn" alarm will be present. Once the RUN is removed, no alarm will be present.	Check DeviceNet connection and communications data.

Table 7-2. Fault Displays and Corrective Actions

Fault Display		Drive Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
dE1	● ◍ or ☼ ◍	Warning. Fault contacts do not change state.	I/O message length from PLC does not match the Polled I/O Data length set by n148 and n149.	Check PLC data sent and n148 and n149.
oC			OC (Overcurrent) Drive output current momentarily exceeds approx. 250% of rated current.	• Short circuit at drive output side • Excessive load inertia • Extremely rapid accel/ decel time (parameters n019 to n022) • Special motor used • Starting motor during coasting • Motor of a capacity greater than the drive rating has been started. • Magnetic contactor open/closed at the drive output side
ou	● ☼	Protective Operation. Output is shut OFF and motor coasts to a stop.	OV (Main circuit over-voltage) Main circuit DC voltage exceeds the overvoltage detection level because of excessive regenerative energy from the motor. Detection level: 230V: Stops at main circuit DC voltage below approx. 410V 460V: Stops at main circuit DC voltage approx. 820V or more	• Insufficient decel time parameters n020 and n022) • Lowering of minus load (elevator, etc.) ⇦ • Increase decel time. • Connect optional dynamic braking resistor.
Uu1			UV1 (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the drive output is ON. 230V: Stops at main circuit DC voltage below approx. 200V 460V: Stops at main circuit DC voltage approx. 400V or more	• Reduction of input power supply voltage • Open phase of input supply • Occurrence of momentary power loss ⇦ Check the following: • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are securely tightened.

Table 7-2. Fault Displays and Corrective Actions - Continued

Fault Display: Digital Operator	Fault Display: RUN (Green) ALARM (Red)	Drive Status	Explanation	Causes and Corrective Actions
Uu2	● ☼	Protective Operation. Output is shut OFF and motor coasts to a stop.	UV2 (Control power supply fault) Voltage fault of control power supply is detected.	Cycle power. If the fault remains. replace the drive.
oH			OH (Cooling fin overheat) Temperature rise because of drive overload operation or intake air temperature rise.	• Excessive load • Improper V/f pattern setting • Insufficient accel time if the fault occurs during acceleration • Intake air temperature exceeding 122°F (50°C) ⇦ Check the following: • Load size • V/f pattern setting (parameters n011 to n017) • Intake air temperature.
oL1			OL1 (Motor overload) Motor overload protection operates by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (parameters n011 to n017) • Set the motor rated current shown on the nameplate in parameter n036.
oL2			OL2 (Drive overload) Drive overload protection operates by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (parameters n011 to n017) • Check the drive capacity.
oL3			OL3 (Overtorque detection) V/f mode: Drive output current exceeded the preset value in parameter n098. Open Loop Vector mode: Motor current or torque exceeded the preset value in parameters n097 and n098. When overtorque is detected, drive performs operation according to the preset setting of parameter n096.	Check the driven machine and correct the cause of the fault, or increase the value of parameter n098 up to the highest value allowed for the machine.

Table 7-2. Fault Displays and Corrective Actions - Continued

Fault Display		Drive Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
EF□	● ☼	Protective Operation. Output is shut OFF and motor coasts to a stop.	EF☐ (External fault) Drive receives an external fault input from control circuit terminal. EF0: External fault reference through DEVICENET communications EF1: External fault input command from control circuit terminal S1 EF2: External fault input command from control circuit terminal S2 EF3: External fault input command from control circuit terminal S3 EF4: External fault input command from control circuit terminal S4 EF5: External fault input command from control circuit terminal S5 EF6: External fault input command from control circuit terminal S6 EF7: External fault input command from control circuit terminal S7	Check the external circuit (sequence).
F00			CPF-00 Drive cannot communicate with the digital operator for 5 sec. or more when power is turned ON.	Cycle power after checking the digital operator is securely mounted. If the fault remains, replace the digital operator or drive.
F01			CPF-01 Transmission fault occurred for 5 sec or more when transmission starts with the digital operator.	Cycle power after checking the digital operator is securely mounted. If the fault remains, replace the digital operator or drive.
F04			CPF-04 EEPROM fault of drive control circuit is detected.	• Record all parameter data and initialize the constants. (Refer to paragraph 5.__ for constant initialization.) • Cycle power. If the fault remains, replace the drive.

Table 7-2. Fault Displays and Corrective Actions - Continued

Fault Display: Digital Operator	Fault Display: RUN (Green) ALARM (Red)	Drive Status	Explanation	Causes and Corrective Actions
F05	● ☼	Protective Operation. Output is shut OFF and motor coasts to a stop.	CPF-05 A/D converter fault is detected.	Cycle power. If the fault remains, replace the drive.
F06			CPF-06 Option card connecting fault	Remove power to the drive. Check the connection of the digital operator.
F07			CPF-07 Operator control circuit (EEPROM or A/D converter) fault	Cycle power after checking the digital operator is securely mounted. If the fault remains, replace the digital operator or drive.
oPA			OPR (Operator connecting fault)	Cycle power. If the fault remains, replace the drive.
CE			CE (MODBUS communications fault)	Check the communication devices or communication signals.
STP	☼ or ● ☼	Stops according to parameter	STP (Emergency stop) The drive stops according to parameter n005 after receiving the emergency stop fault signal.	Check the external circuit (sequence).
bUS	● ☼	Protective Operation. Output is shut OFF and motor coasts to a stop.	DeviceNet 24V power supply is OFF and cannot communicate with DeviceNet master.	Check the 24V power supply and cable connections.
— (OFF)	● ●	Stops according to parameter	• Insufficient power supply voltage • Control power supply fault • Hardware fault	Check the following: • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are securely tightened. • Control sequence. Replace the drive.

For display/clear of fault history, refer to page 7-8.

Note 1: This fault display only available on drive model numbers CIMR-V7AM25P51, 27P51, 45P51, and 47P51 (MVA025, MVA033, MV015, and MVB018). All other drive ratings display “0L” when a ground fault condition occurs.

7.2 Displaying Fault Sequence

When U-09 or n178 is selected, a four-digit box is displayed. The three digits from the right show a fault description code, and the digit on the left shows the order of fault (from one to four). Number 1 represents the latest fault, and 2,3,4, in ascending order of fault occurrence.

- Example
  ■□□□ ...... 4-digit numbers
  ■ : Order of fault (1 to 4)
  □□□ : Fault description
  "---" is displayed if there is no fault.
  (Refer to section 6 for details of fault.)

- Viewing fault record
  Press the ∧ or ∨ key to examine the complete fault record.

- Clearing fault record
  Set parameter n001 to "6" to clear the fault record. Display returns to "n001" after completion of 6 setting.

Table 7-3. Displaying Fault Sequence

STEP	OPERATION PROCEDURE	DIGITAL OPERATOR DISPLAY
1	Press DSPL until the MNTR LED is lit The digital operator display will read "U-01"	U-01
2	Press ∧ until "U-09" appears on the display.	U-09
3	Press ENTER .	1.EF3
4	Press ∧ . The display indicates that this is currently the next code in the memory register.	2.OV
5	Continue pressing ∧ to display the other codes in the memory register. After the last register code is displayed, the sequence will return to the first code.	3.OC 4.– – – 1.EF3

After the fault sequence has been examined, troubleshoot the most recent fault before entering a Fault Reset command (by Digital Operator **STOP/RESET** key or external signal at multi-function input) to prepare the Drive for restart of operation.

Note 1: Parameter initializing (n001=10 or 11) also clears the fault record.
Note 2: Resetting a fault from either the digital operator or multi-function input will not reset the fault record.

7.3 DeviceNet Faults

Table 7-4. DeviceNet Communication LED Faults and Operation

LED Display		Content	Cause	Countermeasure
MS	NS			
Not Lit	Not Lit	Power OFF	The drive does not have power supply.	Check the drive main circuit wiring. Turn the power ON.
Flashing Green	Not Lit	During Communication Preparation	Initial setting status or the communication is not ready.	Cycle drive power. If the fault persists, change the drive unit.
Flashing Red	Not Lit	Related to Communication Possible Recovery Fault	A wrong setting of a switch or the possible recovery fault is occurring.	Check baud rate setting, and then cycle drive power. If the fault persists, change the drive unit.
Lit Red	Not Lit	Related to Communication Impossible Recovery Fault	A fault, which is impossible to recover related to communication, is occurring.	Cycle drive power. If the fault persists, change the drive unit.
Lit Green	Flashing Red	Communication Time-Out	Communication timeout occurred.	• Check if the end termination resistance is correctly connected to the communication line. • Check if the communication line is correctly connected (disconnection and connector connection fault. • Check if the communication line is separated from the main circuit wiring. • Check data length sent by the PLC matches the data length expected by the drive.
Lit Green	Lit Red	Communication Fault	Communication cannot proceed.	• Check if other device and MAC ID are overlapped in the network. • Check if the master is correctly operated. • Check if the end termination resistance is correctly connected. • Check if the communication line is correctly connected (disconnection and connector connection fault). • Check if the communication line is separated from the main circuit wiring.
Lit Green	Flashing Green	Normal (No Communication Data)	Although a fault did not occur, the drive does not communicate with master.	Send explicit message / I/O message from the master as necessary.
Lit Green	Lit Green	Normal (Communication Data)	Performing normal communication.	-

During explicit messaging, if a requested message has an error response from the master, the drive sends a response message with one of the following error codes as shown in Table 7-5, attached as data with the service code "94."

Table 7-5. Explicit Message Communication Error

Error Code	Content	Cause	Solution
08FF	Service not requested.	Wrong service code.	Correct service code.
09FF	Invalid attribute value detection.	Wrong attribute value.	Correct attribute value.
0CFF	Executing requested service not possible.	A non run-operative drive parameter is being attempted to be set during drive operation.	Stop drive operation.
0EFF	Attribute setting prohibited.	Cannot write to Attribute.	Correct service code and attribute value.
13FF	Improper data size.	Data size is not matched.	Correct data size.
14FF	Unauthorized Attribute.	Unauthorized service was attempted to operate on the attribute.	Correct service code and attribute value.
15FF	Excessive data.	Data size is not matched.	Correct data size.
16FF	Object does not exist.	Object is not defined in interface.	Correct class and interface value.
1FFF	Manufacturer specific error.	An un-settable drive setting was attempted to be written to during drive operation. A drive setting is attempted to be written outside the setting range.	Stop the drive. Correct the data within the range.
20FF	Parameter fault.	A data write is attempted that is outside of the setting range.	Correct the data within the setting range.

Table 7-6. Modbus I/O Instance Errors

Error Code	Content	Causes
01 Hex	Function code error	Function code from the master was other than 00 Hex, 03 Hex, and 10 Hex.
02 Hex	Register No. error	A register number was not found. Enter command (0900H) registered for write started to read.
21 Hex	Data setting error	Parameter setting error occurred by a parameter write. Upper and lower byte values were out of alignment, swapped.
22 Hex	Write mode error	During run, a parameter was attempted to be written from the master. Enter command was attempted to write from the master during UV. A parameter was attempted to write from the master during UV. Enter command was attempted to write from the master during UV. A parameter was attempted to write from the master during data store. Data for read only was attempted to write from the master.

7.4 DEVICENET TROUBLESHOOTING

The following is a short guide to troubleshooting a Yaskawa V7N DeviceNet installation. It highlights some of the most common issues when diagnosing and correcting issues associated with the startup and operation of a Yaskawa V7N in a DeviceNet industrial network. Further information on the features of each interface can be found in the V7N DeviceNet Technical Manual. While most of this information is centered on the application of V7N, most of the guidelines presented are applicable in most DeviceNet Networks.

Diagnosis of network fault issues will typically fall into three categories, Installation of the DeviceNet drive, Wiring and Cabling issues, and Network Configuration / Diagnostics. Each of these areas will be discussed in the following document to help resolve common problems associated in DeviceNet network troubleshooting.

7.4.1 DeviceNet Troubleshooting Check-off Sheet

DRIVE Checklist:

- ❑ Drive Model Number:
- ❑ The drive works correctly without DeviceNet communications.
- ❑ The DeviceNet Drive Software Number from parameter n179: __________________
- ❑ The DeviceNet baud rate settings are correct.
  - SW1 (RATE): ____________
  - Parameter n152: __________
- ❑ The DeviceNet Node Address / MAC ID (MAC ID = (S3 x 10) + S4): _______
  - SW3 (MSD): _________
  - SW4 (LSD): _________
  - Parameter n150: ________
- ❑ The Drive, Network Frequency Reference and RUN/STOP method are set.
  - Run/Stop n003= __________
  - Frequency Reference n004= __________

CABLING Checklist:

- ❑ The correct type of cabling is used throughout the DeviceNet network installation.
- ❑ The Cable Connections at EACH NODE have been verified for solid connections.
- ❑ The Cable Lengths are within DeviceNet specification requirements.
- ❑ The DeviceNet Cabling node drop lengths are within the specification requirements.
- ❑ There are NO MORE than 64 nodes connected on the DeviceNet network.
- ❑ There are ONLY two termination resistors (which are 120 ohms) installed at each of the furthest ends of the DeviceNet Cabling installation.
- ❑ There is 24 volts measured at each node of the DeviceNet installation across Pins 1 and 5 of the DeviceNet connector.
- ❑ The DC common mode voltage drop measures less than 5 volts between any two points on the DeviceNet network cabling.
- ❑ The shield is continuous throughout the DeviceNet cabling installation and is connected at the Power Supply at one single point.
- ❑ The DeviceNet recommended clearances and routing procedures are followed in the cable paths throughout the network cabling installation.
- ❑ The 24 Volt power supply is grounded at only one point in the installation.

CONFIGURATION and DIAGNOSTICS Checklist:

- ❑ The Polled producing Assembly and Polled Consuming Assembly have been set in the Drive.
  - Polled Producing Assembly: PPA = ________________.
  - Polled Consuming Assembly: PCA = ________________.
- ❑ The DeviceNet master (PLC or Controller) is configured to receive and transmit the corresponding number of bytes of information dependant on the assemblies programmed.
- ❑ The DeviceNet Drive is indicating the correct LED status. The NS and MS LED’s will be ON solid green when operating with the PLC or Controller.
- ❑ All of the DeviceNet nodes on the network have the DeviceNet Conformance Tested check mark.

7.4.2 Installation of DeviceNet Drive

1. **Verify that the Yaskawa drive works correctly without the communications**. Follow Yaskawa Drive's Quick start and Technical Manual procedures to validate that the drive's operation and installation is correct before introducing any further issues. This will also help determine if the problem is associated with the network controls system or the drive applications.
2. **Verify and write down the Model Number and Software Number of the Drive**. The Model Number can be found on the nameplate on the side of the drive. The Model Number or capacity is necessary to select the proper EDS file. The software number is shown in parameter n179. This specifies the software version in the drive. It will also be useful to have for further technical support.
3. **Verify that the Drive Run/Stop Operation Method Selection parameter is set per the application requirements**. For Example: If the V7N will be receiving the Run/Stop command from the DeviceNet network, the parameter n003 in the V7N must be set to '3 – Drive'. See V7N technical manual for further explanation of this parameter.
4. **Verify that the Drive Frequency Reference Selection parameter is set per the application requirements**. For Example: If the V7N will be receiving the Frequency Reference from the DeviceNet network, the parameter n004 in the V7N must be set to '9 – Drive'. See V7N technical manual for further explanation of this parameter.

V7N Programming required for DeviceNet Control

Parameter	Value	Description
n003	3	Sets the Run/Stop to come from the Drive
n004	9	Sets the frequency reference to come from the Drive

5. **Verify that the Rotary Switch Position S1 "RATE" is set correctly on the Drive**. The Drive's baud rate can be set in two different ways. The baud rate can be set using rotary switch when in position 0, 1, or 2 (125kbps, 250kbps, or 500kbps). The baud rate can also be set through parameter n152 when the rotary switch is set to 3 to 9.

S1 Switch Setting	0	1	2	3-9	
Baud Rate	125 kbps	250 kbps	500 kbps	Parameter n152	0: 125 kbps 1: 250 kbps 2: 500 kbps

6. **Verify that the Network Address set for the V7N by rotary switch S3 and S4 (MSD and LSD)**. The Drive's Address or MAC ID can be set in two different ways. The address can be set using rotary switches with a setting range of 0 to 63. Or, the address can be set using parameter n150 when the rotary switch is set to 64 to 99. Each address for EACH DEVICE ADDRESS MUST BE UNIQUE on the network segment. (Valid addresses are 0 to 63). Typically, address '0' is reserved for the DeviceNet master node and address '62' or '63' is left open for a configuration tool connection. Check that all devices are addressed and each node has a different address versus all other devices on the network. The following table summarizes the rotary switch settings for the V7N DeviceNet Drive.

S3 + S4 Switch Setting	0-63	64-99	
Address or MAC ID	MAC ID = (S3 x 10) + S4	Parameter n150	Setting Range: 0 to 63

7.4.3 Wiring and Cabling

Several of all serial communications troubleshooting issues can be traced to cabling, grounding, or power supply issues. DeviceNet utilizes a linear differential bus topology, and specifies the cable to be used, the cable length requirements, and termination requirements. The following describes the items that should be checked in the network installation to verify correct cabling and grounding.

1. **Verify that the correct type of compliant cable is being utilized in the installation**. There are typically two types of cable used for DeviceNet Networks, Thick and Thin.

   <u>Thick Cable Specification:</u>
   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 trunk line when length is important.

   The thick cable specified for DeviceNet network connections consists of:
   - One twisted signal pair (18 AWG): blue/white
   - One twisted power pair (15 AWG): black/red
   - Separate aluminized mylar shields around power pair and signal pair
   - Overall foil/braid shield with drain wire (18 AWG): bare

   Further specifications dictate that the Data pair has a 120ohm impedance, with 12pf capacitance between conductors, (24pf between one conductor and the other connected to shield) and a maximum of 6.9 ohms/1000 ft. max. DC resistance.

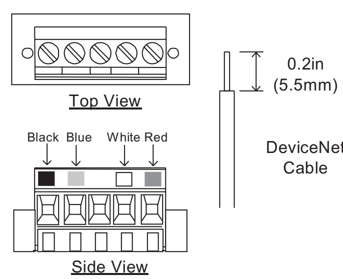
   <u>Thin Cable Specification:</u>
   Thin Cable is smaller and more flexible than Thick Cable. It is commonly used for drop lines, but can also be used, for shorter distances, as trunk line.

   The thin cable specified for DeviceNet network connections consists of:
   - One twisted signal pair (24 AWG): blue/white
   - One twisted power pair (22 AWG): black/red
   - Separate aluminized mylar shields around power pair and signal pair
   - Overall foil/braid shield with drain wire (22 AWG): bare

   Further specifications dictate that the Data pair has a 120ohm impedance, with 12pF capacitance between conductors, (24pf between one conductor and the other connected to shield) and a maximum of 28 ohms/1000 ft. max. DC resistance.

2. **Verify cable connections at EACH node connecting to the DeviceNet Bus**. Check for shorts, broken wires, loose connections, and that the signal, power, and shield wires are connected into the correct pin outs on the drive terminal block with the corresponding color code specified.

Terminal Color	Name	Wiring Color	Content
Black	V-	Black	Communication power supply GND
Blue	CAN_L	Blue	Communication data low side
-	Shield	Bare	Shield wire
White	CAN_H	White	Communication data high side
Red	V+	Red	Communication power supply DC+24V

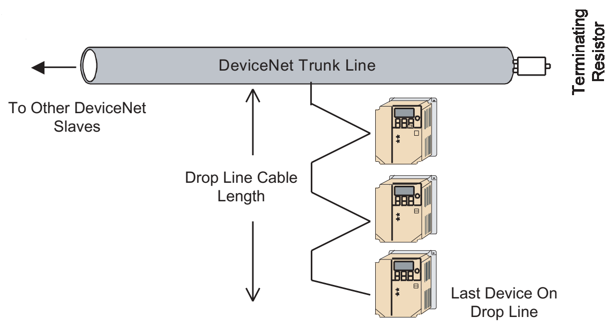


3. **Verify that the DeviceNet cable lengths are within the specified requirements**. Both baud rate and cable type used affect the total amount of allowable network length. The total amount of measured linear cable allowed between any two points on the network must be within the following tables specification:

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

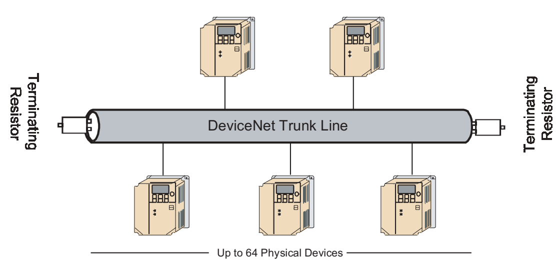
In addition, **verify that the node drop lengths are within the specified drop length requirements of the DeviceNet specification**. The total amount of measured linear cable allowed between the point of the drop connection (from the main trunk line cable) to the end of the last node connection on the drop line, along with the cumulative total or sum of all drop cable length(s) must not exceed the maximum specified. The following table and diagram specifies these requirements:

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



4. **There should be no more than 64 total nodes on the network segment, which means only 64 physical addresses can be assigned on one DeviceNet network**. Verify that there are no more than 64 physical nodes on the network segment, which includes all Master/PLC connections, Slave devices, and Configuration nodes for all trunk line and drop line connections. If there are more than 64 devices, divide the network into two separate segments. Additional PLC scanner or DeviceNet Master interface may be needed for the second network segment.

5. **Verify that the DeviceNet network is terminated correctly**. A DeviceNet network is based on a linear bus topology and requires two termination resistors of 120 ohms, _ watt (Note: 121 ohm resistors will also work as specified in the V7N DeviceNet Technical Manuals) at each of the furthest ends of the Trunk Line cabling. The reason for this is for matching the impedance of the cabling such that transmission signal distortion is kept to a minimum along all sections of the network bus. Please see the diagram below to illustrate.



6. **Verify with a voltmeter that the 24 Volt power supply voltage measurement at each V7N nodes on DeviceNet is greater than 11 VDC. Also verify that the voltage drop between each node and its power supply is less than 5 VDC**. If the voltage is less than 11 Vdc, the reason could be an undersized power supply or a broken or loose connection in either the DC common bus or +24 VDC bus cabling. Correct by fixing connections or resizing the power supply as required for the total cumulative load of all the devices on the DeviceNet network.

7. **Verify that the common DC voltage drop between any two points on the DeviceNet network cabling measures less than 5 VDC**. The DeviceNet requires that the common mode voltage is less than 5 volts and can be caused by drawing too much current for too long of a distance. To correct this either centralize the power supply in the center of the network or place a large equalization conductor to bring the voltage potentials across the network back to a central point. Typically, this is at the power supply, which is single point grounded. Note, placement of the network power supply can affect common mode voltage requirements; therefore, please take this into account when locating the power supply equipment in the system.

8. **Verify that the shield is continuous throughout the entire DeviceNet networking cabling installation**. This means that the shields on each of the cable segments, between nodes, from one extreme end of the network to the other extreme end of the network shall be connected to form a single conduction path throughout the span of the network cabling. The shield should then be single point grounded at the power supply ground connection.

9. **Verify that a Single Point ground is used in the network system power supply equipment, and the ground conductor coming from the power service entrance is of adequate size**. The grounding system approach utilized in network systems is of primary importance to provide not only system safety ground considerations, but also a path for unwanted noise to be flushed from the system. A single point common voltage potential (i.e. Ground) is to be seen across the span of the networked system. Therefore the power supply for the DeviceNet network should be grounded at a single point to minimize the problems associated with ground loops, etc.

10. **Verify that the DeviceNet cabling clearances are followed throughout the network cabling installation**. DeviceNet cabling should not be routed parallel or close to high power or high frequency cables, and should adhere to Category 2 distances from high voltage cables. Typically a rule is 4" – 10" minimum clearance is required, depending on the level of voltage or signals in the cables. Also, network cables should be routed across any high power or high frequency cables at 90 degree angles.

Cabling related issues seem to be more of the common incidents associated with malfunctioning DeviceNet networks. When wiring the network please follow the guidelines set by the Open DeviceNet Vendor Association (ODVA) because deviation from these rules typically causes more problems than benefits. Please see www.odva.org for more details.

7.4.4 DeviceNet Configuration and V7N Diagnostics

In order for a V7N to operate in a DeviceNet networked system, the drive requires some configuration after all of the above issues have been addressed. Typically, configuration of devices is performed with a DeviceNet configuration tool such as Allen Bradley "RS Networx for DeviceNet" (previously "DeviceNet Manager") or Cutler Hammers "NetView" product for example. These tools along with others allow the user to configure each device on the DeviceNet network. The V7N AC drive requires a master DeviceNet scanner to facilitate the distribution and retrieval of control information to and from all of the devices on a DeviceNet network. Therefore, the control information types and sizes must be known in the networked device and the network scanner/controller, to transfer the information and verify that the network is operating correctly by receiving and producing the correct type and amount of control information for each networked device. Also, the V7N and all other DeviceNet devices must conform to a set of LED diagnostic standards. These issues will be discussed in the following points, which should help with troubleshooting various device configuration and operational issues.

1. **Verify that the Polled Producing Assembly and the Polled Consuming Assembly is set in the V7N DeviceNet Drive:** The PPA (Polled Producing Assembly) and the PCA (Polled Consuming Assembly) determine the data format and size of how the drive status information and drive control information is transmitted to / and from the DeviceNet master (i.e. controller or PLC). Please write down what each of these values are set to PPA = __________ and PCA = ___________ for each Yaskawa DeviceNet drive on the network. PCA is also referred to as Input Data Assembly and PPA as Output Data Assembly. For Example: This can be determined by utilizing a configuration tool (as mentioned above) and checking either EDS for PCA "Polled Consuming Assembly" and PPA "Polled Producing Assembly" in the V7N or reading DeviceNet explicit message path, PPA – (Class = 101, Instance = 1, Attribute = 1) and PCA – (Class = 101, Instance = 1, Attribute = 2).

   Note: Each of the parameters, PPA and PCA must be set to one of the following values. The following is a list and summary of valid values for these two DeviceNet parameters. Be sure to cycle power to the drive to save changes to PPA and PCA.

Table 7-7. Polled Producing Assemblies and Polled Consuming Assemblies

Type	Number of Data Bytes	Assembly	Description
PPA (Output Data Assembly)	4	70 (46Hex)	Basic Speed Control Output Instance 70 (Section 3.2)
	4	71 (47Hex)	Extended Speed Control Output Instance 71 (Section 3.4)***default***
	5	150 (96Hex)	V7N Memobus I/O Control Output Instance 150 (Section 3.6)
	8	151 (97Hex)	V7N Standard Drive Control Output Instance 151 (Section 3.8)
	8	152 (98Hex)	V7N Accel/Decel Time Control Output Instance 152 (Section 3.10)
	8	155 (9BHex)	V7N Extended I/O MEMOBUS Output Instance 155 (Section 3.12)
	8	156 (9CHex)	V7N General Purpose DI/DO Output Instance 156 (Section 3.14)
PCA (Input Data Assembly)	4	20 (14Hex)	Basic Speed Control Input Instance 20 (Section 3.1)
	4	21 (15Hex)	Extended Speed Control Input Instance 21 (Section 3.3)***default***
	5	100 (64Hex)	V7N Memobus I/O Control Input Instance 100 (Section 3.5)
	8	101 (65Hex)	V7N Standard Drive Control Input Instance 101 (Section 3.7)
	8	102 (66Hex)	V7N Accel/Decel Time Control Input Instance 102 (Section 3.9)
	8	105 (69Hex)	V7N Extended I/O MEMOBUS Input Instance 105 (Section 3.11)
	8	106 (6AHex)	V7N General Purpose DI/DO Input Instance 106 (Section 3.13)

2. **Verify that the DeviceNet Master (Controller or PLC) scan list is configured to receive and transfer the correct amount of polled data to each node on the DeviceNet network:** There are several master devices on the market today. Some support the configuration tools mentioned above and some have their own configuration tools. Please refer to the manufacturer's documentation for determining how to verify and program the scan list settings in the master, for PPA and PCA sizes, for each device on the DeviceNet network. Note, the data information size that is expected, from the master to the device must match in size, and the data information that is expected, from the device to the master must match in size.

3. Verify that the DeviceNet drive on the V7N is operating correctly by reporting the state of the LEDs on the Drive. During normal operation when the drive is correctly transferring control data, to and from a DeviceNet master (controller or PLC), the NS and MS will be ON solid green. This is a quick check to verify the operation of the network, note all DeviceNet devices conform to this standard. See the following table for additional states the LEDs may be indicating. Refer to the following tables for the status of the LEDs.

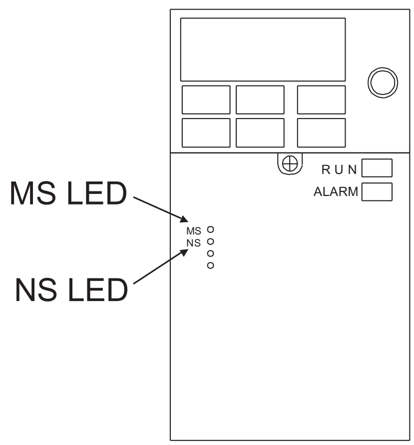


Table 7-8A. DeviceNet Communication LED Faults and Operation

LED Name	Display		Operation Status	Description
	Color	Status		
MS	Green	Lit	During drive operation	The drive is operating normally.
	Green	Flashing	During drive initialization	Initial setting status or communication not ready.
	Red	Lit	Unrecoverable fault	An unrecoverable fault occurred in the drive.
	Red	Flashing	Recoverable fault	A recoverable fault occurred, such as switch setting error.
	-	Not lit	Power OFF	Power not being supplied to the drive.
NS	Green	Lit	DeviceNet communication taking place	DeviceNet communicating normally.
	Green	Flashing	DeviceNet communication not taking place	DeviceNet network normal, but not communicating with the master.
	Red	Lit	Communication fault	A fault that makes it impossible for the DeviceNet to communicate occurred. • Duplicate MAC ID • Bus-off detection
	Red	Flashing	Communication timeout	Communication timeout with master occurred.
	-	Not lit	Offline, Power OFF	DeviceNet not set to Online. Power not being supplied to the interface card. Mismatch of baud rate.

Table 7-8B. DeviceNet Communication LED Faults and Operation

LED Display		Content	Cause	Countermeasure
MS	NS			
Not Lit	Not Lit	Power OFF	The inverter does not have power supply.	Check the inverter main circuit wiring. Turn the power ON.
Flashing Green	Not Lit	During Communication Preparation	Initial setting status or the communication is not ready.	Turn the inverter power back. If the fault persists, change the drive unit.
Flashing Red	Not Lit	Related to Communication Possible Recovery Fault	A wrong setting of a switch or the possible recovery fault is occurring.	Check baud rate setting, and then turn the power back. If the fault persists, change the drive unit.
Lit Red	Not Lit	Related to Communication Impossible Recovery Fault	A fault, which is impossible to recover related to communication, is occurring.	Turn the inverter power back. If the fault persists, change the drive unit.
Lit Green	Flashing Red	Communication Time-Out	The master and communication timeout occurred.	• Check if the end termination resistance if correctly connected to the communication line. • Check if the communication line is correctly connected (disconnection and connector connection fault). • Check if the communication line is separated from the main circuit wiring.
Lit Green	Lit Red	Communication Fault	Communication cannot proceed.	• Check if other device and MAC ID are overlapped in the network. • Check if the master is correctly operated. • Check if the end termination resistance is correctly connected. • Check if the communication line is correctly connected (disconnection and connector connection fault). • Check if the communication line is separated from the main circuit wiring.
Lit Green	Flashing Green	Normal (No Communication Data)	Although a fault did not occur, the drive does not communicate with master.	Send explicit message / I/O message from the master as necessary.
Lit Green	Lit Green	Normal (Communication Data)	Performing normal communication.	-

7.4.5 DeviceNet System Checks

Other issues may also come into play with respect to operation of the network. If all of the above is completed and there are still issues with the DeviceNet installation some other items to check are:

a.) Verify that the total network utilized bandwidth is less than 100%. Typically a DeviceNet analyzer is required to check this.
  b.) Sometimes the EPR (Expected Packet Rate) setting in the Master/Scanner requires an increase.
  c.) On a Polled network, the ISD (InterScan Delay) may need adjustment in the Master/Scanner.
  d.) Verify that the devices on the DeviceNet network have been properly conformance tested, by checking for the DeviceNet Conformance Tested Logo.

In Summary:
The above should have given a good starting point on troubleshooting DeviceNet networks and V7N installations, however sometimes the need for escalation of a problem arises. Please contact Yaskawa Technical Support for further questions or issues regarding the Yaskawa DeviceNet installation.

When Calling Technical Support:
Using the following DeviceNet Troubleshooting Check-off Sheet, please have available the drive model number, software number, and record any fault information displayed on the V7N digital operator, when calling for additional technical support. This will help to provide the base required information that may be asked if engineering escalation is required to resolve the issue.

Additional Technical Information is available at: www.drives.com

Yaskawa Technical Support Phone: (800) YASKAWA (800-927-5292) Press 1 for Technical Service.

Appendix 1. PARAMETER LISTING

The Drive control circuits use various parameters to select functions and characteristics of the Drive. Changing of parameter settings must be done in the Program mode, or by use of the Function LEDs, if available (see Section 4).

The following table lists all parameters in numerical order. For each parameter, reference paragraph(s) in Section 5 are listed (if applicable) where the features of the Drive affected by that parameter are described.

Table A1-1. Drive Parameters

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n001	101h	01h	Parameter Selection / Initialization	0 1 2 3 4 5 6 7 8 9 10 11	0: **n001** can be read and set; **n002 - n179** read only 1: **n001 - n039** can be read and set 2: **n001 - n079** can be read and set 3: **n001 - n119** can be read and set 4: **n001 - n179** can be read and set 5: **n001 - n179** can be read and set RUN command accepted during Program mode 6: Clear Fault History Only 7: Not Used 8: 2-wire Initialization (Japan Spec.) 9: 3-wire Initialization (Japan Spec.) 10: 2 wire initialization (USA Spec) 11: 3 wire initialization (USA Spec.)	1	1	5.18
n002	102h	02h	Control Method Selection	0 1	0: V/f Control 1: Open Loop Vector	1	0	2.2
n003	103h	03h	Operation Method Selection	0 1 2 3	0: Digital Operator 1: Terminal 2: Not Used 3: DeviceNet	1	3	5.12, 6.3
n004	104h	04h	Reference Selection	0 1 2 3 4 5 6 7 8 9	0: Digital Operator Pot 1: Frequency Reference 1 (n024) 2: Not Used 3: Not Used 4: Not Used 5: Not Used 6: Not Used 7: Multi-Function Analog Input (0 to 10V) (CN2) 8: Multi-Function Analog Input (4 to 20 mA) (CN2) 9: DeviceNet	1	9	5.10, 5.12, 5.25, 6.3
n005	105h	05h	Stop Method	0 1	0: Ramp to stop 1: Coast to stop	1	0	5.21
n006	106h	06h	Reverse Prohibit	0 1	0: Reverse Run enabled 1: Reverse Run disabled	1	0	
n007	107h	07h	**STOP** Key Function	0 1	0: **STOP** key is effective regardless of programming of n003 1: **STOP** key is effective only when sequence command (per n003) is from Digital Operator	1	0	5.12
n008	108h	08h	Reference Selection - Digital Operator	0 1	0: Frequency Reference from digital operator pot 1: Frequency Reference from **n024**	1	0	5.12
n009	109h	09h	Frequency Reference Setting Method From Digital Operator	0 1	0: **ENTER** key must be pressed to write-in new value 1: **ENTER** key does not have to be pressed to write-in new value	1	0	5.12
n010	10Ah	0Ah	Operation Selection When Digital Operator is Disconnected	0 1	0: Disabled (operation continues) 1: Enabled (motor coasts to a stop and fault is displayed)	1	0	5.13
n011	10Bh	0Bh	Frequency - Max.	-	50.0 to 400.0	0.1 (Hz)	60.0	5.24
n012	10Ch	0Ch	Voltage - Max.	-	0.1 to 255.0 (230V drive) 0.2 to 510.0 (460V drive)	0.1 (V)	230.0 460.0	
n013	10Dh	0Dh	Frequency - Max. Voltage Point	-	0.2 to 400.0	0.1 (Hz)	60.0	
n014	10Eh	0Eh	Frequency - Midpoint	-	0.1 to 399.9	0.1 (Hz)	(Note 2)	
n015	10Fh	0Fh	Voltage - Midpoint	-	0.1 to 255.0 (230V drive) 0.2 to 510.0 (460V drive)	0.1 (V)	(Note 2)	
n016	110h	10h	Frequency - Min.	-	0.1 to 10.0	0.1 (Hz)	(Note 2)	
n017	111h	11h	Voltage - Min.	-	0.1 to 50.0 (230V drive) 0.2 to 100.0 (460V drive)	0.1 (V)	(Note 2)	

Table A1-1. Drive Parameters - Continued

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n018	112h	12h	Accel/Decel Time Setting Unit	0 1	0: 0.1 1: 0.01	1 (sec)	0	5.2
n019	113h	13h	Acceleration Time 1 (Note 4)	-	0.00 to 600.0 or 0.0 to 6000 (Dependent on **n018** setting)	0.01 (sec) or 0.1 (sec)	10.0	5.2
n020	114h	14h	Deceleration Time 1 (Note 4)					
n021	115h	15h	Acceleration Time 2 (Note 4)					
n022	116h	16h	Deceleration Time 2 (Note 4)					
n023	117h	17h	S-curve Selection	0 1 2 3	0: No S-curve 1: 0.2 second 2: 0.5 second 3: 1.0 second	1	0	5.3
n024	118h	18h	Freq. Reference 1 (Note 4)	-	0.00 to 400.00	0.01 (Hz) (< 100 Hz) or 0.1 (Hz) (>= 100 Hz)	6.00	5.10
n025	119h	19h	Freq. Reference 2 (Note 4)				0.00	
n026	11Ah	1Ah	Freq. Reference 3 (Note 4)				0.00	
n027	11Bh	1Bh	Freq. Reference 4 (Note 4)				0.00	
n028	11Ch	1Ch	Freq. Reference 5 (Note 4)				0.00	
n029	11Dh	1Dh	Freq. Reference 6 (Note 4)				0.00	
n030	11Eh	1Eh	Freq. Reference 7 (Note 4)				0.00	
n031	11Fh	1Fh	Freq. Reference 8 (Note 4)				0.00	
n032	120h	20h	Jog Freq. Reference (Note 4)				6.00	5.11
n033	121h	21h	Frequency Reference Upper Limit	-	0. to 110	1(%)	100	5.8
n034	122h	22h	Frequency Reference Lower Limit	-	0. to 110	1(%)	0	
n035	123h	23h	Digital Operator Display Mode	0 1 2-39 40-3999	0: 0.01 Hz (less than 100 Hz) / 0.1 Hz 1: 0.1% 2 - 39: rpm 40 - 3999: custom	1	0	5.27, 6.3
n036	124h	24h	Motor Rated Current	-	0.1 to 49.5 Amps (Up to 150% of drive rated current)	0.1 (A)	(Note 1)	5.22
n037	125h	25h	Electronic Thermal Overload Protection (for OL1 fault)	0 1 2	0: Short term rating 1: Standard rating 2: Disabled	1	0	
n038	126h	26h	Electronic Thermal Overload Protection Time Constant	-	1 to 60	1 (min)	8	
n039	127h	27h	Cooling Fan Operation Selection	0 1	0: Operates only when drive is running (continues operation for 1 minute after drive is stopped) 1: Operates with power applied to drive	1	0	
n040	128h	28h	Motor Rotation	0 1	0: Rotate C.C.W. 1: Rotate C.W. (or opposite direction)	1	0	
n041	129h	29h	Acceleration Time 3 (Note 4)	-	0.00 to 600.00 or 0.0 to 6000.0 (Dependent on **n018** setting)	0.01 (sec) or 0.1 (sec)	10.0	5.2
n042	12Ah	2Ah	Deceleration Time 3 (Note 4)					
n043	12Bh	2Bh	Acceleration Time 4 (Note 4)					
n044	12Ch	2Ch	Deceleration Time 4 (Note 4)					
n050	132h	32h	Multi-function Input Selection 1 (Terminal S1)	0 1 2 3 4 5 6 7 8	0: Fwd / Rev command (3 wire control) **[can only be set in n052]** 1: Forward run (2 wire control) 2: Reverse run (2 wire control) 3: External Fault (N.O.) 4: External Fault (N.C.) 5: Fault Reset 6: Multi-step speed ref. cmd. A 7: Multi-step speed ref. cmd. B 8: Multi-step speed ref. cmd. C	1	1 (1)	5.15
n051	133h	33h	Multi-function Input Selection 2 (Terminal S2)			1	2 (2)	
n052	134h	34h	Multi-function Input Selection 3 (Terminal S3)			1	3 (0)	

Table A1-1. Drive Parameters - Continued

<table>
<tr><th>PARA-
METER</th><th>ADDR</th><th>CLASS 100
INST. 01</th><th>NAME</th><th>DATA</th><th>SETTING RANGE
(AND UNITS)</th><th>SETTING
INCREMENT</th><th>FACTORY
SETTING</th><th>PARA.
REF.</th></tr>
<tr><td>n053</td><td>135h</td><td>35h</td><td>Multi-function Input Selection 4
(Terminal S4)</td><td rowspan="4">9
Ah
Bh
Ch
Dh
Eh
Fh
10h
11h
12h

13h
14h
15h
16h
17h
18h
19h
1Ah
1Bh
1Ch
22</td><td rowspan="4">9: Multi-step speed ref. cmd. D
10: JOG Selection
11: Accel/Decel time change cmd.
12: External Base Block (N.O.)
13: External Base Block (N.C.)
14: Speed search from max. freq.
15: Speed search from set freq.
16: Accel/Decel hold command
17: Remote/Local selection
18: Communication / control circuit terminal selection
19: Fast Stop - Fault (N.O.)
20: Fast Stop - Alarm (N.O.)
21: Fast Stop - Fault (N.C.)
22: Fast Stop - Alarm (N.C.)
23: PID control off
24: I value reset (PID)
25: I value hold (PID)
26: Over Heat Pre-alarm OH3
27: Accel/Decel Time Select 2
28: Data input from DeviceNet communications
34: Up/Down Function</td><td>1</td><td>5
(5)</td><td rowspan="4">5.15</td></tr>
<tr><td>n054</td><td>136h</td><td>36h</td><td>Multi-function Input Selection 5
(DeviceNet Input S5)</td><td>1</td><td>6
(6)</td></tr>
<tr><td>n055</td><td>137h</td><td>37h</td><td>Multi-function Input Selection 6
(DeviceNet Input S6)</td><td>1</td><td>7
(7)</td></tr>
<tr><td>n056</td><td>138h</td><td>38h</td><td>Multi-function Input Selection 7
(DeviceNet Input S7)</td><td>1</td><td>10
(10)</td></tr>
<tr><td>n057</td><td>139h</td><td>39h</td><td>Multi-Function Output Selection 1 (DeviceNet Output MA)</td><td rowspan="3">0
1
2
3
4
5
6
7
8
9
Ah
Bh
Ch
Dh
Eh
Fh
10h
11h
12h
13h
14h
15h</td><td rowspan="3">0: Fault
1: During running
2: Speed Agree
3: Zero Speed
4: Frequency detection 1
5: Frequency detection 2
6: Overtorque detection (N.O.)
7: Overtorque detection (N.C.)
8: Undertorque Detection (N.O.)
9: Undertorque Detection (N.C.)
10: Minor Fault
11: During Base Block
12: Local / Remote
13: Ready
14: During auto restart
15: During undervoltage
16: During reverse run
17: During speed search
18: Comm. Controlled
19: PID feedback loss
20: Frequency Reference Loss Detect (N.O.)
21: Overheat Pre-alarm OH3 (N.O.)</td><td>1</td><td>0</td><td rowspan="3">5.16</td></tr>
<tr><td>n058</td><td>13Ah</td><td>3Ah</td><td>Multi-Function Output Selection 2
(Terminals P1 & PC)</td><td>1</td><td>1</td></tr>
<tr><td>n059</td><td>13Bh</td><td>3Bh</td><td>Multi-Function Output Selection 3
(Terminals P2 & PC)</td><td>1</td><td>2</td></tr>
<tr><td>n064</td><td>140h</td><td>40h</td><td>Frequency Reference Loss Detection</td><td>0
1</td><td>0: No Detection
1: Continue to run at 80% of max. frequency</td><td>1</td><td>0</td><td>5.30</td></tr>
<tr><td>n068</td><td>144h</td><td>44h</td><td>Analog Frequency Reference Gain (CN2, Voltage Ref Input)</td><td>-</td><td>-255 to 255</td><td>1%</td><td>100</td><td rowspan="2"></td></tr>
<tr><td>n069</td><td>145h</td><td>45h</td><td>Analog Frequency Reference Bias (CN2, Voltage Ref Input)</td><td>-</td><td>-100 to 100</td><td>1%</td><td>0</td></tr>
</table>

Table A1-1. Drive Parameters - Continued

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n070	146h	46h	Analog Frequency Reference Filter Time Constant (CN2, Voltage Ref Input)	-	0.00 to 2.00	0.01 s	0.10	
n071	147h	47h	Analog Frequency Reference Gain (CN2, Current Ref Input)	-	-255 to 255	1%	100	
n072	148h	48h	Analog Frequency Reference Bias (CN2, Current Ref Input)	-	-100 to 100	1%	0	
n073	149h	49h	Analog Frequency Reference Filter Time Constant (CN2, Current Ref Input)	-	0.00 to 2.00	0.01 s	0.10	
n077	14Dh	4Dh	Multi-Function Analog Input CN2 Selection	0 1 2 3 4	0: Multi-Function analog input disabled 1: Aux. Frequency reference 2: Frequency gain 3: Frequency bias 4: Voltage bias	1	0	5.29
n078	14Eh	4Eh	Multi-Function Analog Input Signal Selection	0 1	0: 0 - 10V 1: 4 - 20 mA	1	0	
n079	14Fh	4Fh	Multi-Function Digital Input Scan Rate Selection	0 1	0: Scans twice with 8 msec scan rate 1: Scans twice with 2 msec scan rate	1	0	5.15
n080	150h	50h	Carrier Frequency	-	1 to 4 (x 2.5 kHz) 7 to 9 (synchronous)	1	3	5.5
n081	151h	51h	Momentary Power Loss Ride-through Method	0 1 2	0: Not Provided 1: Continuous operation after power recovery within 2 sec. 2: Continuous operation after power recovery within control logic time (no fault output)	1	0	5.14
n082	152h	52h	Number of auto restarts attempts	-	0 to 10	1	0	5.4
n083	153h	53h	Prohibit Frequency 1	-	0.00 to 400.0	0.01 (Hz) or 0.1 (Hz)	0.00	
n084	154h	54h	Prohibit Frequency 2	-	0.00 to 400.0	0.01 (Hz) or 0.1 (Hz)	0.00	5.6
n085	155h	55h	Prohibit Frequency 3	-	0.00 to 400.0	0.01 (Hz) or 0.1 (Hz)	0.00	
n086	156h	56h	Prohibit Frequency Deadband	-	0.00 to 25.50	0.01 (Hz)	0.00	
n087	157h	57h	Elapsed Time Function Selection[5]	0 1	0: Time elapses when power is On 1: Time elapses when Drive is running	0		5.32
n088	158h	58h	Elapsed Operation Time (Initial Value)[5]	-	0 to 9999 hours	0		
n089	159h	59h	DC Injection Current	-	0 to 100	1 (%)	50	
n090	15Ah	5Ah	DC Injection Time at stop	-	0.0 to 25.5	0.1 (sec)	0.0	5.7
n091	15Bh	5Bh	DC Injection Time at start	-	0.0 to 25.5	0.1 (sec)	0.0	
n092	15Ch	5Ch	Stall Prevention During Deceleration	0 1	0: Enabled 1: Disabled	1	0	
n093	15Dh	5Dh	Stall Prevention During Acceleration	-	30 to 200	1 (%)	170	5.20
n094	15Eh	5Eh	Stall Prevention Level During Running	-	30 to 200	1 (%)	160	
n095	15Fh	5Fh	Frequency Detection Level	-	0.00 to 400.0	0.01 (Hz) or 0.1 (Hz)	0.00	5.16

Table A1-1. Drive Parameters - Continued

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n096	160h	60h	Overtorque Detection (OL3)	0 1 2 3 4	0: Detection Disabled 1: Detect only at set frequency; operation continues 2: Detect only at set frequency; coast to stop 3: Detect during all frequency conditions; operation continues 4: Detect during all frequency conditions; coast to stop	1	0	5.17
n097	161h	61h	Overtorque Detection Selection (OL3) (Note 5)	0 1	0: Detected by output torque 1: Detected by output current	1	0	
n098	162h	62h	Overtorque Detection Level (OL3)	-	30 to 200	1 (%)	160	
n099	163h	63h	Overtorque Detection Delay Time (OL3)	-	0.1 to 10.0	0.1 (sec)	0.1	
n100	164h	64h	Up/Down Hold Memory	0 1	0: Disabled 1: Enabled	1	0	5.9
n101	165h	65h	Speed Search Deceleration Time	-	0.0 to 10.0	0.1 (sec)	2	5.15
n102	166h	66h	Speed Search Operation Level	-	0 to 200%	1 (%)	150	
n103	167h	67h	Torque Compensation Gain (Note 4)	-	0.0 to 2.5	0.1	1.0	5.23
n104	168h	68h	Torque Compensation Time Constant	-	0.0 to 25.5	0.1 (sec)	(Note 2)	
n105	169h	69h	Torque Compensation Iron Loss	-	0.0 to 6550	0.1 (W) or 1 (W)	(Note 1)	
n106	16Ah	6Ah	Motor Rated Slip (Note 4)	-	0.0 to 20.0	0.1 (Hz)	(Note 1)	2.2, 5.19
n107	16Bh	6Bh	Motor Line-to-line Resistance	-	0.000 to 65.50	0.001 (ohm)	(Note 1)	
n108	16Ch	6Ch	Motor Leakage Inductance (Note 1)	-	0.00 to 655.0	0.01 (mH) or 0.1 (mH)	(Note 1)	
n109	16Dh	6Dh	Torque Compensation Limit (Note 1)	-	0 to 250	1 (%)	150	5.23
n110	16Eh	6Eh	Motor No-load Current	-	0 to 99	1 (%)	(Note 1)	2.2, 5.19
n111	16Fh	6Fh	Slip Compensation Gain (Note 4)	-	0.0 to 2.5	0.1	(Note 2)	5.19
n112	170h	70h	Slip Compensation Primary Delay Time	-	0.0 to 25.5	0.1 (sec)	(Note 2)	
n113	171h	71h	Slip Compensation Selection During Regeneration (Note 1)	0 1	0: Disabled 1: Enabled	1	0	
n115	173h	73h	Stall Prevention Above Base Speed During Run	0 1	0: Disabled (level is based on setting of **n094**) 1: Enabled (level at Fmax is **n094** x 0.4)	1	0	5.20
n116	174h	74h	Stall Prevention During Run, Accel/Decel Time Select	0 1	0: Follows acc/dec #1 (**n019, n020**) or acc/dec #2 (**n021, n022**) Note: Multi-Function input selectable 1: Follows acc/dec #2 (**n021, n022**) always	1	0	
n117	175h	75h	Undertorque Detection Select (UL3)	0 1 2 3 4	0: Undertorque detection disabled 1: Detected during constant speed running. Operation continues after detection 2: Detected during constant speed running. Operation stops during detection 3: Detected during all frequency conditions. Operation continues 4: Detected during all frequency conditions. coast to stop	1	0	5.31
n118	176h	76h	Undertorque Detection Level	-	0 to 200% Inverter rated current = 100%; if n097 = 0 (detection by torque); motor rated torque becomes 100%	1(%)	10	
n119	177h	77h	Undertorque Detection Time	-	0.1 to 10.0	0.1 (sec)	0.1	
n120	178h	78h	Frequency Reference 9 (Note 4)	-	0.00 to 400.00	0.01 (Hz) (< 100 Hz) or 0.1 (Hz) (>= 100 Hz)	0.00	5.11
n121	179h	79h	Frequency Reference 10 (Note 4)					
n122	17Ah	7Ah	Frequency Reference 11 (Note 4)					
n123	17Bh	7Bh	Frequency Reference 12 (Note 4)					
n124	17Ch	7Ch	Frequency Reference 13 (Note 4)					
n125	17Dh	7Dh	Frequency Reference 14 (Note 4)					
n126	17Eh	7Eh	Frequency Reference 15 (Note 4)					
n127	17Fh	7Fh	Frequency Reference 16 (Note 4)					

Table A1-1. Drive Parameters - Continued

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n128	180h	D3h	PID Control Selection	0 1 2 3 4 5 6 7 8	0: PID control disabled 1: D = Feed Forward 2: D = Feedback 3: Reference + PID (D = Feed Forward) 4: Reference + PID (D = Feedback) 5: Inverse PID - D = Feed Forward 6: Inverse PID - D = Feedback 7: Inverse PID - Reference + PID (D = Feed Forward) 8: Inverse PID - Reference + PID (D = Feedback)	1	0	
n129	181h	D4h	PID Feedback Gain (Note 4)	-	0.00 to 10.00	0.01	1.00	
n130	182h	82h	PID Proportional Gain (Note 4)	-	0.00 to 25.00	0.1	1.0	
n131	183h	83h	PID Integral Time (Note 4)	-	0.00 to 360.00	0.1 s	1.0	5.25
n132	184h	84h	PID Derivative Time (Note 4)	-	0.00 to 2.50	0.01	0.00	
n133	185h	85h	PID Offset Adjustment (Note 4)	-	-100 to 100	1%	0	
n134	186h	86h	Integral Value Limit (Note 4)	-	-100 to 100	1%	100	
n135	187h	87h	PID Output Lag Filter Time (Note 4)	-	0.0 to 10.0	0.1 s	0.0	
n136	188h	88h	Feedback Loss Detection Selection (FbL)	0 1 2	0: Disabled 1: Enabled - Alarm (operation continues) 2: Enabled Fault (coast to stop)	1	0	
n137	189h	89h	Feedback Loss Detection Level	-	0 to 100	1%	0	
n138	18Ah	8Ah	Feedback Loss Detection Time	-	0.0 to 25.5	0.1 s	1.0	
n139	18Bh	8Bh	Energy Saving Selection (Note 5) (Energy Saving)	0 1	0: Energy saving disabled 1: Energy saving enabled Note: Energy saving becomes enabled by V/f control mode	1	0	
n140	18Ch	8Ch	Energy Saving Gain K2 (Energy Saving)	-	0.00 to 6550	0.1 or 1	(Note 1)	
n141	18Dh	8Dh	Energy Saving Voltage Lower Limit at 60 Hz (Energy Saving)	-	0 to 120	1%	50	
n142	18Eh	8Eh	Energy Saving Voltage Lower Limit at 6 Hz (Energy Saving)	-	0 to 25	1%	12	5.28
n143	18Fh	8Fh	Time of Average kW (Energy Saving)	-	1 to 200	1 (x 24 ms)	1 (24 ms)	
n144	190h	90h	Voltage Limit of Tuning (Energy Saving)	-	1 to 100	1%	0	
n145	191h	91h	Step Voltage of Tuning to 100% Output Voltage (Energy Saving)	-	0.1 to 10.0	0.1%	0.5	
n146	192h	92h	Step Voltage of Tuning to 5% Output Voltage (Energy Saving)	-	0.1 to 10.0	0.1%	0.2	
n148	194h	94h	DeviceNet I/O Polled Producing Attribute	46h 47h 96h 97h 98h 9Bh 9Ch	70: Basic Speed Control Output Instance 71: Extended Speed Control Output Instance 150: V7N Modbus I/O Control Output Instance 151: V7N Standard Drive Control Output Instance 152: V7N Accel/Decel Time Control Output Instance 155: Expanded I/O Modbus Output Instance 156: V7N General Purpose DI/DO Output Instance	70, 71, 150, 151, 152, 155, 156	71	
n149	195h	95h	DeviceNet I/O Polled Consuming Attribute	14h 15h 64h 65h 66h 69h 6Ah	20: Basic Speed Control Input Instance 21: Extended Speed Control Input Instance 100: V7N Modbus I/O Control Input Instance 101: V7N Standard Drive Control Input Instance 102: V7N Accel/Decel Time Control Input Instance 105: Expanded I/O Modbus Input Instance 106: V7N General Purpose DI/DO Input Instance	20, 21, 100, 101, 102, 105, 106	21	6.3
n150	196h	96h	DeviceNet MAC ID	-	0 to 63	1	0	
n151	197h	97h	DeviceNet Timeover Detection Selection	0 1 2 3 4	0: Coast to stop 1: Decel to stop using Decel Time 1 (n020) 2: Decel to stop using Decel Time 2 (n022) 3: Operation continues with Alarm 4: Disabled	1	0	
n152	198h	98h	DeviceNet Baud Rate Selection	0 1 2	0: 125 kbps 1: 250 kbps 2: 500 kbps	1	2	
n153	199h	99h	DeviceNet Speed Scale	-	-15 to 15	1	0	
n154	19Ah	9Ah	DeviceNet Current Scale	-	-15 to 15	1	0	
n155	19Bh	9Bh	DeviceNet Electric Power Scale	-	-15 to 15	1	0	
n156	19Ch	9Ch	DeviceNet Voltage Scale	-	-15 to 15	1	0	
n157	19Dh	9Dh	DeviceNet Time Scale	-	-15 to 15	1	0	

Table A1-1. Drive Parameters - Continued

PARA-METER	ADDR	CLASS 100 INST. 01	NAME	DATA	SETTING RANGE (AND UNITS)	SETTING INCREMENT	FACTORY SETTING	PARA. REF.
n158	19Eh	9Eh	Motor Code (Energy Saving)	-	0 to 70	1	Note 1	
n159	19Fh	9Fh	Energy Saving Voltage Upper Limit At 60 Hz (Energy Saving)	-	0 to 120	1%	120	
n160	1A0h	A0h	Energy Saving Voltage Upper Limit At 6 Hz (Energy Saving)	-	0 to 25	1%	16	5.28
n161	1A1h	A1h	Power Supply Detection Hold Width (Energy Saving)	-	0 to 100	1%	10	
n162	1A2h	A2h	Power Supply Detection Filter Time Constant	-	0 to 255	1 (x 4 ms)	5 (20 ms)	
n163	1A3h	A3h	PID Output Gain	-	0.0 to 25.0	0.1	1.0	
n164	1A4h	A4h	PID Feedback Selection	0 1 2 3 4 5	0: Not Used 1: Not Used 2: Not Used 3: Multi-Function Analog Input (Voltage 0 - 10V) (CN2) 4: Multi-Function Analog Input (Current 4 - 20mA) (CN2) 5: Not Used	1	0	5.25
n166	1A6h	A6h	Input Phase Loss Detection Level	-	0 to 100 (%)	1%	0	
n167	1A7h	A7h	Input Phase Loss Detection Time	-	0 to 255 (sec)	1 sec	0	
n168	1A8h	A8h	Output Phase Loss Detection Level	-	0 to 100 (%)	1%	0	
n169	1A9h	A9h	Output Phase Loss Detection Time	-	0.0 to 2.0 (sec)	0.1 sec	0	
n170	1AAh	AAh	Modbus Frequency Unit Selection	0 1 2 3	0: 0.1 Hz 1: 0.01 Hz 2: 30,000/100% 3: 0.1%	1	0	
n173	1ADh	ADh	DC Injection P Gain	-	1 to 999	1 (0.001)	83 (0.083)	
n174	1AEh	AEh	DC Injection I Time	-	1 to 250	1 (4ms)	25 (100ms)	
n175	1B0h	B0h	Reduce Carrier at low speed selection	0 1	0: Disabled 1: Carrier Frequency reduced to 2.5kHz when Fout <= 5Hz & Iout >= 110%	1	0	5.5
n176	1B1h	B1h	Digital Operator Parameter Copy Function Selection	Rdy rEd CPy vFy vA Sno	rdy : READY status rEd: READ executes Cpy: COPY executes vFy: VERIFY executes vA: Inverter capacity display Sno: Software No. display	rdy rEd Cpy vFy vA Sno	rdy	5.26
n177	1B2h	B2h	Digital Operator Parameter copy Access Selection	0 1	0: Read prohibited 1: Read allowed	1	0	
n178	1B3h	B3h	Fault History	-	(Note 3)	N/A	N/A	7.2
n179	1B4h	B4h	Software Number	-	(Note 3)	N/A	N/A	4.5

Note 1: Factory setting differs depending on V7N capacity. See Appendix 3-1.
Note 2: Factory setting differs depending on control method selected (**n002**). See Appendix 3-1.
Note 3: **n178** and **n179** are display only parameters
Note 4: Parameter can be changed while V7N is operating.
Note 5: Available only in CIMR-V7NU25P5, 27P5, 45P5, and 47P5 drives.

Modbus Registers

DeviceNet communication can be used to transfer Modbus messages to and from the V7N. Modbus messages can be used to control I/O, monitor drive status, and change drive parameters. Modbus is accessed through polled messaging using the following DeviceNet I/O Assemblies:

Type	Number of Data Bytes	Assembly	Description
PPA (Output Data Assembly)	5	150 (96Hex)	V7N Modbus I/O Control Output Instance 150
	8	155 (9BHex)	V7N Extended I/O Modbus Output Instance 155
PCA (Input Data Assembly)	5	100 (64Hex)	V7N Modbus I/O Control Input Instance 100
	8	105 (69Hex)	V7N Extended I/O Modbus Input Instance 105

Note: The Yaskawa V7N drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of Modbus registers are stored in different areas of memory. V7N Modbus monitor and command registers 001-03Dhex (Appendix 2) are always stored in Volatile memory. Any data read or written from these registers will not be retained during a power loss situation. Modbus parameter registers 101h to 1D2h (Appendix 2) are stored in Volatile memory until the 'ENTER' command is applied. When writing new data to parameter registers, the 'ENTER' command must be given for the new data to become stored in Non-Volatile memory. If the 'ENTER' command is not used, the changed data will not be retained during power loss. An 'ENTER' command is executed by writing the value of '0' to Modbus register 0900h (Class 64h, Instance 09h, Attribute 00h). If a power loss occurs after the ENTER command has been issued and accepted, the data will be retained in the V7N.

WARNING

Use the ENTER command 0900h only when necessary! The life of the EEPROM (Non-Volatile memory) on the V7N will support a finite number of operations. This means that the ENTER command, value '0' written to register 0900h (Class 64h, Instance 09h, Attribute 00h), 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 (ERR) requiring the V7N control board to be replaced.

Table A1-2. Modbus Command Registers (Read/Write)

ADDR	FUNCTION	BIT	DESCRIPTION
001h	Operational Signals	0	Forward Run
		1	Reverse Run
		2	External Fault
		3	Fault Reset
		4	Multi-Function Input 1 (Closed Ext Terminal S1)
		5	Multi-Function Input 2 (Closed Ext Terminal S2)
		6	Multi-Function Input 3 (Closed Ext Terminal S3)
		7	Multi-Function Input 4 (Closed Ext Terminal S4)
		8	Multi-Function Input 5 (Closed Ext Terminal S5)
		9	Multi-Function Input 6 (Closed Ext Terminal S6)
		Ah	Multi-Function Input 7 (Closed Ext Terminal S7)
		Bh	Not Used
		Ch	Not Used
		Dh	Not Used
		Eh	Not Used
		Fh	Not Used
002h	Frequency Reference / Output Frequency	-	Frequency[1, 2]
003h	V/F Gain	-	1000 / 100% (Setting Value 2.0%-200.0%)
004h-008h	Not Used	N/A	Not Used
009h	Multi-Function Output Setting	0	Multi-Function Output Reference 1[3] (MA Contact ON)
		1	Multi-Function Output Reference 2[4] (Photo Coupler P1 ON)
		2	Multi-Function Output Reference 3[5] (Photo Coupler P2 ON)
		3 - Fh	Not Used
00Ah-01Fh	Not Used	N/A	Not Used

Table A1-3. Modbus Monitor Registers (Read only)

ADDR	CLASS 100 INST. 16	FUNCTION	BIT	DESCRIPTION
020h	020h	Status Signal	0	Run Command
			1	Reverse Operation
			2	Drive Ready
			3	Fault
			4	Data Setting Error
			5	Multi-Function DeviceNet Output MA
			6	Multi-Function Photo Coupler Output P1
			7	Multi-Function Photo Coupler Output P2
			8	Not Used
			9	Not Used
			Ah	Not Used
			Bh	Not Used
			Ch	Not Used
			Dh	Not Used
			Eh	Not Used
			Fh	Not Used
021h	021h	Fault Content	0	Overcurrent (OC)
			1	Overvoltage (OV)
			2	Drive Overload (OL2)
			3	Drive Overheat (OH1)
			4	Not Used
			5	Not Used
			6	PID Feedback Loss (FBL)
			7	External Fault (EF, EFO), Emergency Stop (STP)
			8	Hardware Fault (Fxx)
			9	Motor Overload (OL1)
			Ah	Overtorque Detection (OL3)
			Bh	Undertorque Detection (UL3)
			Ch	Power Loss (UV1)
			Dh	Control Power Supply Under-Voltage (UV2)
			Eh	DeviceNet Communication Fault (BUS)
			Fh	Operator Connection Fault (OPR)
022h	022h	Data Link Status	0	During Data Write-In
			1	Not Used
			2	Not Used
			3	Upper / Lower Limit Fault
			4	Matching Fault
			5	Not Used
			6	Not Used
			7	Not Used
			8	Not Used
			9	Not Used
			Ah	Not Used
			Bh	Not Used
			Ch	Not Used
			Dh	Not Used
			Eh	Not Used
			Fh	Not Used
023h	023h	Frequency Reference	-	Unit Depends Upon n170[6]
024h	024h	Output Frequency	-	Unit Depends Upon n170
025h-026h	025h-026h	Not Used	N/A	Not Used
027h	027h	Output Current	-	10/1A
028h	028h	Output Voltage	-	1/1V

Table A1-3. Modbus Monitor Registers (Read only) - Continued

ADDR	CLASS 100 INST. 16	FUNCTION	BIT	DESCRIPTION
029h	029h	Phase Loss Detection	0	Not Used
			1	Not Used
			2	Input Phase Loss (PF)[7]
			3	Output Phase Loss (LF)[8]
			4	Not Used
			5	Not Used
			6	Not Used
			7	Not Used
02Ah	02Ah	Warning Status	0	Operator Function Stop (STP)[9]
			1	Sequence Error (SER)
			2	Simultaneous FWD/REV Run Commands (EF)
			3	External Base Block (BB)
			4	Overtorque Detection (OL3)[10]
			5	Cooling Fan Overheat (OH)
			6	Main Circuit Overvoltage (OV)[11]
			7	Main Circuit Low Voltage (UV)[12]
			8	Cooling Fan Alarm (FAN)
			9	Not Used
			A	DeviceNet Communication Loss (BUS)
			B	Undertorque Detection (UL3)[13]
			C	External Inverter Overheat (OH3)[14]
			D	PID Feedback Loss (FBL)[15]
			E	Fast Stop (STP)[16]
			F	Internal Communications Standby (CALL)
02Bh	02Bh	External Input Status	0	Input Terminal S1 Closed
			1	Input Terminal S2 Closed
			2	Input Terminal S3 Closed
			3	Input Terminal S4 Closed
			4	Input Terminal S5 Closed
			5	DeviceNet Input Terminal S6 Closed
			6	DeviceNet Input Terminal S7 Closed
			7	Not Used
			8	Not Used
			9	Not Used
			A	Not Used
			B	Not Used
			C	Not Used
			D	Not Used
			E	Not Used
			F	Not Used

Table A1-3. Modbus Monitor Registers (Read only) - Continued

ADDR	CLASS 100 INST. 16	FUNCTION	BIT	DESCRIPTION
02Ch	02Ch	Drive Status	0	Running
			1	During Zero Speed
			2	Speed Agree
			3	Minor Fault
			4	Frequency Detection 1 (Output Frequency < n095)
			5	Frequency Detection 2 (Output Frequency ≥ n095)
			6	Drive Ready
			7	Under-Voltage
			8	Base-Block 1
			9	Frequency Reference From: 0=DeviceNet Comm. 1=n011 or Analog Input
			A	Run Signal From: 0=DeviceNet Comm. 1=Digital Oper. or External Terminals
			B	Overtorque Detection
			C	Undertorque Detection
			D	During Fault Retry
			E	Fault
			F	Time Out Communication Fault
02Dh	02Dh	External Terminal Output Status	0	DeviceNet Output Contact (MA) On
			1	Photo Coupler 1 (P1, PC) On
			2	Photo Coupler 2 (P2, PC) On
			3	Not Used
			4	Not Used
			5	Not Used
			6	Not Used
			7	Not Used
02Eh	02Eh	Inverter Status	0	Frequency Reference Loss Detection
			1	Not Used
			2	Not Used
			3	Not Used
			4	Not Used
			5	Not Used
			6	Not Used
			7	Not Used
02Fh-030h	02Fh-030h	Not Used	N/A	Not Used
031h	031h	DC Bus Voltage	-	1 / 1v
032h	032h	Torque Monitor	-	1 / 1%; (100% / Motor Rated Torque)
033h-036h	033h-036h	Not Used	N/A	Not Used
037h	037h	Output Power	-	1 / 1W; With Sign
038h	038h	PID Feedback	-	+/-100% / Equivalent to Max. Output Frequency Input; 10 / 1% Without Sign
039h	039h	PID Input	-	+/-100% / Equivalent to Max. Output Frequency Input; 10 / 1% Without Sign
03Ah	03Ah	PID Output	-	+/-100% / Equivalent to Max. Output Frequency; 10 / 1% With Sign
03Bh-03Ch	03Bh-03Ch	Not Used	N/A	Not Used

Table A1-3. Modbus Monitor Registers (Read only) - Continued

ADDR	CLASS 100 INST. 16	FUNCTION	BIT	DESCRIPTION
03Dh	03Dh	Communication Error[17]	0	CRC Error
			1	Data Length Error
			2	Not Used
			3	Parity Error
			4	Overrun Error
			5	Framing Error
			6	Time Overrun
			7	Not Used
			8	Not Used
			9	Not Used
			A	Not Used
			B	Not Used
			C	Not Used
			D	Not Used
			E	Not Used
			F	Not Used
03Eh-FFh	03Eh-FFh	Not Used	N/A	Not Used

[1] When a frequency value greater than maximum frequency (see parameter n011) is entered, maximum frequency will override
[2] Scaling is dependent on setting of parameter n170
[3] Effective when n057 = 18
[4] Effective when n058 = 18
[5] Effective when n059 = 18
[6] Value is zero without a run command
[7] Input phase loss detection depends on setting of parameter n166 and n167
[8] Output phase loss detection depends on setting of parameter n168 and n169
[9] Stop key on operator keypad depends on setting of parameter n007
[10] Depends on setting of parameter n096-n099
[11] Detection level: approx. 410VDC or more for 230V class; approx. 810VDC for 460V class
[12] Detection level: approx. 200VDC or more for 230V class; approx. 400VDC for 460V class
[13] Undertorque detection depends on setting of parameter n117, n118, and n119
[14] Effective when parameter n050-n056 is set to 26
[15] Effective when parameter n136 is set to 1
[16] Effective when parameter n050-n056 is set to either 20 or 22
[17] Error is held until a fault reset command

Appendix 2. SPECIFICATIONS

Table A2-1. Standard Specifications

SECTION A. Model No. Related Specifications

230V Class

		20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
Model	CIMR-V7NU ☐	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
Output Characteristics	Max. applicable motor output HP (kW) *(1)*	1/8 (0.1)	1/4 (0.2)	1/2 (0.4)	3/4 & 1 (0.7)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)
	Drive capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13
	Rated Output Current (A)	0.8	1.6	3.0	5.0	8.0	11.0	17.5	25	33
	Rated Input Current (A)	1.1	1.8	3.9	6.4	11.0	15.1	24.0	33.0	39.6
	Max. Output Voltage (V)	200 to 230V (proportional to input voltage)								
	Max. Output Frequency (Hz)	400 Hz (programmable)								
Power Supply	Rated Input Voltage and Frequency	3-phase. 200 to 230 V, 50/60 Hz								
	Allowable voltage fluctuation	-15% to +10%								
	Allowable frequency fluctuation	±5%								
Physical Character-istics	Cooling Method (QTY)	self	self	self	fan	fan	fan	fan	fan(2)	fan(2)

460V Class

		- -	40P2	40P4	40P7	41P5	42P2	43P7	45P5	47P5
Model	CIMR-V7NU ☐	- -	40P2	40P4	40P7	41P5	42P2	43P7	45P5	47P5
Output Characteristics	Max. applicable motor output HP (kW) *(1)*	- -	1/2 (0.2)	3/4 (0.4)	1 & 2 (0.7)	3 (1.5)	3 (2.2)	5 (3.7)	7.5 & 10 (5.5)	10 (7.5)
	Drive capacity (kVA)	- -	0.9	1.4	2.6	3.7	4.2	7	11	14
	Rated Output Current (A)	- -	1.2	1.8	3.4	4.8	5.5	8.6	14.8	18
	Rated Input Current (A)	- -	1.6	2.4	4.7	7.0	8.1	12.0	19.6	23.8
	Max. Output Voltage (V)	380 to 460V (proportional to input voltage)								
	Max. Output Frequency (Hz)	400 Hz (programmable)								
Power Supply	Rated Input Voltage and Frequency	3-phase. 380 to 460 V, 50/60 Hz								
	Allowable voltage fluctuation	-15% to +10%								
	Allowable frequency fluctuation	±5%								
Physical Character-istics	Cooling Method (QTY)	- -	self	self	self	fan	fan	fan	fan(2)	fan(2)

SECTION B. All Drives

Control Characteristics	Control method	Sine wave PWM (V/f Control or Open Loop Vector)
	Frequency control range	0.1 to 400 Hz
	Frequency accuracy (temperature change)	Digital command: ±0.01% (14 to 122°F, -10 to +50°C) Analog command: ±0.5% (77°F ± 18°F, 25°C ± 10°C)
	Speed Regulation	Open Loop Vector: ±0.2% V/Hz Mode: ±0.5% – 1% with Slip Compensation
	Frequency setting resolution	Digital Operator reference: 0.01 Hz (< 100Hz) 0.1 Hz (100Hz or more) Analog reference: 0.06Hz/60Hz (1/1000)
	Output frequency resolution	0.01 Hz
	Overload capacity	150% of rated output current for 1 minute
	Frequency Reference Signal	0 to 10VDC (20kΩ), 4 to 20mA (250Ω), 0 to 20mA (250Ω) pulse train input, Digital Operator Pot
	Accel/Decel Time	0.01 to 6000 sec. (accel/decel time are independently programmed)
	Braking Torque	Short-term average deceleration torque (2) 0.2kW: 150% 0.75kW: 100% 1.5kW: 50% 2.2kW or more: 20% Continuous regenerative torque: Approx. 20% (150% with optional braking resistor, braking transistor built-in)
	V/f characteristics	Custom V/f pattern

See notes at end of table.

(table continued on next page)

Table A2-1. Standard Specifications (Continued)

SECTION B. All Drives (Continued)			
Protective Functions	Motor overload protection		Electronic thermal overload relay
	Instantaneous overcurrent		Motor coasts to stop at approx. 250% of drive current
	Overload		Motor coasts to stop after 1 min. at 150% of drive rated current (7)
	Overvoltage		Motor coasts to stop if DC bus voltage exceeds 410VDC (230V), 820VDC (460V)
	Undervoltage		Motor coasts to stop when DC bus voltage is 210VDC or less (230V), 400VDC or less (460V)
	Momentary Power Loss		The following operations are selectable: • Not provided (stops if power loss is 15 ms or longer) • Automatic restart at recovery from 0.5 sec. power loss • Automatic restart
	Heatsink overheat		Protected by electronic circuit
	Stall prevention level		Independently programmable during accel and constant-speed running. Selectable during decel.
	Ground fault		Protected by electronic circuit (overcurrent level)
	Power charge indication		ON until the DC bus voltage becomes 50V or less. RUN lamp says ON or digital operator LED stays ON. (Charge LED is Provided for 400V)
	Cooling Fan Fault		Protected by electronic circuit
Other Functions	Input signals	Run/stop input	2-Wire or 3-Wire
		Multi-function input	Seven of the following input signals are selectable: *(3)* Forward/reverse run (3-Wire sequence), fault reset, external fault (NO/NC contact input), multi-step speed operation, Jog command, accel/decel time select, external baseblock (NO/NC contact input), speed search command, accel/decel hold command, LOCAL/REMOTE selection, DeviceNet communication/control circuit terminal selection, emergency stop fault emergency stop alarm
	Output signals	Multi-function output	Following output signals are selectable (1 NO/NC contact output, 2 photo-coupler outputs): *(4)* Fault, running, zero speed, at frequency, frequency detection (output frequency ≤ or ≥ set value), during overtorque detection, during undervoltage detection, minor error, during baseblock, operation mode, inverter run ready, during fault retry, during UV, during speed search, data output through DeviceNet communication
	Standard functions		Open Loop Vector Control, full-range automatic torque boost, auto restart, upper/lower frequency limit, DC injection braking current/time at start/stop, frequency reference gain/bias, prohibited frequencies, analog meter calibrating gain, S-curve accel/decel, slip compensation, DeviceNet communications, frequency reference from digital operator pot
	Display	Status indicator LEDs	RUN and ALARM LEDs provided as standard
		Digital Operator	Monitors frequency reference, output frequency, output current, FWD/REF selection
	Terminals		Screw terminals for both main circuit and control circuit
	Wiring distance between drive and motor		328 ft (100 m) or less *(5)*
	Enclosure		Nema Type 1
	Cooling method		Self-cooling/cooling fan
DeviceNet Specifications	Input Power		Voltage: 11 to 25VDC Current: 40mA
	DeviceNet Specification		Conformance level 16: Passed
	DeviceNet Profile		AC Drive Device Type 2
	Connector Type		5-pin open-style screw connector
	Physical Layer Type		Isolated Physical Layer CAN transceiver + photo coupler
	MAC ID Setting		5 dip-switches: MAC ID 0 to 63; Parameter setting available
	Baud Rate		2 dip-switches: 125/250/500 kbaud; Parameter setting available
	Supported Message		Group 2 only server Explicit and Polled I/O messaging
	I/O Assembly Instance		Input: 5 types (4-8 bytes) Output: 5 types (4-8 bytes)
Environmental conditions	Ambient temperature		14 to 104°F (-10 to 40°C)
	Humidity		95% RH or less (non-condensing)
	Storage temperature *(6)*		-4 to 140°F (-20 to 60°C)
	Location		Indoor (free from corrosive gases or dust)
	Elevation		3,280 feet (1,000 m) or less
	Vibration		Up to 1G, at less than 20 Hz; up to 0.2G, at 20 to 50 Hz

NOTES:

(1) Based on an N.E.C. standard 4-pole motor for max. applicable motor output.
(2) Shows deceleration torque for an uncoupled motor decelerating from 60 Hz in 0.1 seconds.
(3) Four of these input signals are present on the control terminal, and three are controlled via DeviceNet communications.
(4) Two photo-coupler outputs are present on the control terminal, and one NO contact output is controlled via DeviceNet communications.
(5) Contact Yaskawa for wiring distances greater than 328 ft. (100 m).
(6) Temperature during shipping (for short periods of time).

Appendix 3. CAPACITY & CONTROL METHOD RELATED PARAMETERS

The factory setting of certain parameters change with drive rating and control method selected. The following two tables list the parameters and how they change.

Table A3-1. Parameters Related to Drive Capacity

Model CIMR-V7NU ☐	n036	n105	n106	n107	n108	n110	n140	n158
20P1	0.6	1.7	2.5	17.99	110.4	72	481.7	0
20P2	1.1	3.4	2.6	10.28	56.08	73	356.9	1
20P4	1.9	4.2	2.9	4.573	42.21	62	288.2	2
20P7	3.3	6.5	2.5	2.575	19.07	55	223.7	3
21P5	6.2	11.1	2.6	1.233	13.40	45	169.4	4
22P2	8.5	11.8	2.9	0.800	9.81	35	156.8	5
23P7	14.1	19.0	3.3	0.385	6.34	32	122.9	7
25P5	19.6	28.8	1.5	0.199	4.22	26	94.8	9
27P5	26.6	43.9	1.3	0.111	2.65	30	72.7	10
40P2	0.6	3.4	2.5	41.97	224.3	73	713.8	21
40P4	1.0	4.0	2.7	19.08	168.8	63	576.4	22
40P7	1.6	6.1	2.6	11.22	80.76	52	447.4	23
41P5	3.1	11.0	2.5	5.044	53.25	45	338.8	24
42P2	4.2	11.7	3.0	3.244	40.03	35	313.6	25
43P7	7.0	19.3	3.2	1.514	24.84	33	245.8	27
45P5	9.8	28.8	1.5	0.797	16.87	26	189.5	29
47P5	13.3	43.9	1.3	0.443	10.59	30	145.4	30

Table A3-2. Parameters Related to Control Method

Parameter	Description	V/f Control Mode (n002 = 0)	Open Loop Vector (n002 = 1)
n014	Frequency - Midpoint	1.5	3.0
n015	Voltage - Midpoint	12.0 (230V) 24.0 (460V)	11.0 (230V) 22.0 (460V)
n016	Frequency - Min.	1.5	1.0
n017	Voltage - Min.	12.0 (230) 24.0 (460)	4.3 (230) 8.6 (460)
n097	Overtorque Detection Selection	0.0	N/A
n104	Torque Compensation Time	0.3	0.2
n108	Motor Leakage Inductance	N/A	See table A3-1
n109	Torque Compensation Limit	N/A	150
n111	Slip Compensation Gain	0.0	1.0
n112	Slip Compensation Time	2.0	0.2
n113	Slip Compensation Selection During Regeneration	N/A	0.0
n139	Energy Saving Selection	0.0	N/A

Appendix 4. PERIPHERAL DEVICES

The following peripheral devices may be required to be mounted between the AC main circuit power supply and the Drive input terminals L1 (R), L2 (S) and L3 (T).

⚠ CAUTION

Never connect a general LC/RC noise filter to the drive output circuit.

Never connect a phase-advancing capacitor to the input/output sides or a surge suppressor to the output side of the drive.

When a magnetic contactor is installed between the drive and the motor, never turn it on or off during operation.

For more details on peripheral devices, contact your manufacturer.

• Recommended Branch Short Circuit Protection Peripheral Devices

All models have UL evaluated motor overload protection built in. Motor overload protection is also provided in accordance with the NEC and CEC. Additional branch circuit overload protection is not required.

230V 3-Phase

Model CIMR-V7NU ☐	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13.0
Rated output current (A)	0.8	1.6	3.0	5.0	8.0	11.0	17.5	25.0	33.0
Rated input current (A)	1.1	1.8	3.9	6.4	11.0	15.1	24.0	33.0	39.6
Max. Time Delay Fuse Rating (A)(1)	1.8	3.2	6.25	10.0	17.5	20.0	25.0	45.0	60.0
Max. Non-Time Delay Fuse Rating (A)(2)	3.0	5.0	10.0	20.0	30.0	45.0	45.0	70.0	80.0
Max. MCCB Rating (A)	15.0	15.0	15.0	15.0	20.0	30.0	40.0	50.0	60.0

460V 3-Phase

Model CIMR-V7NU ☐	40P2	40P4	40P7	41P5	42P2	43P7	45P5	47P5
Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	7.0	11.0	14.0
Rated output current (A)	1.2	1.8	3.4	4.8	5.5	9.2	14.8	18
Rated input current (A)	1.6	2.4	4.7	7.0	8.1	12.0	19.6	23.8
Max. Time Delay Fuse Rating (A)(1)	2.8	4.0	8.0	12.0	12.0	20.0	35.0	45.0
Max. Non-Time Delay Fuse Rating (A)(2)	5.0	7.0	12.0	20.0	20.0	35.0	60.0	70.0
Max. MCCB Rating (A)	15.0	15.0	15.0	15.0	15.0	20.0	30.0	40.0

Notes:

(1) Apply UL designated Class RK5 fuses.

(2) Apply UL designated Class CC or T non-time delay fuses.

Input fuse sizes are determined by NEC guidelines, and should not exceed the ratings shown in the table.
Fuse Ratings are based upon 250V fuses for 230V Drives, and 600V for 460V Drives
Fuse Manufacturer's Designators: Class CC: KTK, FNQ or equivalent
Class RK5: FRN, FRS or equivalent
Class T: JJS, JJN or equivalent

• Magnetic Contactor

Mount a surge protector on the coil. When using a magnetic contactor to start and stop the drive, do not exceed one start per hour.

• Ground Fault Interrupter

Select a ground fault interrupter not affected by high frequencies. To prevent malfunctions, the current should be 200mA or more and the operating time 0.1 second or more.

• AC and DC Reactor

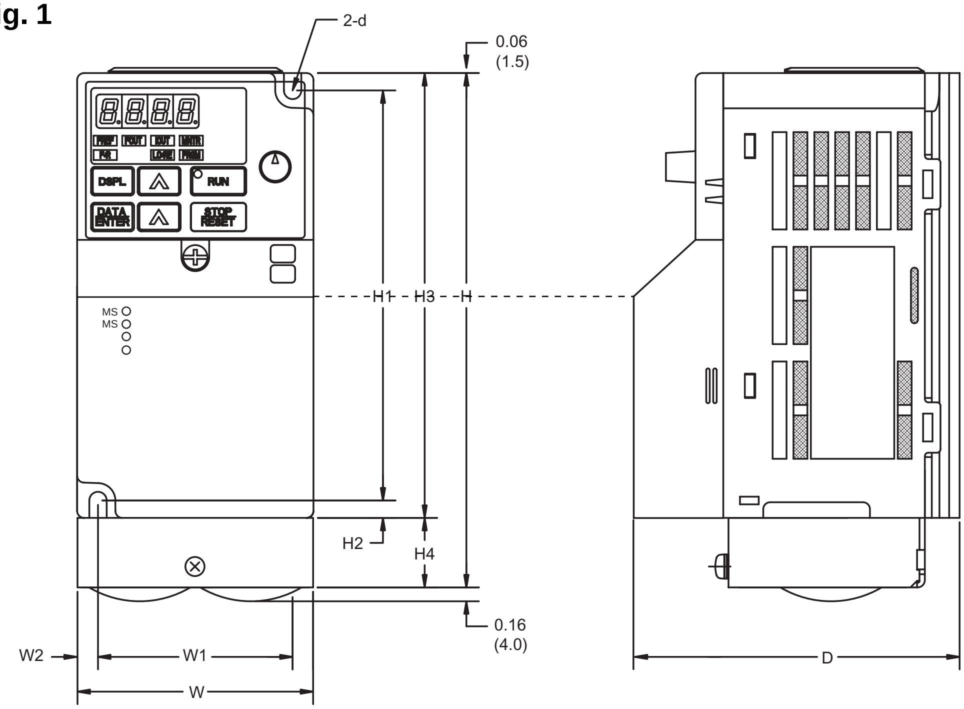
Install a reactor to connect to a power supply transformer of large capacity (600 kVA or more) or to improve the power factor on the power supply side.

• Noise Filter

Use a noise filter exclusively for the drive if radio noise generated from the drive causes other control devices to malfunction.

Appendix 5. DRIVE DIMENSIONS

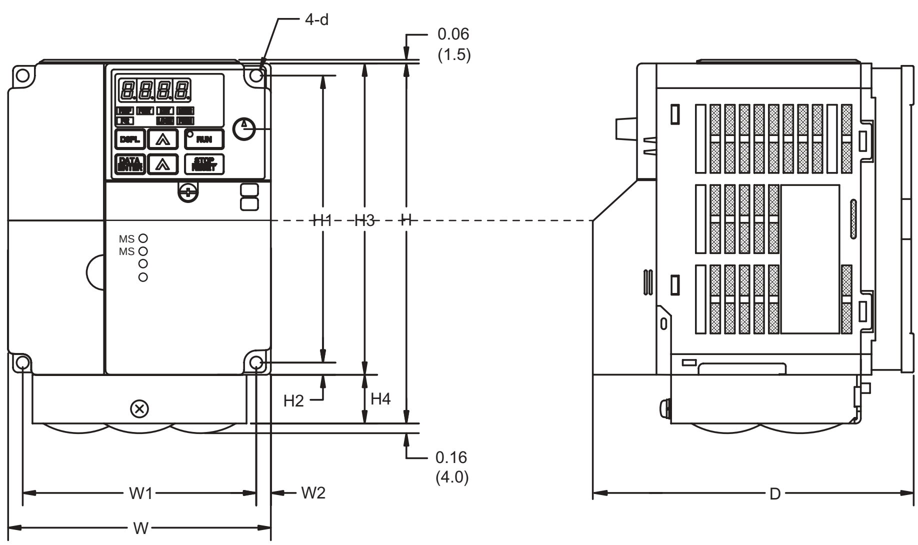
Fig. 1



V7N Enclosed wall mounted type

Voltage Class	Model	Size	Dimensions in inches (mm)										Weight	Heat Loss (W)			Fig.
	CIMR-V7NU ☐	HP	W	H	D	W1	H1	H2	W2	H3	H4	d	(kg)	Heat-sink	Internal	Total	
230V 3-phase	20P1	1/8	2.68	5.83 (68)	3.58 (148)	2.20 (91)	4.65 (56)	0.20 (118)	0.24 (5)	5.04 (6)	0.79 (128)	M4 (20)	1.55	3.7 (0.7)	9.3	13.0	1
	20P2	1/4	2.68	5.83 (68)	3.58 (148)	2.20 (91)	4.65 (56)	0.20 (118)	0.24 (5)	5.04 (6)	0.79 (128)	M4 (20)	1.55	7.7 (0.7)	10.3	18.0	1
	20P4	1/2	2.68	5.83 (68)	4.84 (148)	2.20 (123)	4.65 (56)	0.20 (118)	0.24 (5)	5.04 (6)	0.79 (128)	M4 (20)	2.20	15.8 (1.0)	12.3	28.1	1
	20P7	3/4 & 1	2.68	5.83 (68)	5.63 (148)	2.20 (143)	4.65 (56)	0.20 (118)	0.24 (5)	5.04 (6)	0.79 (128)	M4 (20)	2.65	28.4 (1.2)	16.7	45.1	1

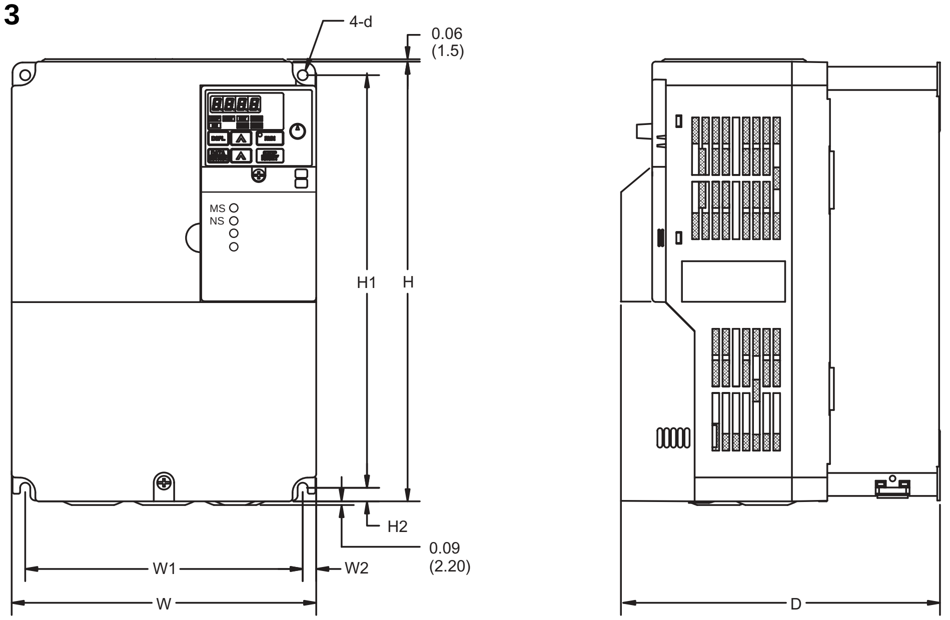
Fig. 2



V7N Enclosed wall mounted type

Voltage Class	Model CIMR-V7NU □	Size HP	Dimensions in inches (mm) W	H	D	W1	H1	H2	W2	H3	H4	d	Weight (kg)	Heat Loss (W) Heat-sink	Internal	Total	Fig.
230V 3-phase	21P5	2	4.25 (108)	5.83 (148)	5.75 (146)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	3.53 (1.6)	53.7	19.1	72.8	2
	22P2	3	4.25 (108)	5.83 (148)	6.10 (155)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	3.75 (1.7)	60.4	34.4	94.8	2
	23P7	5	5.51 (140)	5.83 (148)	6.22 (158)	5.04 (128)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	5.30 (2.4)	96.7	52.4	149.1	2
460V 3-phase	40P2	1/2	4.25 (108)	5.83 (148)	4.21 (107)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	2.65 (1.2)	9.4	13.7	23.1	2
	40P4	3/4	4.25 (108)	5.83 (148)	4.92 (125)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	2.65 (1.2)	15.1	15.0	30.1	2
	40P7	1 & 2	4.25 (108)	5.83 (148)	6.10 (155)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	3.75 (1.7)	30.3	24.6	54.9	2
	41P5	3	4.25 (108)	5.83 (148)	6.73 (171)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	3.75 (1.7)	45.8	29.9	75.7	2
	42P2	3	4.25 (108)	5.83 (148)	6.73 (171)	3.78 (96)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	3.75 (1.7)	50.5	32.5	83.0	2
	43P7	5	5.51 (140)	5.83 (148)	6.22 (158)	5.04 (128)	4.65 (118)	0.20 (5)	0.24 (6)	5.04 (128)	0.79 (20)	M4	5.30 (2.4)	73.4	44.5	117.9	2

Fig. 3



V7N Enclosed wall mounted type[1]

Voltage Class	Model	Size	Dimensions in inches (mm)										Weight	Heat Loss (W)			Fig.
	CIMR-V7NU ☐	HP	W	H	D	W1	H1	H2	W2	H3	H4	d	(kg)	Heat-sink	Internal	Total	
230V 3-phase	25P5	7.5	7.09 (180)	10.24 (260)	7.28 (185)	6.46 (164)	9.61 (244)	0.31 (8)	0.31 (8)	–	–	M5	11.45 (5.2)	170.4	79.4	249.8	3
	27P5	10	7.09 (180)	10.24 (260)	7.28 (185)	6.46 (164)	9.61 (244)	0.31 (8)	0.31 (8)	–	–	M5	11.89 (5.4)	219.2	98.9	318.1	3
460V 3-phase	45P5	7.5 & 10	7.09 (180)	10.24 (260)	7.28 (185)	6.46 (164)	9.61 (244)	0.31 (8)	0.31 (8)	–	–	M5	10.14 (4.6)	168.8	87.7	256.5	3
	47P5	10	7.09 (180)	10.24 (260)	7.28 (185)	6.46 (164)	9.61 (244)	0.31 (8)	0.31 (8)	–	–	M5	10.58 (4.8)	209.6	99.3	308.9	3

[1] 230V and 460V drives represented in Fig. 3 can be used as "IP00" type enclosures if the top and bottom covers are removed.

Appendix 6. DYNAMIC BRAKING OPTION

GENERAL. Dynamic braking (DB) enables the motor to be brought to a smooth and rapid stop. This is achieved by dissipating the regenerative energy of the AC motor across the resistive components of the Dynamic Braking option. For further details on dynamic braking, see the option instruction sheet shipped with the dynamic braking components.

The Drive has an integral braking transistor. However, to make use of the Dynamic Braking function requires addition of either a Braking Resistor (for 3% duty cycle) or Braking Resistor Unit (for 10% duty cycle). See table below. In either case, interface to external control circuitry is necessary to ensure that dynamic brake resistor overheating is communicated to the drive as a fault condition.

Table A6-1. Drive DB Components

Model	Size	DB Components				Minimum Connect Resistance (Ω)
CIMR-	HP	Braking Resistor - 3% Duty		Braking Resistor - 10% Duty		
V7NU ☐		Part No.	Qty. Reqd.	Part No.	Qty Reqd.	
20P1	1/8	50185531	1	—	—	300
20P2	1/4	50185531	1	—	—	300
20P4	1/2	50185430	1	05P00041-0825	1	200
20P7	3/4 & 1	50185430	1	05P00041-0825	1	120
21P5	2	50185431	1	05P00041-0827	1	60
22P2	3	50185432	1	05P00041-0827	1	60
23P7	5	50185433	1	05P00041-0828	1	32
25P5	7.5	N/A	—	05P00041-0829	1	9.6
27P5	10	N/A	—	05P00041-0830	1	9.6
40P2	1/2	50185530	1	05P00041-0835	1	750
40P4	3/4	50185530	1	05P00041-0835	1	750
40P7	1 & 2	50185530	1	05P00041-0835	1	510
41P5	3	50185531	1	05P00041-0837	1	240
42P2	3	50185532	1	05P00041-0837	1	200
43P7	5	50185531	2	05P00041-0838	1	100
45P5	7.5 & 10	N/A	—	05P00041-0840	1	32
47P5	10	N/A	—	05P00041-0841	1	32

DYNAMIC BRAKING OPTION INSTALLATION. This option must be installed by a TECHNICALLY QUALIFIED INDIVIDUAL who is familiar with this type of equipment and the hazards involved.

⚠ WARNING

HAZARDOUS VOLTAGE CAN CAUSE SEVERE INJURY OR DEATH.
LOCK ALL POWER SOURCES FEEDING THE DRIVE IN "OFF" POSITION.

⚠ CAUTION

Failure to follow these installation steps may cause equipment damage or personnel injury.

Preliminary Procedures

1. Disconnect all electrical power to the drive.

2. Open the Drive's terminal covers.

3. Verify that voltage has been disconnected by using a voltmeter to check for voltage at the incoming power terminals, L1 (R), L2 (S) and L3 (T).

Braking Resistor (3% Duty Cycle) Installation

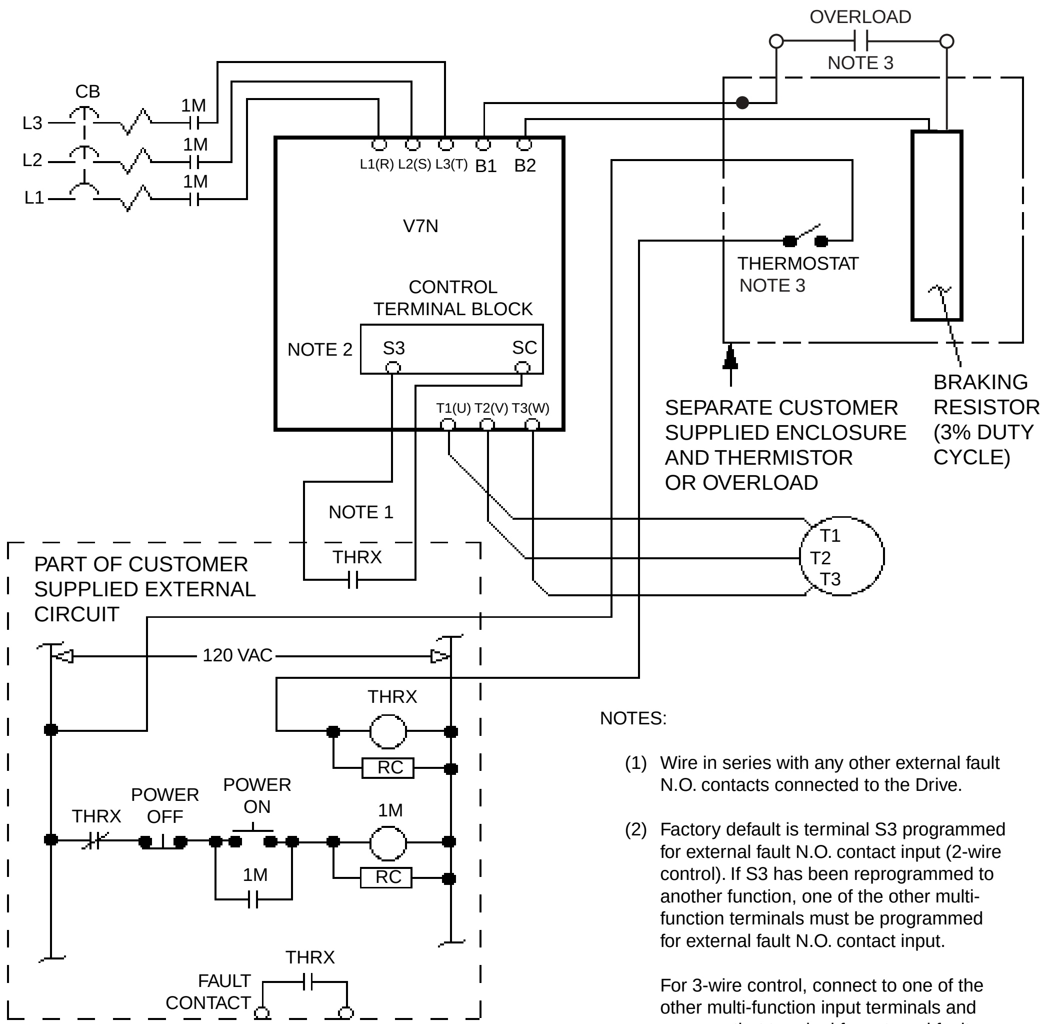
Note: The 3% duty cycle Braking Resistor is supplied with 6-inch leads.

1. Mount the Braking Resistor, along with an overload or thermostat, in a suitable metal enclosure.

2. At the Drive. Connect the leads from the Braking Resistor to drive terminals B1 and B2, and make connections to external control circuit, as shown in Figure A6-1.

3. Close the Drive's terminal covers.

4. Proceed to "Adjustments" on page A6-4.



NOTES:

(1) Wire in series with any other external fault N.O. contacts connected to the Drive.

(2) Factory default is terminal S3 programmed for external fault N.O. contact input (2-wire control). If S3 has been reprogrammed to another function, one of the other multi-function terminals must be programmed for external fault N.O. contact input.

For 3-wire control, connect to one of the other multi-function input terminals and program that terminal for external fault N.O. contact input.

(3) Either an overload can be used in series with the Braking resistor or a thermostat can be configured as shown.

Figure A6-1. Typical Wiring of Braking Resistor (for 3% Duty Cycle) to Drive

IMPORTANT

Since the Braking Resistor Unit generates heat during the dynamic braking operation, install it in a location away from other equipment which emits heat.

1. Mount the Braking Resistor Unit on a vertical surface, maintaining minimum 1.18 inch (30 mm) clearance on each side and 5.91 inch (150 mm) clearance top and bottom.

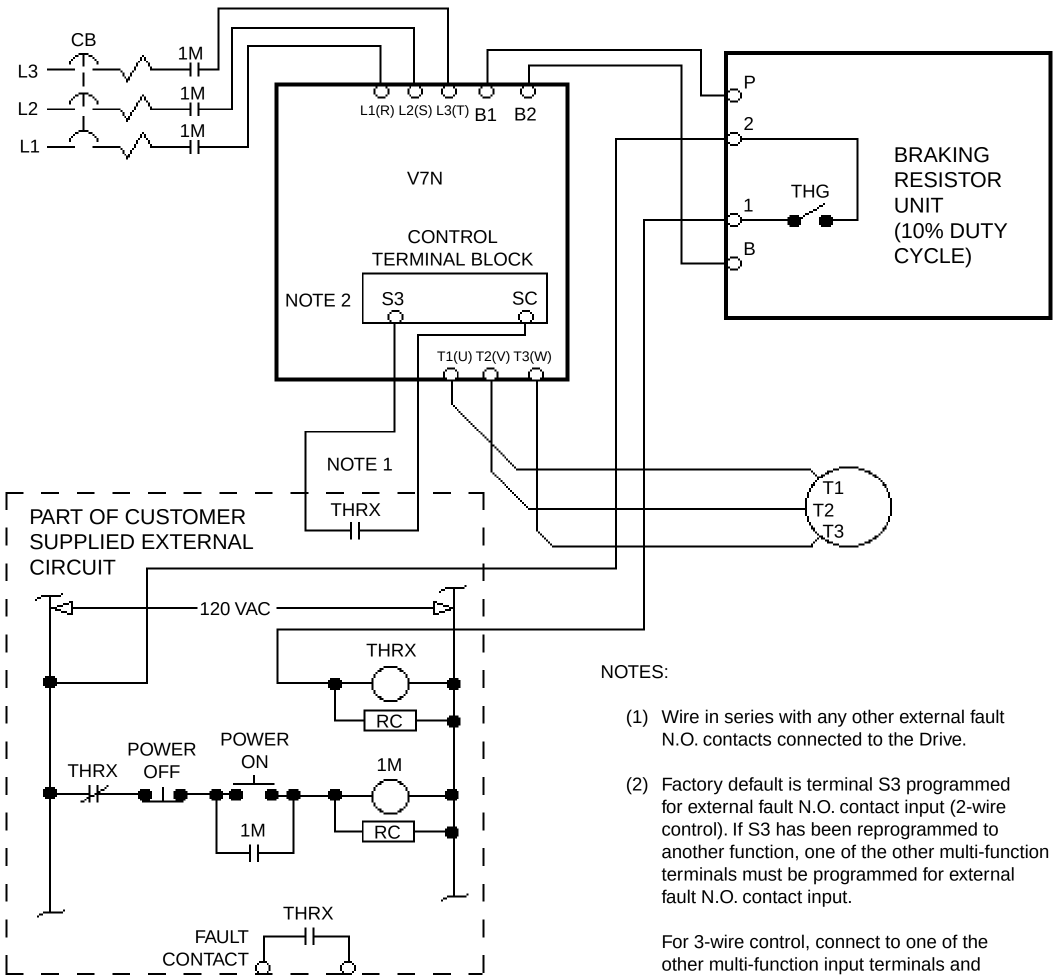
2. Open the Braking Resistor Unit terminal box to access its terminal block. Connect the Braking Resistor Unit to the drive and external control circuit according to the following table and Figure A6-2.

Terminals	**B, P, B1, B2**	**1, 2, S3, SC***
Lead Size (AWG)	12 - 10	18 - 14 *
Lead Type	600V ethylene propylene rubber insulated, or equivalent	
Terminal Screw	M4 (resistor end)	

* Power leads for the Braking Resistor Unit generate high levels of electrical noise; therefore, signal leads must be grouped separately.

3. Close and secure the cover of the Braking Resistor Unit terminal box. Close the Drive's terminal covers.

4. **Adjustments.** Program constant ***n092*** to " 1 "; this disables stall prevention during deceleration.



NOTES:

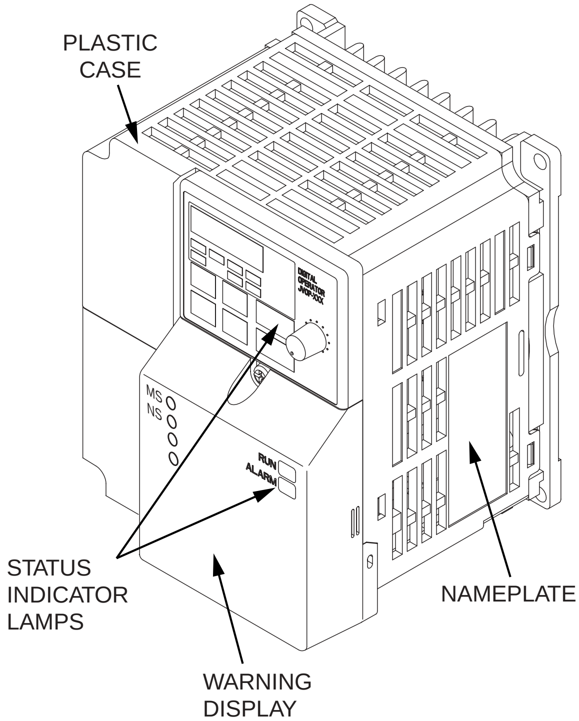
(1) Wire in series with any other external fault N.O. contacts connected to the Drive.

(2) Factory default is terminal S3 programmed for external fault N.O. contact input (2-wire control). If S3 has been reprogrammed to another function, one of the other multi-function terminals must be programmed for external fault N.O. contact input.

For 3-wire control, connect to one of the other multi-function input terminals and program that terminal for external fault N.O. contact input.

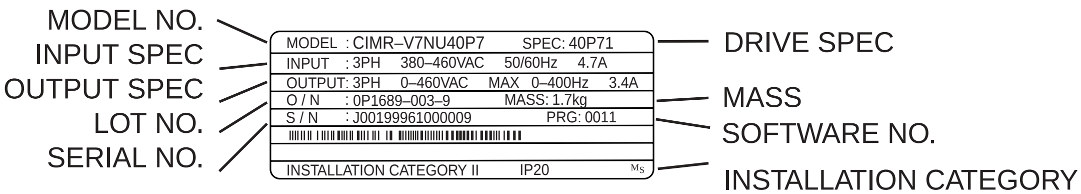
Figure A6-2. Typical Wiring of Braking Resistor Unit (for 10% Duty Cycle) to Drive

Appendix 7. NAMEPLATE INFORMATION



V7N

Nameplate



V7N

Model No.

C I M R - V 7 N U 2 0 P 1

- CIMR: DRIVE
- V7: V7 SERIES

N	Embedded DeviceNet Communications

No.	Applicable maximum motor output
0P1	0.13 HP
0P2	0.25 HP
0P4	0.5 HP
0P7	1 HP
1P5	2 HP
2P2	3 HP
3P0	4 HP
3P7	5 HP
5P5	7.5 HP
7P5	10 HP

No.	Voltage Class	
B	Single-phase	230VAC
2	Three-phase	230VAC
4	Three-phase	460VAC

No.	Specifications
U	UL Specification (U.S. Specification)

Drive Spec

2 0 P 1 1

B	Single-phase 230VAC
2	Three-phase 230VAC
4	Three-phase 460VAC

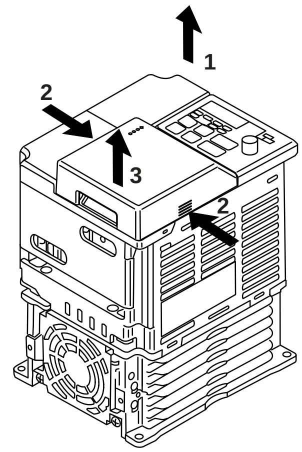
No.	Applicable maximum motor output
0P1	0.13 HP
0P2	0.25 HP
0P4	0.5 HP
0P7	1 HP
1P5	2 HP
2P2	3 HP
3P0	4 HP
3P7	5 HP
5P5	7.5 HP
7P5	10 HP

No.	Protective structure
0	Open chassis (IP20, IP00)
1	Enclosed wall-mounted (NEMA 1)

Appendix 8. REMOVE/INSTALL DRIVE FACE PLATES

REMOVING AND MOUNTING DIGITAL OPERATOR COVERS

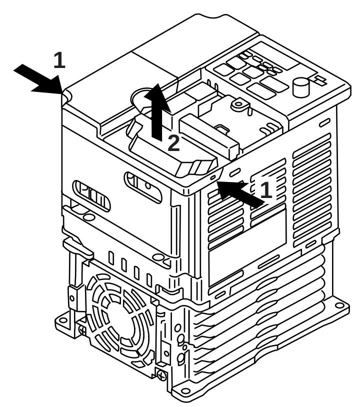
NOTE: Mount the Drive after removing the front cover, digital operator and terminal cover.



- **Removing front cover**
  Use a screwdriver to loosen the screw on the front cover surface to direction 1 to remove it. Then press the right and left sides to direction 2 and lift the front cover to direction 3.

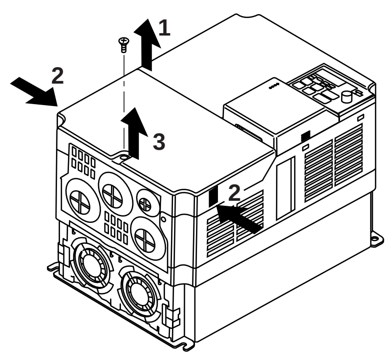
- **Mounting front cover**
  Mount the front cover in the reverse order of the above procedure for removal.

- **Removing terminal cover when "W" (Width) dimensions are 4.25" (108mm), 5.51" (140mm), or 6.69" (170mm)**
  After removing the front cover, press the right and left sides to direction 1 and lift the terminal cover to direction 2.



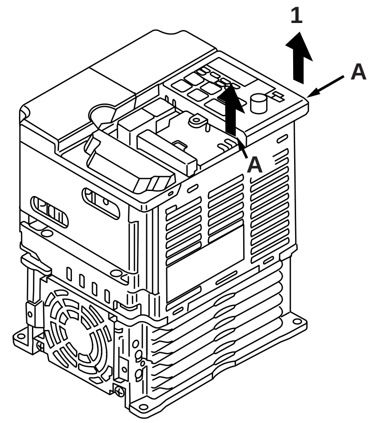
- **Removing terminal cover when "W" (Width) dimensions are 7.09" (180mm)**
  Use a screwdriver to loosen the screw on the terminal cover surface to direction 1 to remove it. Then press the right and left sides to direction 2 and lift the terminal cover to direction 3.

- **Mounting terminal cover**
  Mount the terminal cover in the descending order of the above procedure for removal.

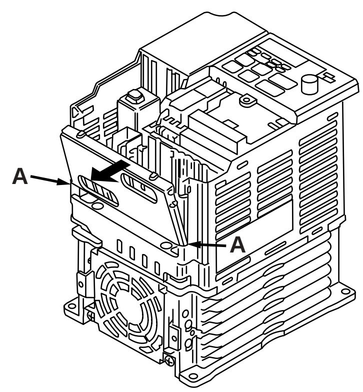


- **Removing digital operator**
  After removing the front cover, lift the upper and lower sides (section A) of the right side of the digital operator to direction 1.

- **Mounting digital operator**
  Mount the digital operator in the reverse order of the above procedure for removal.

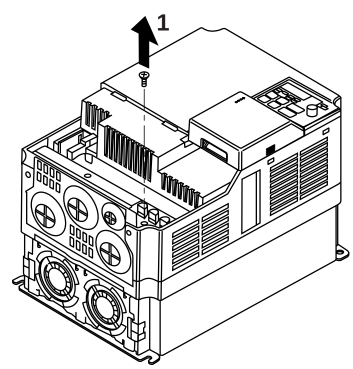


- **Removing bottom cover when “W” (Width) dimensions are 4.25" (108mm), 5.51" (140mm), or 6.69" (170mm)**
  After removing the front cover and the terminal cover, tilt the bottom cover to direction 1 with section A as a supporting point.



- **Removing terminal cover when “W” (Width) dimensions are 7.09" (180mm)**
  After removing the terminal cover use a screwdriver to loosen the fastening screw to direction 1 to remove it.

- **Mounting bottom cover**
  Mount the bottom cover in the reverse order of the above procedure for removal.



Appendix 9. DEVICENET CONFIGURATION

The DeviceNet configuration refers to properly setting the DeviceNet slave in a network system through its parameter settings. The V7N has DeviceNet parameters and drive parameters accessible through its EDS file. The configuration software uses the EDS file to map the DeviceNet and drive parameters, so the user can access them easily. The configuration software that this document will address is DeviceNet Manager and RSNetWorx.

Note: This section is only intended to be used as a guide for configuration of the Yaskawa V7N on DeviceNet using configuration tool software DeviceNet Manager and RSNetWorx. Any updates to the two configuration tool software will not be noted in this appendix. Please use the user's manual of the configuration tool as the primary reference and use the contents of this section only as a general guide.

1. Install EDS files.

   EDS files can be downloaded from the internet from www.odva.org in the "Downloads" area or www.drives.com in the "Our Products" - "Literature Library" - "Software Downloads" area. Be sure to select the version of EDS file that matches the DeviceNet card version and the drive capacity of the V7N for correct scaling of parameters. Refer to the Table of EDS Files and Product Codes in Section 2.9 for a full list of EDS files.
   Download the EDS files in a temporary directory of the PC.

   To install follow these steps:
   a. For RSNetWorx.
      i. Run RSNetWorx for DeviceNet.
      ii. From the Tools menu select EDS Wizard.
      iii. Press the Next button.
      iv. Select Register EDS Files from the options and press Next.
      v. Select Register a directory of EDS files from the options.
      vi. In the Named area enter the location of the files (i.e. C:\eds) and press Next.
      vii. After the files are analyzed (test results) press Next.
      viii. Do not change the default icon, press Next.
      ix. At the final task summary press Next to register the devices.
      x. To complete the wizard, press the Finish button.

   b. For DeviceNet Manager.
      i. Run DeviceNet Manager.
      ii. From the Utilities menu select Install EDS Files.
      iii. Select the directory where the EDS files were installed and press the Select All button and press OK.
      iv. At the Set Device Bitmap prompt press No.

2. Add the drive to the network by dragging it from the AC Drives folder or other location (depending on the software).
   At this point there should be at least two items on the network, a master device, such as a scanner module, and the V7N drive.

3. Add the drive to the scanner module's scan list.
   a. For RSNetWorx.
      i. Double click on the scanner icon. This will open the scanner's configuration screen.
      ii. Select the Scanlist tab.
      iii. Deselect the Automap on Add option.
      iv. From the column on the left side select the drive and press the arrow button to insert on the scan list column on the right.
      v. Press the Edit I/O button.
      vi. The Polled option is automatically selected. The Tx and Rx sizes are set to 4 bytes, and the Poll Rate is set to Every Scan. The size of Tx and Rx will depend on what assembly is chosen. Refer to the V7N DeviceNet Technical Manual, Appendix B for a list of available assemblies.

The default assemblies are 21 and 71 (DeviceNet Extended Speed Control, 4 bytes each).

vii. Once the polled information is entered press OK.

b. For DeviceNet Manager.
   i. Select and drag the drive icon onto the scanner's icon.
   ii. At the Do you really want to add device Node x[x] to scan list of Master Node y[y] press Yes.
   iii. Double click on the scanner's icon. This will bring up the scanner's configuration screen. Press the Select Scan List button.
   iv. Select the drive from the list and press the Edit I/O Parameters button.
   v. The Polled option is automatically selected. The Tx and Rx sizes are set to 4 bytes and the Poll Rate is set to Every Scan. The size of Tx and Rx will depend on what assembly is chosen. Refer to the V7N DeviceNet Technical Manual, Appendix B for a list of available assemblies.

      The default assemblies are 21 and 71 (DeviceNet Extended Speed Control, 4 bytes each).

   vi. Once the polled information is entered press OK.

4. Map the drive.
   a. For RSNetWorx.
      i. Select the Input tab from the scanner's configuration screen.
      ii. Select the drive to map from the list.
      iii. Select the memory area to map the drive.

   The memory area depends on the type of scanner module being used. For example if the scanner is the Allen-Bradley 1747-SDN there are two sections where it can be mapped: the discrete and the m file.
   Please refer to the master device technical manual for the available mapping locations.

      iv. Press the AutoMap button.
      v. Select the Output tab from the scanner's configuration screen and repeat steps ii through iv.
      vi. Press the OK button.

   b. For DeviceNet Manager.
      i. Select the drive to map from the list.
      ii. Press the Auto Map button from the Scan List Tools.
      iii. In the Regions of Map/Unmap area select the memory area to map the drive.

   The memory area depends on the type of scanner module being used. For example if the scanner is the Allen-Bradley 1747-SDN there are two sections where it can be mapped: the discrete and the m file.
   Please refer to the master device technical manual for the available mapping locations.

      iv. Press the Map button. This will map both the input and the output.

5. Download configuration to scanner.
   If the scanner module is from Allen-Bradley, then the processor must be set to program mode, by means of the key, prior to downloading. If the scanner or master device is from a different manufacturer refer to the technical manual for specific configuration requirements.

   a. For RSNetWorx.
      i. If the RSNetWorx was online during the configuration period, then at the moment the OK button was pressed after mapping the drive the information was downloaded.
      ii. If the configuration was done offline, press the online speed button. Note: make sure RSLinx has been configured, connected to the network, and running in the background.
      iii. Right click on the scanner's icon and select Download to Device.

b. For DeviceNet Manager.
   i. If DeviceNet Manager was online during the configuration then press the SDN button located on the Save to area of the window.
   ii. If the configuration was done offline, press the online button.
   iii. Select the appropriate driver to communicate with the network and configure its settings.
   iv. Double click on the scanner's icon.
   v. Press the Edit Scan List button.
   vi. Press the SDN button located on the Save to area of the window.

Refer to RSNetWorx and/or DeviceNet Manager manuals for additional information on configuration.

INDEX

INDEX (Continued)

DEVICENET TRAINING AND SUPPORT

Training is available on integrating the V7N on a DeviceNet Network.

Training formats include:

- Yaskawa Electric America Training Centers
- On-Site Training
- Internet Virtual Training Room

Topics covered include:

- History of DeviceNet
- DeviceNet Application Examples
- Slave & Master Device Types
- Message Types
- DeviceNet Installation
- Programming Yaskawa Drives
- DeviceNet Power Specifications
- Network Grounding
- Master & Node Configuration
- EDS File Information
- Explanation of PLC Program
- Basic Troubleshooting Checks
- Other DeviceNet System Checks

For more information on classes and course schedules:

- Internet **www.drives.com**
- Telephone **1-800-YASKAWA**
- Email **training@yaskawa.com**

V7N with DeviceNet

YASKAWA ELECTRIC AMERICA, INC.
Drives Division
16555 W. Ryerson Rd., New Berlin, WI 53151, U.S.A.
Phone: (800) YASKAWA (800-927-5292)   Fax: (262) 782-3418
Internet: http://www.drives.com

YASKAWA ELECTRIC AMERICA, INC.
Chicago-Corporate Headquarters
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone: (800) YASKAWA (800-927-5292)   Fax: (847) 887-7310
Internet: http://www.yaskawa.com

MOTOMAN INC.
805 Liberty Lane, West Carrollton, OH 45449, U.S.A.
Phone: (937) 847-6200   Fax: (937) 847-6277
Internet: http://www.motoman.com

YASKAWA ELECTRIC CORPORATION
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo, 105-0022, Japan
Phone: 81-3-5402-4511   Fax: 81-3-5402-4580
Internet: http://www.yaskawa.co.jp

YASKAWA ELETRICO DO BRASIL COMERCIO LTDA.
Avenida Fagundes Filho, 620 Bairro Saude Sao Paolo-SP, Brasil CEP: 04304-000
Phone: 55-11-5071-2552   Fax: 55-11-5581-8795
Internet: http://www.yaskawa.com.br

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone: 49-6196-569-300   Fax: 49-6196-888-301

MOTOMAN ROBOTICS AB
Box 504 S38525, Torsas, Sweden
Phone: 46-486-48800   Fax: 46-486-41410

MOTOMAN ROBOTEC GmbH
Kammerfeldstrabe 1, 85391 Allershausen, Germany
Phone: 49-8166-900   Fax: 49-8166-9039

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, Scotland, United Kingdom
Phone: 44-12-3673-5000   Fax: 44-12-3645-8182

YASKAWA ELECTRIC KOREA CORPORATION
Paik Nam Bldg. 901 188-3, 1-Ga Euljiro, Joong-Gu, Seoul, Korea
Phone: 82-2-776-7844   Fax: 82-2-753-2639

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
Head Office: 151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, SINGAPORE
Phone: 65-282-3003   Fax: 65-289-3003

TAIPEI OFFICE (AND YATEC ENGINEERING CORPORATION)
10F 146 Sung Chiang Road, Taipei, Taiwan
Phone: 886-2-2563-0010   Fax: 886-2-2567-4677

YASKAWA JASON (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone: 852-2803-2385   Fax: 852-2547-5773

BEIJING OFFICE
Room No. 301 Office Building of Beijing International Club,
21 Jianguomanwai Avenue, Beijing 100020, China
Phone: 86-10-6532-1850   Fax: 86-10-6532-1851

SHANGHAI OFFICE
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6553-6600   Fax: 86-21-6531-4242

SHANGHAI YASKAWA-TONJI M & E CO., LTD.
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6533-2828   Fax: 86-21-6553-6677

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO., LTD.
30 Xue Yuan Road, Haidian, Beijing 100083 China
Phone: 86-10-6232-9943   Fax: 86-10-6234-5002

SHOUGANG MOTOMAN ROBOT CO., LTD.
7, Yongchang-North Street, Beijing Economic & Technological Development Area,
Beijing 100076 China
Phone: 86-10-6788-0551   Fax: 86-10-6788-2878

YEA, TAICHUNG OFFICE IN TAIWAIN
B1, 6F, No.51, Section 2, Kung-Yi Road, Taichung City, Taiwan, R.O.C.
Phone: 886-4-2320-2227   Fax:886-4-2320-2239

YEA Document Number: TM.V7N.01   12/15/04   Rev: 04-12