MOTOR CONTROL

REGAL

MD100H Series, Low Voltage Variable Frequency Drive

Lonworks Option Manual

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Thank you for purchasing MD100H LᴏɴWᴏʀᴋS Option Board.

SAFETY PRECAUTIONS

- Always follow safety instructions to prevent accidents and potential hazards from occurring.

- Safety precautions are classified into "WARNING" and "CAUTION" and their meanings are as follows:

⚠ **WARNING**   Improper operation may result in serious personal injury or death.

⚠ **CAUTION**   Improper operation may result in slight to medium personal injury or property damage.

- The indicated illustrations on the product and in the manual have the following meanings.

⚠   Danger may be present. Read the message and follow the instructions carefully.

⚡   Particular attention should be paid because danger of an electric shock may be present.

- Keep operating instructions handy for quick reference.
- Read the operating instructions carefully to fully understand the functions of the MD100H series and to use it properly.

⚠ CAUTION

- **Be cautious, when handling the CMOS components of the Option Board.**

  Static may lead to malfunctioning of the product.

- **Turn off the inverter power, when changing the communication cable.**

  Otherwise, you may damage the board or a communication error may occur.

- **Make sure to insert the Option Board connector to the inverter precisely.**

  Otherwise, you may damage the board or a communication error may occur.

- **Check the parameter unit before setting up the parameter.**

  Otherwise, a communication error may occur.

1. Introduction

1.1 About the LonWorks (Local Operating Network) Platform

The LonWorks is a networking platform created by Echelon Corporation, which is widely utilized in the field of building automation. On a LonWorks network, all the devices connected to the network nodes can freely communicate with each other using the LoneTalk protocol. There is no distinction between 'the master' and 'the slave' devices. Devices connected to the LonWorks network are manufacturer-independent. This independence is achieved by the use of the standard network variable types (SNVT). The MD100H communication module supports these standard network variable types. Using the standard network variable types, automated data communication becomes available at the initial installation of the devices. This is done by configuring the input and output variables with an installation tool. When configuring the input and output variables of the devices, the network variable types used must always match.

1.2 The MD100H LonWorks Communication Module Features

The MD100H LonWorks communication module provides control and monitoring for inverters. The LonWorks platform allows the connection of multiple inverters to a single line, thus saving on the expenses of network implementation. Also, the LonWorks network features simple wiring, which allows for decreased installation time and easier maintenance.

1.3 The MD100H LonWorks Communication Module - Model Name

Model Name: CLON-MD100H

1.4 Included Items

The MD100H communication module comes with the following items.
- MD100H LonWorks communication module x 1EA
- MD100H LonWorks user manual x 1EA
- Screws (M3xL08) x 2EA
- 3-Pin connector (PTR AK 950/03-5.0-GREEN) x 1EA
- Module supporter x 1EA

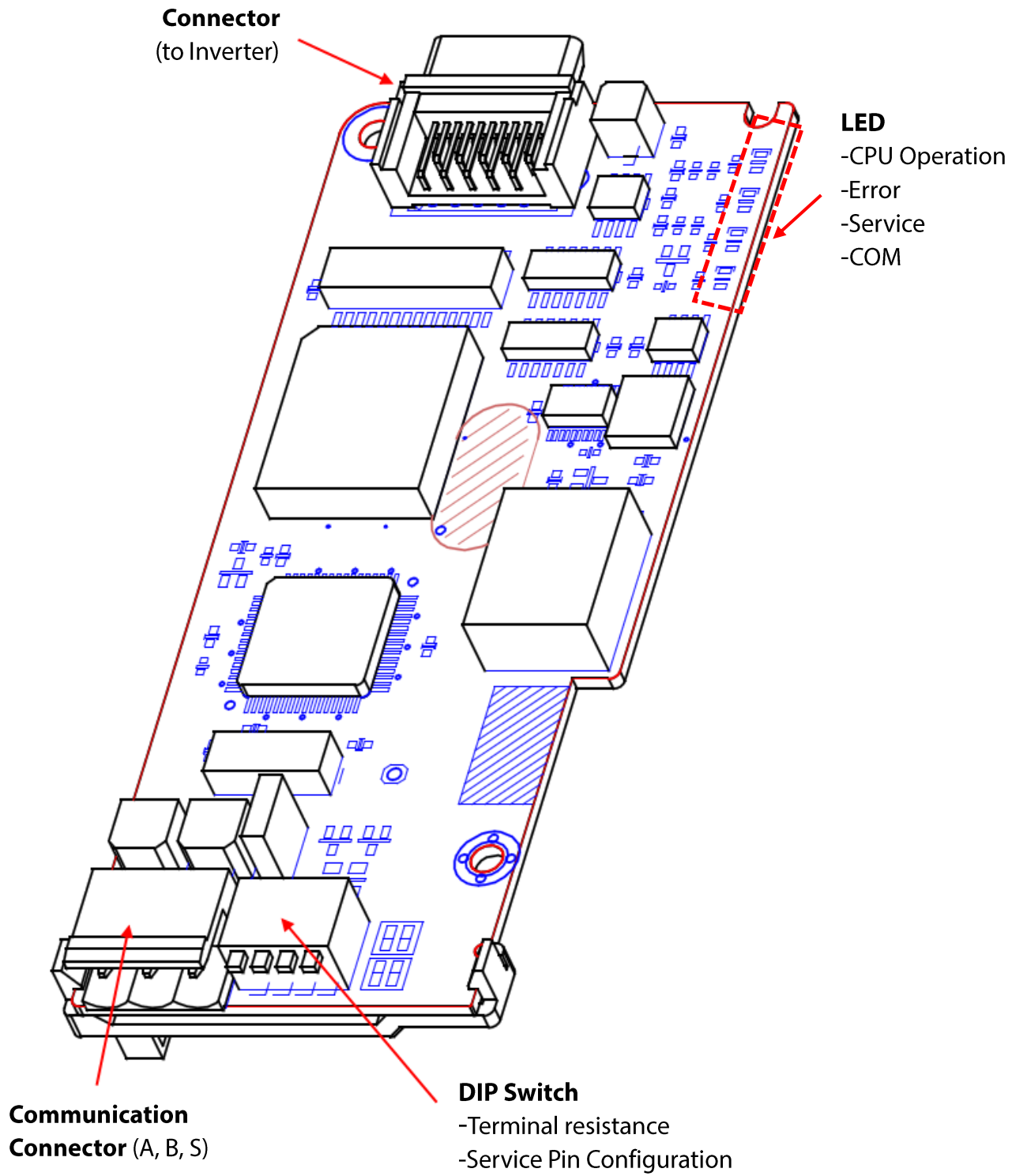## 2. About The MD100H Lon Works Communication Module

2.1 Technical Data

Items		Description
Power	Power supply to the MD100H LonWorks communication module	Power is supplied by the inverter(s)
Network Topology		Free Topology (Bus, Star, Loop, or any combination of these 3 types)
Baud Rate		78 Kbit/s
LonWorks Communication Chipset		FT3150-P20 chip (Echelon)
LonWorks Transceiver		FT-X1
Data Networking Type		Peer-to-peer
Channel Type		TP/FT-10
Transfer Cable		Free Topology Twisted Pair
Maximum Number of Nodes		Maximum 2^{48} nodes (48bit addressing) 64 channels per segment (including the Master)
Maximum Transfer Distance per Segment		Free Topology : 500m Bus Topology : 2700m
Available PDO (Physical Device Object)		Node Object Variable Speed Motor Object(6010)[1] User Object(20001, User Function Profile Type)[2]
LonWorks Connector		Plug-in Connector
Terminal Resistance		Free Topology : 50Ω Bus Topology : 100Ω Built-in terminal resistance (switch on the module for topology selection)

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[1] Variable Speed Motor Object (6010) is a universally compatible object throughout all manufacturers.
[2] User Object is a manufacturer-defined object whose flexibility is dependent upon the manufacturer design.

2.2 Device Layout

Connector
(to Inverter)

LED
-CPU Operation
-Error
-Service
-COM

**Communication
Connector** (A, B, S)

DIP Switch
-Terminal resistance
-Service Pin Configuration

4

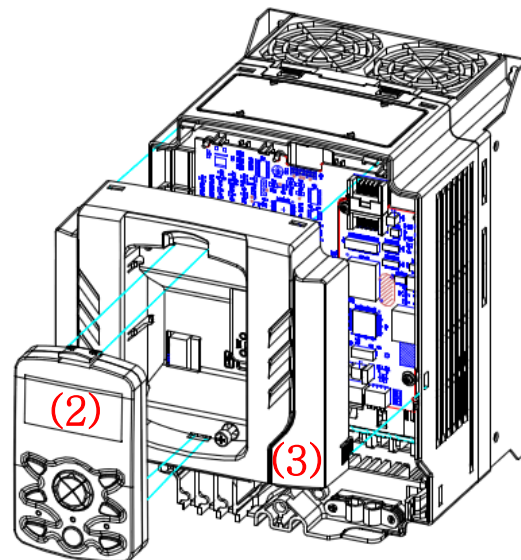## 2.3 Installing the MD100H LonWorks Communication Module

Warning

Turn off the power to the inverter before installation and network connection. Installing or removing the communication module while the power is on may damage the inverter or the LonWorks communication module. Make sure that the inverter is fully discharged before installing or removing the MD100H LonWorks communication Module.

■ Turn off the inverter and remove
the power terminal block cover.
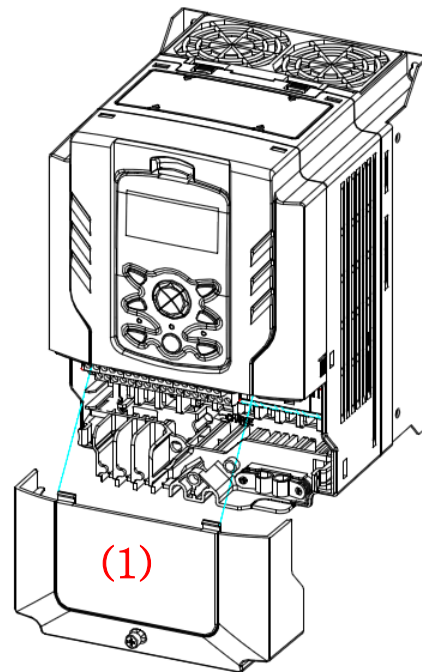
■ Remove the keypad(2),
and then remove the top cover(3).

■ Install the MD100H LonWorks communication
module (4) into the connector on the I/O board.

(4

■ Secure the communication module with the 2 screws supplied with the device.

6

■ Replace the top cover (5), then the keypad (6).

(6)

(5)

■ Replace the power terminal block cover (7). The inverter is now ready for use.

(7)

2.4 Wiring the MD100H LonWorks Communication Module

The MD100H Lon Works communication module has a connector socket for network connection.
The following table describes the details of the connector. Connector #1 and #2 are for the LonWorks
communication connection. The LonWorks communication connection does not require a certain order of polarity
in network wiring. Therefore, arranging of the polarity is not necessary.

No	Signal	Description
1	A	Network signal cable (no polarity)
2	B	
3	S	Shield

Note

Use the 3-pin cable connector (PTR AK 950/03-5.0-GREEN) supplied with the device to connect the MD100H
LonWorks communication module to a network.

2.5 Configuring a Network

Warning

Turn off the power to the inverter before installation and network connection. Installing or removing the
communication module while the power is on may damage the inverter and the LonWorks communication module.
Make sure that the inverter is fully discharged before installing or removing the MD100H LonWorks communication
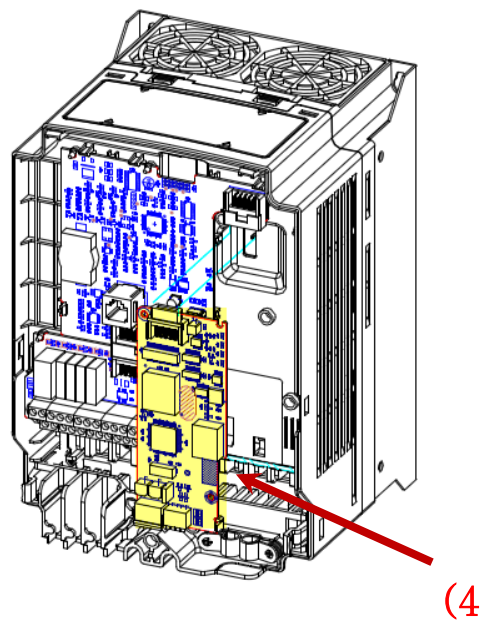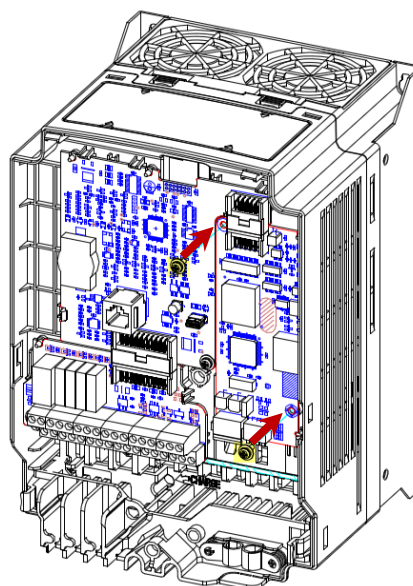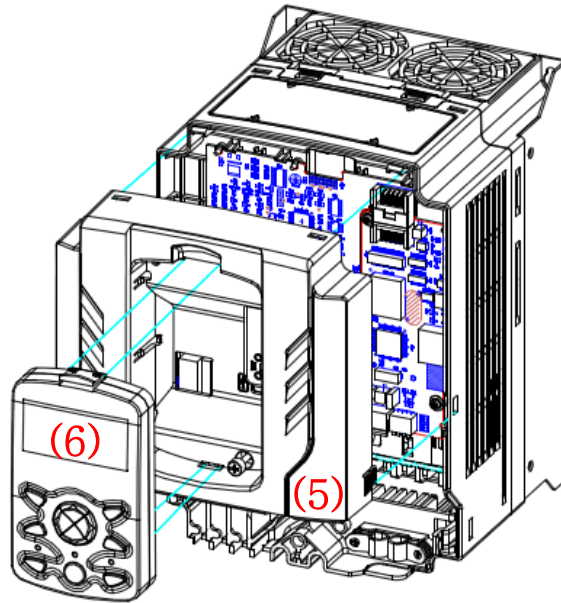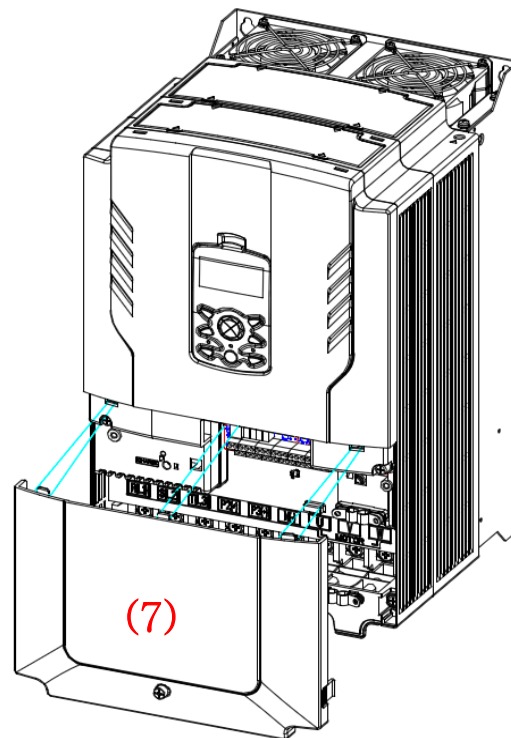Module.

The LonWorks network allows for various types of network topology.

a) Star topology   b) Bus topology   c) Ring topology
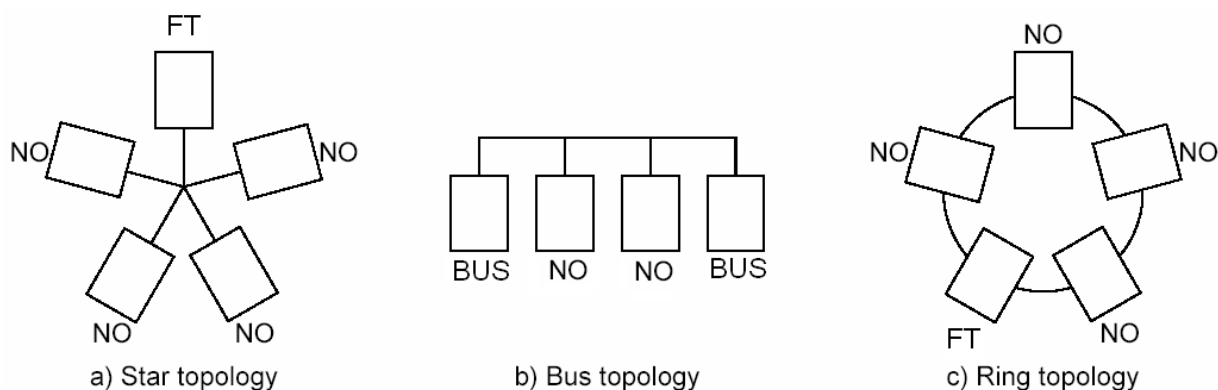
Appropriate network termination is required to guarantee data reliability and to reduce noise. The MD100H
LonWorks communication module has built-in terminal resistance. Therefore, network termination can be made by
simply turning on the termination switch.

For a bus network, turn on the termination switch of the MD100H LonWorks communication modules at both ends.

8

When the termination switch is set to BUS, 100Ω 1/8W termination resistance is connected between communication terminals A and B.

For a free topology network connection, terminate one module on the network. When the termination switch is set to FT, 50Ω 1/8W termination resistance is connected between communication terminals A and B.

The following table describes the type and feature of the termination resistance for each switch position.

Switch Position	Termination Type
FT	For use with a free topology network 50Ω terminal resistance Terminate one module on the network.
NO	Termination is not used.
BUS	For use with a bus topology 100Ω terminal resistance Terminate two modules at the ends of the network.
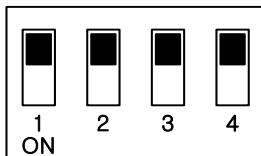
① NO
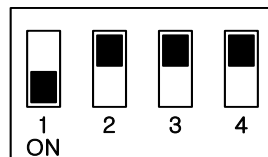
② FT

Free Topology

(50 Ω)

③ BUS

Bus Topology

(100 Ω)

<Termination Switch Configuration for the MD100H LonWorks communication module>

2.6 Installation Guidelines

Refer to the following guidelines when installing the MD100H LonWorks communication module.

1. When you unpack the MD100H LonWorks communication module, inspect the device to make sure that it is not physically damaged.
2. Connect power to the MD100H inverter and test the module to ensure that all functions work properly. Use the keypad to operate the inverter and ensure that it operates normally.
3. Turn off the inverter and wait for at least five minutes for the internal charge to fully discharge. Before working on the MD100H inverter, test the DC link voltage to ensure that the charge is at a safe level.
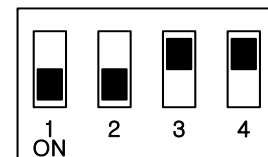4. Install the MD100H LonWorks communication module in the MD100H inverter. Remove the covers from the MD100H inverter before installing the communication module.
5. Connect communication cables A and B to the MD100H communication module. Polarity arrangement is not necessary because the LonWorks communication module does not require specific network wiring polarity. Make sure that the cables are connected securely.
6. If the node (the MD100H inverter) is the last device on the network, terminate the network by setting the termination switch.
7. To configure the LonWorks communication module, download the external interface file (H100_LONWORKS.XIF) from the MARATHON DRIVE web site (www.regalaustralia.com.au)
8. Turn on the power to the inverter and use the keypad to ensure that CNF-30 Option-1 Type displays 'LonWorks.'
9. Configure the Lon Works communication parameters.
10. Inspect the MD100H Lon Works communication module's LED status. The 'Service' LED flashes in 2-sec intervals if the device has not been configured.
11. Turn off the power to the MD100H inverter and wait for 5 minutes until the DC link voltage discharges. Replace the inverter covers. The installation process is finished. Turn the power on to the MD100H inverter, and then configure the device using the network tool.

Note
After first installing the MD100H communication module, it must be configured at least once before it can communicate with the inverter. Communication will be available once the communication module is configured after installation.
While configuring the communication module, an 'Option Trip' occurs because internal-interface communication is not available immediately after installation. Bypass the 'Option Trip' at this stage and operate the inverter. The communication module will communicate with the inverter properly once it is configured.

To configure the MD100H communication module, turn the service switch ON, and then turn it off. The service LED

10

will turn off if the module was successfully configured.

2.7 Maximum Ranges for Different Network Cables

As shown in the following table, the maximum ranges of a network are limited based on the topology and the type of cables used. Reliable network communication cannot be guaranteed beyond the maximum ranges listed in the table.

BUS Topology

Cable Type	Maximum Bus Length
Belden 85102	2,700 m
Belden 8471	2,700 m
Level IV, 22AWG	1,400 m
JY(St) Y 2x2x0.8	900 m
TIA Category 5	900 m

Free Topology

Cable Type	Maximum Distance between Devices	Maximum Total Range
Belden 85102	500 m	500 m
Belden 8471	400 m	500 m
Level IV, 22AWG	400 m	500 m
JY(St) Y 2x2x0.8	320 m	520 m
TIA Category 5	250 m	450 m

11

3. Inverter Parameters

3.1 Table of Parameters

Code	Parameter Name	Default Value	Settings
CNF-30	Option-1 Type	-	-
DRV-06	Cmd Source	1.Fx/Rx-1	0. Keypad
			1. Fx/Rx-1
			2. Fx/Rx-2
			3. Int 485
			4. FieldBus
			5.Time Event
DRV-07	Freq Ref Src	0.Keypad-1	0. Keypad-1
			1. Keypad-2
			2. V1
			4. V2
			5. I2
			6. Int 485
			7. Fieldbus
			9. Pulse
BAS-04	Cmd 2nd Src	1. Fx/Rx-1	0. Keypad
			1. Fx/Rx-1
			2. Fx/Rx-2
			3. Int 485
			4. FieldBus
			5.Time Event
BAS-05	Freq 2nd Src	0. Keypad-1	0. Keypad-1
			1. Keypad-2
			2. V1
			4. V2
			5. I2
			6. Int 485
			7. Fieldbus
			9. Pulse

13

Code	Parameter Name	Default Value	Settings
IN-65–71	P1–P7 Define		17. 2ndSource
COM-06	FBus S/W Ver	-	
COM-09	FBus LED		-
COM-10	Opt Parameter1		
COM-11	Opt Parameter2	-	-
COM-12	Opt Parameter3		
COM-13	Opt Parameter4	-	-
COM-14	Opt Parameter5	0	0
			1
COM-31	Para Status-1	0x000A	0–0xFFFF
COM-32	Para Status-2	0x000E	0–0xFFFF
COM-33	Para Status-3	0x000F	0–0xFFFF
COM-34	Para Status-4	0x0000	0–0xFFFF
COM-35	Para Status-5	0x0000	0–0xFFFF
COM-36	Para Status-6	0x0000	0–0xFFFF
COM-37	Para Status-7	0x0000	0–0xFFFF
COM-38	Para Status-8	0x0000	0–0xFFFF
COM-51	Para Control-1	0x0005	0–0xFFFF
COM-52	Para Control-2	0x0006	0–0xFFFF
COM-53	Para Control-3	0x0000	0–0xFFFF
COM-54	Para Control-4	0x0000	0–0xFFFF
COM-55	Para Control-5	0x0000	0–0xFFFF
COM-56	Para Control-6	0x0000	0–0xFFFF
COM-57	Para Control-7	0x0000	0–0xFFFF
COM-58	Para Control-8	0x0000	0–0xFFFF
COM-94	CommUpdata	0.No	0. No
			1. Yes
PRT-12	Lost Cmd Mode	0.None	0. None
			1. Free-Run
			2. Dec
			3. Hold Input
			4. Hold Output
			5. Lost Preset
PRT-13	Lost Cmd Time	1.0 sec	0.1 – 120.0 sec
PRT-14	Lost Preset F	0 Hz	Start Frequency – Max frequency

3.2 Basic Field Bus Parameters

3.2.1 Communication Module Information– Option Type (CNF-30)

CNF-30	Option Type

This parameter automatically displays the name of the currently installed communication module.

If the LonWorks communication module is installed, CNF-30 Option Type displays 'LonWorks.'

If the CNF-30 Option Type does not display any communication module names, this may mean that there is a faulty connection between the inverter and the LonWorks communication module.

3.2.2 Command Source Options–Cmd Source (DRV-06)

DRV-06	Cmd Source

This parameter is used to select a command source.

To operate the inverter using the Lon Works communication, setDRV-06Cmd Source to '4.Fieldbus.'

3.2.3 Source of Frequency Reference Options– Freq Ref Src (DRV-07)

DRV-07	Freq Ref Src

This parameter is used to select a frequency reference.

To provide a frequency reference using the LonWorks communication, set DRV-07 Freq Ref Src to '7.Fieldbus.'

3.2.4 Secondary Command Source Options (for switching between two different command sources)

BAS-04	Cmd 2nd Src
BAS-05	Freq 2nd Src
IN-65–71	P1–P7 Define

This parameter is used to provide a second command source (frequency reference and run command) using the multi-purpose input terminals. If the inverter is operated by remote network commands from network modules such as the Lon Works communication module, this parameter may be used to stop remote operation and switch to local operation using the inverter keypad.

This feature requires that the multi-purpose terminals P1–P7 (parameters IN65–71) are set to '2nd Source.'

15

3.2.5 Version information for the installed Communication Module– Fbus S/W Ver (COM-06)

This parameter is used to display the version information about the Lon Works communication module that is installed in the inverter.

3.2.6 Communication Module LED Status Display– FbusLED (COM-9)
This parameter is used to display the status of the four LEDs (CPU, Error, Service, and COM) of the communication module on the inverter keypad.
Each bit indication(On or Off) on the keypad display, from right to left, represent the status of the COM, Service, Error and CPU LED.

An example of COM-09 LED State – 1101

LED	COM (GREEN)	SERVICE (GREEN)	ERR (RED)	CPU (GREEN)
Status	ON	ON	OFF	ON
Keypad Display				

3.2.7 Display the Neuron ID– Opt Parameter1–3(COM-10–12)

COM-10	Opt Parameter1
COM-11	Opt Parameter2
COM-12	Opt Parameter3

These read-only parameters are used to display on the keypad the neuron IDs (a 6Byte data value) stored in the neuron chip of the communication module. Parameters COM10–12 display the neuron ID information in HEX values, in the order of upper to lower level information.
The information in the neuron IDs 1–3 may be used when you are installing the network manually without using the service pin on the Lon Works communication module.

3.2.8 Display Node Status– Opt Parameter4(COM-13)

COM-13	Opt Parameter4

This read-only parameter is used to display the network interface status. When the interface is operating normally, 'Configured on-line' is displayed. This means that the relevant node has been commissioned by the network and is on-line. 'Soft', 'Bypass', or 'Hard off-line' states indicate that the node failed to participate in the network.

Values	Description
0	Unknown state
1	Not configured
2	Application unassigned
3	Configured on-line
4	Configured off-line
5	Soft off-line
6	Configured bypass off-line
7	Hard off-line, Bypass off-line

3.2.9 Enable Service Pin– Opt Parameter5 (COM-14)

COM-14	Opt Parameter5

This parameter is used to enable the service pin feature without using the service pin switch on the LonWorks communication module. Set COM-14 Service Pin Enable to '1' to enable the service pin feature. This allows the Lon Works communication module to send its Neuron ID and Program ID to the network.

Note
The Service Pin may be enabled on the keypad ONCE OLNY, after the inverter has been turned on the first time. Once decommissioned from the configuration tool, the inverter cannot be commissioned again on a network using the 'Enable Service Pin' parameter. You must turn on the service pin switch on the LonWorks communication module to connect to the network.

3.2.10 User Object Output Variables (COM-31–38)

COM-31–38	Para Status-1–8

This parameter is used to configure the addresses for User Object output variables. For more details, refer to the 'User Object' section of this manual.

3.2.11 User Object Input Variables (COM-51–58)

COM-51–58	Para Control-1–8

This parameter is used to configure the addresses for User Object input variables. For more details, refer to the 'User Object' section of this manual.

3.2.12 Communication Update (COM-94)

After making changes to the parameters related to configuring Drive Objects using the keypad, a communication update is required to apply the changes. Set COM 94 Comm Update to 'Yes' to perform a communication update. After the update, the Comm Update parameter automatically changes back to 'No.'
Keypad parameters that require the communication update are listed in the table below.

Codes	Parameters
DRV-03	Acc Time
DRV-04	Dec Time
DRV-18	Base Frequency
DRV-19	Start Frequency
DRV-20	Max Frequency
BAS-11	Pole Number

Note

After commissioning the MD100H Lon Works communication module, COM-94 Comm Update must be set to 'Yes' to apply the inverter's configuration properties configured using the keypad.

3.2.13 Operation Options for a Lost Command– Lost Cmd Mode (PRT-12)

DRV-06	Cmd Source
DRV-07	Freq Ref Src
PRT-12	Lost Cmd Mode
PRT-13	Lost Cmd Time
PRT-14	Lost Preset F

This parameter is used to select an operation mode to be used when the command is lost. When remote command via network is lost for the 'lost command decision time', the inverter decides that the command is lost.
This feature is available only when DRV-06 is set to '4.Fieldbus,' or when DRV-07 is set to '7.Fieldbus.'
With this feature enabled, the selected operation mode is used when the network command is lost.

	Settings	Description
0	None	Keeps the inverter operation at lost command.
1	Free-Run	The inverter blocks output. The motor performs a free-run stop.
2	Dec	The motor decelerates and then stops at the time set at PRT-07 Trip Dec Time.
3	Hold Input	The inverter calculates the average input value for 10 sec before the loss of the speed command and uses it as the speed reference.
4	Hold Output	The inverter calculates the average output value for 10 sec before the loss of the speed command and uses it as the speed reference.
5	Lost Preset	The inverter operates at the frequency set at PRT-14 Lost Preset F.

3.2.14 Lost Command Decision Time– Lost Cmd Time (PRT-13)

DRV-06	Cmd Source
DRV-07	Freq Ref Src
PRT-12	Lost Cmd Mode
PRT-13	Lost Cmd Time

This parameter is used to set the time the inverter takes to decide that the command is lost. When the remote command via network is lost for the lost command decision time (PRT-13 Lost Cmd Time + the time set at nciRdvHrtBt), the inverter decides that the command is lost.

This feature is available only when DRV-06 is set to '4.Fieldbus,' or when DRV-07 is set to '7.Fieldbus.' If the network command is recovered before the lost command decision time (PRT-13 Lost Cmd Time + the time set at nciRdvHrtBt) is passed, the inverter does not output a fault trip and continues normal operation.
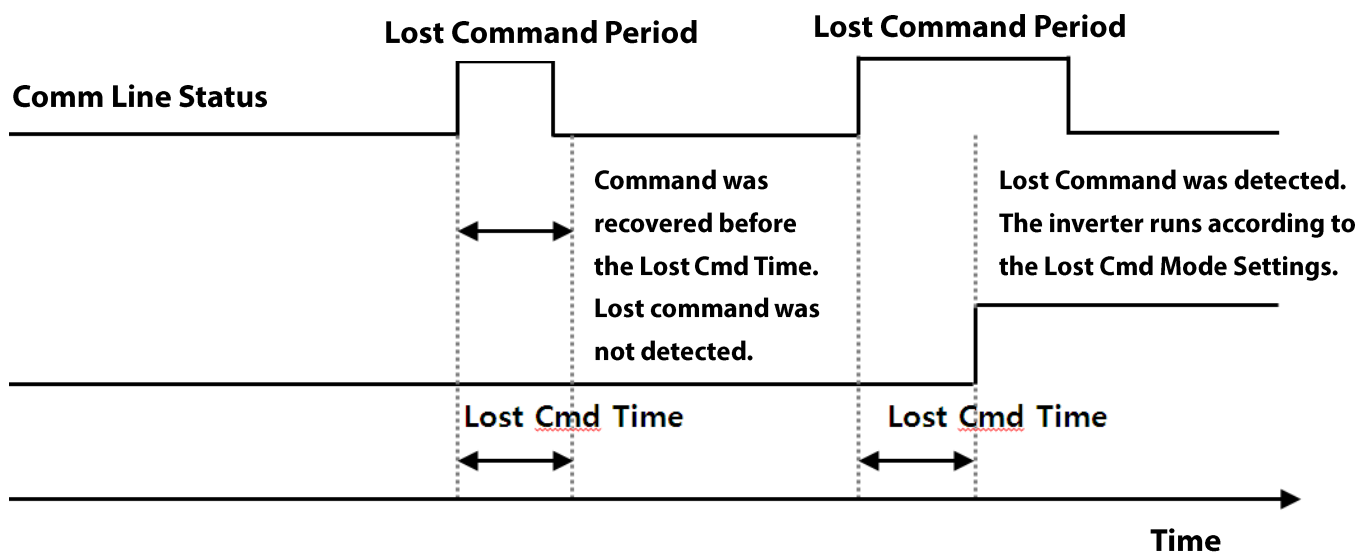
Caution

Lost command time protection operates only when the 'nciRcvHrtBt' variable is set to any value other than '0.'

20

4. Functional Profile

4.1 Node Object

Input Network
Variable

Node Object

Output Network
Variable

nv1 | nviRequest
SNVT_obj_request

Mandatory
Network
Variables

nv2 | nvoStatus
SNVT_obj_state
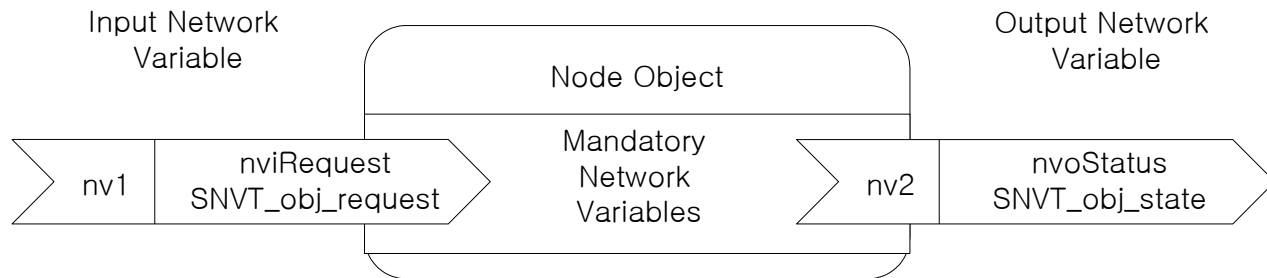
Network Input Variables

Function	Variable Name	SNVT Type	Min	Max
Node Object Request	nviRequest	SNVT_obj_request	-	-

4.1.1 'nviRequest' Variable

The 'nviRequest'input variable enables or updates the command inputs from a network. This input variable supports
RQ_ENABLE, RQ_DISABLE, RQ_CLEAR_ALARM, RQ_NORMAL, RQ_CLEAR_STATUS, RQ_UPDATE_STATUS,
RQ_REPORT_MASK.

Network Output Variables

Function	Variable Name	SNVT Type	Min	Max
Node Object Status	nvoStatus	SNVT_obj_status	-	-

4.1.2 'nvoStatus' Variable

The following table shows the Node Object states indicated by the 'nvoStatus' output variable.

Bit Setting	Description
Invalid ID	Invalid node ID has been requested.
Report mask	Reporting supported fields.
Disabled	RQ_DISABLE is active.
Electrical_fault	Drive fault has occurred.
Manual_control	Drive is in local control mode.
In_alarm	Drive alarm has been turned on.

21

4.2 Drive Object

Input Network Variable

Variable Speed Motor Drive (6010)

Output Network Variable

| nv1 | nviDrvSpeedStpt SNVT_switch |

Mandatory Network Variables

| nv4 | nvoDrvSpeed SNVT_lev_percent |

| nv3 | nvoDrvCurrent SNVT_amp |

| nv2 | nviDrvSpeedScale SNVT_lev_percent |

Optional Network Variables

| nv5 | nvoDrvVolt SNVT_volt |

| nv6 | nvoDrvPwr SNVT_power_kilo |

| nv7 | nvoDrvRunHours SNVT_time_hour |

Configuration Properties

nc17   nciLocation (Optional)
nc50   nciMaxSpeed (Mandatory)
nc53   nciMinSpeed (Mandatory)
nc48   nciRcvHrtBt (Optional)
nc49   nciSndHrtBt (Mandatory)
nc52   nciMinOutTm (Optional)
nc158 nciNmlSpeed (Mandatory)
nc159 nciNmlFreq (Mandatory)
nc160 nciRampUpTm (Mandatory)
nc161 nciRampDownTm (Mandatory)
nc162 nciDrvSpeedScale (Optional)

Network Input Variables

Function	Variable Name	SNVT Type	Min	Max
Drive Speed Setpoint	nviDrvSpeedStpt	SNVT_switch	N/A	N/A
Drive Speed SetpointScaling	nviDrvSpeedScale	SNVT_lev_percent	-163.840%	163.830%

4.2.1 'nviDrvSpeedStpt' and 'nviDrvSpeedScale' Variables

Definition

Network input SNVT_switch   nviDrivSpeedStpt

Network input SNVT_lev_percent   nviDrvSpeedScale

Description

Variables 'nviDrvSpeedStpt' and 'nviDrvSpeedScale' are used for run commands and speed references. The state variable value for 'nviDrvSpeedStpt' decides whether to run or stop an inverter. The inverter stops when the 'nviDrvSpeedStpt' state is set to '0', and runs when it is set to '1.'

The 'nviDrvSpeedScale' variable provides rotation direction information for the inverter. The inverter operates in the forward direction (Fx) when the 'nviDrvSpeedScale' value is set to a positive number, and in the reverse direction (Rx) when it is set to a negative number.

Frequency reference information is given by a combination of the 'nviDrvSpeedScale' and 'nviDrvSpeedStpt' variable values. The 'nviDrvSpeedScale' and 'nviDrvSpeedStpt' values are in percentages (%).

To calculate the frequency reference, multiply the 'nviDrvSpeedStpt' value with the 'nviDrvSpeedScale' value, and then multiply the resulting value (%) with the base frequency. This means that the 'nviDrvSpeedScale' variable provides the scale value for the 'nviDrvSpeedStpt' variable.

For Example, if the 'nviDrvSpeedStpt' value is set to '100 (%)' and the 'nviDrvSpeedScale' value is set to '-80 (%),' the resulting value will be -80% (1 X -0.8 = -0.8). As a result, the inverter operates in the reverse direction, at a frequency that is 80% of the base frequency (if the base frequency is set to 50.00 Hz) and the resulting frequency reference will be 40Hz (50.00Hz X 0.8).

The 'nviDrvSpeedScale' value range is between -163.840% – 163.830%. Therefore, a value of 0x7fff (+163.835%) becomes an invalid data.

NviDrvSpeedStpt States and Value Range

State	Value	Inverter Operating Frequency / Operation State
0	-	Stop
1	0	Frequency reference at 0% of the base frequency
1	0.5–100.0	Frequency reference at 0.5–100.0% of the base frequency
1	100.0	Frequency reference at 100% of the base frequency
0xFF	-	Auto

In the communication (COMM) group, set DRV-06 Cmd Source to 'FieldBus' and DRV-07 Freq Ref Src to 'FieldBus' using the keypad. These settings configure the inverter to receive run commands and frequency references from the LonWorks communication.

Code Number/ Common Area Address	Code Description	Default	Settings
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int 485
			FieldBus
			Time Event
DRV-07	Freq Ref Src	Keypad-1	Keypad-1
			Keypad-2
			V1
			Reserved
			V2
			I2
			Int 485
			FieldBus
			Reserved
			Pulse

nviDrvSpeedScale Range -163.840% – 163.830%
nviDrvSpeedScale Default 0.000%

Inverter Parameters Related to the 'nviDrvSpeedStpt' and 'nviDrvSpeedScale' Variables

Code Number/ Common Area Address	Code Description	Default	Range
0x0005	Frequency Command	0.00 Hz	0.00 – 400.00
0x0006	Run Command	Refer to the 'Common Area' section.	
DRV-18	Base Frequency	50.00 Hz	30.00–400.00

Note

Network variables 'nviDrivSpeedStpt' and 'nviDrvSpeedScale' may be used in combination with the 'nciRcvHrtBt' variable to configure the lost command options.

Network Output Variables

Function	Variable Name	SNVT Type	Min	Max
Drive Speed Feedback	nvoDrvSpeed	SNVT_lev_percent	-163.840%	163.830%
Actual Motor Current	nvoDrvCurnt	SNVT_amp	0.0 A	3276.7 A
Drive Output Voltage	nvoDrvVolt	SNVT_volt	0.0 V	3276.7 V
Actual Drive Power	nvoDrvPwr	SNVT_power_kilo	0.0 kW	6553.5 kW
Drive total running hours	nvoDrvRunHours	SNVT_time_hour	0 h	65535 hr

'nvoDrvSpeed' Variable

Definition

Network output SNVT_lev_percent   nvoDrvSpeed

Description

The 'nvoDrvSpeed' variable is used to output the inverter's operating frequency as a percentage of the base frequency. The 'nvoDrvSpeed' value is positive if the inverter is running in the forward direction (Fx) and negative if it is running in the reverse direction (Rx).

For example, if the base frequency is set at 50.00 Hz, and the inverter is running at 25.00 Hz in the reverse direction (Rx), 'nvoDrvSpeed' outputs a value of -50.000%.

Typical Range   -163.840 – 163.830 % (0.001 %)

Inverter Parameters Related to the 'nvoDrvSpeed' Variable

Code Number/ Common Area Address	Code Description	Default	Range
0x000A	Output Frequency	-	
0x000E	Status of Inverter(FWD, REV)		
DRV-18	Base Frequency	50.00 Hz	30.00–400.00

4.2.4 'nvoDrvCurnt' Variable

Definition

Network output SNVT_amp   nvoDrvCurnt

Description

The 'nvoDrvCurnt' variable is used to output the inverter's output current in amperes (A).

Typical Range   0.0 – 3276.6 A (0.1 A)

Inverter Parameters Related to the 'nvoDrvCurnt' Variable

Code Number/ Common Area Address	Code Description
x0009	Current

4.2.5 'nvoDrvVolt' Variable

Definition

Network output SNVT_volt   nvoDrvVolt

Description

The 'nvoDrvVolt' variable is used to output the inverter's output voltage (V).

Typical Range   0.0 – 700.0 V (0.1 V)

Inverter Parameters Related to the 'nvoDrvVoltCurnt' Variable

Code Number/ Common Area Address	Code Description
0x000B	Output Voltage

4.2.6 'nvoDrvPwr' Variable

Definition

Network output SNVT_power_kilo   nvoDrvPwr

Description

The 'nvoDrvPwrNetWork' variable is used to output the inverter's power output in kilowatts (kW).

Typical Range   0.0 – 6553.4 kW (0.1 kW)

Inverter Parameters Related to the 'nvoDrvPwr'Variable

Code Number/ Common Area Address	Code Description
MAK-01 0x0301	Inverter Capacity

4.2.7 'nvoDrvRunHours' Variable

Definition

Network output SNVT_time_hour   nvoDrvRunHours

Description

The 'nvoDrvRunHours' variable is used to output the inverter's total operation time.

Inverter Parameters Related to the 'nvoDrvPwr' Variable

Code Number/ Common Area Address	Code Description
0x0342 0x0343	Total Operation Time 0x0342 – in days 0x0343 – in minutes

Network Configuration Variables

Function	Variable Name	Optional/ Mandatory	SNVT Type
Location Label	nciLocation	Optional	SCPTlocation
Maximum Motor Speed	nciMaxSpeed	Mandatory	SCPTmaxSetpoint
Minimum Motor Speed	nciMinSpeed	Mandatory	SCPTminSetpoint
Receive Heartbeat Time	nciRcvHrtBt	Optional	SCPTmaxRcvTime
Send Heartbeat Time	nciSndHrtBt	Mandatory	SCPTmaxSndTime
Minimum Send Time	nciMinOutTm	Optional	SCPTMinOutTime
Nominal Motor Speed in RPM	nciNmlSpeed	Mandatory	SCPTnomRPM
Nominal Motor Frequency	nciNmlFreq	Mandatory	SCPTnomFreq
Minimum Ramp Up Time	nciRampUpTm	Mandatory	SCPTrampUPTm
Minimum Ramp Down Time	nciRampDownTm	Mandatory	SCPTrampDownTm
Default Value for nviDrvSpeedScale	nciDrvSpeedScale	Optional	SCPTdefScale

Note

After modifying the parameters related to configuration variables from the keypad, set COM-94Comm Update to 'Yes' to apply the changes to the configuration variables.

Code Number/ Common Area Address	Code Description	Default	Options
COM-94	Comm Update	No	No Yes

4.2.8 Location Label (Optional)

Definition

Network config input SNVT_str_asc nciLocation

Description

The 'nciLocation' variable is used to obtain the physical location information (6 byte location string) from the neuron chip.

Default   Empty spaces

4.2.9 Maximum Motor Speed (Mandatory)

Definition

Network config input SNVT_lev_percent   nciMaxSpeed

Description

The 'nciMaxSpeed' variable is used to configure the maximum speed of a motor. The 'nciMaxSpeed' value is expressed as a percentage of the nominal frequency (nciNmlFreq) configuration value.
For example, if the 'nciNmlFreq' is 50.0 Hz and the 'nciMaxSpeed' is set to 120%, the resulting frequency is 60 Hz (50.0 x 1.2). The maximum frequency configured by these variables can be viewed on the keypad at DRV-20 Max Freq.

Changes cannot be made to the 'nciMaxSpeed' variable while the inverter is running. Stop the inverter operation before making changes to the 'nciMaxSpeed' variable.
The default value for the 'nciMaxSpeed' variable is 100.00%, which is 100% of the base frequency (DRV-18Base Freq), and the resulting value becomes the maximum frequency (DRV-20 Max Freq).

The 'nciMaxSpeed' variable values must comply with the following formula.

$$-163.840 \ \leq \ Minimum \ \ Speed \ \ \leq \ \ Maximum \ \ Speed \ \ \leq \ 163.840$$

Typical Range   100.000 – 150.000 % (0.001% increments)
Default   100.000%

Note

As shown in the descriptions above, the 'nciMinFreq(nciMinSpeed)' and the 'nciMaxSpeed(%)' values adjust the maximum frequency set at DRV-20 Max Freq. Because the maximum frequency (Max Freq) must fall within the 40–120.00 Hz range, the inverter will maintain the current maximum frequency if the 'nciNmlFreq' is changed to a value less than 40 Hz. (For example, if the 'nciNmlFreq'is set to 25 Hz and the 'nciMaxSpeed' is set to 100.00%, the

maximum frequency will not be changed to 25 Hz).

Inverter Parameters Related to the 'nciMaxSpeed' VariableI

Code Number/ Common Area Address	Code Description	Default	Range
DRV-18	Base Frequency	50.00 Hz	30.00 – 400.00
DRV-20	Max Frequency	50.00 Hz	40.00 – 400.00

4.2.10 Minimum Motor Speed (Mandatory)

Definition

Network config input SNVT_lev_percent   nciMinSpeed

Description

The 'nciMinSpeed' variable is used to configure the minimum speed of a motor. The 'nciMinSpeed' value is expressed as a percentage of the nominal frequency (nciNmlFreq) configuration value. For example, if the 'nciNmlFreq' is 50.0 Hz and the 'nciMinSpeed' is set to 10%, the resulting frequency is 5 HZ (50.0 x 0.1). The minimum frequency configured by these variables can be viewed on the keypad (DRV-19 Start Freq).

Changes cannot be made to the 'nciMinSpeed' variable while the inverter is running. Stop the inverter before making any changes to the 'nciMinSpeed' variable.

The default value for the 'nciMinSpeed' variable (expressed as percentage) is calculated based on the base frequency and the start frequency ('DRV-19 Start Freq' divided by 'DRV-18 Base Freq'). Because the default for the start frequency (DRV-19 Start Freq) is 0.5 Hz, the 'nciMinSpeed' variable value becomes 1.0% (0.5/50=0.01, expressed as a percentage).

The 'nciMinSpeed' variable values must comply with the following formula.

$$-163.840 \leq Minimum\ Speed \leq Maximum\ Speed \leq 163.830$$

Typical Range　　　　　0.000– 40.000 % (0.001 % increments)
Default　　　　　0.000%

※ As shown in the descriptions above, the 'nciMinFreq(nciMinSpeed)' and the'nciMaxSpeed (%)' values adjust the maximum frequency set at DRV-20 Max Freq. Because the maximum frequency (Max Freq) must fall within the 40–400 Hz range, the inverter will maintain the current maximum frequency if the 'nciNmlFreq' is changed to a value less than 40 Hz. (For example, if the 'nciNmlFreq' is set to 30 Hz and the 'nciMaxSpeed' is set to 100.00%, the maximum frequency will not be changed to 30 Hz).

30

Inverter Parameters Related to the 'nciMaxSpeed' Variable

Code Number/ Common Area Address	Code Description	Default	Range
DRV-18	Base Frequency	50.00 Hz	30.00 – 400.00
DRV-20	Start Frequency	0.50 Hz	0.01–10.00

4.2.11 Receive Heart Beat Time (Optional)

Definition

Network config input SNVT_time_sec   nciRcvHrtBt

Description

The 'nciRcvHrtBt' variable is used to configure the maximum update interval for the network input variables 'nviDrvSpeedStpt' and 'nviDrvSpdScale'. If the 'nviDrvSpeedStpt' and 'nviDrvSpdScale' variables are not updated for the set time ('nciRcvHrBt' time value + PRT-13 Lost Cmd Time), the inverter decides that the command is lost. It then runs in the operation mode set by thePRT-12 Lost Cmd Mode.

Lost command time protection operates only when the 'nciRcvHrtBt' variable is set to a value other than 0.0 sec, DRV-06 Cmd Source or DRV-07 Freq Ref Src is set to 'Fieldbus', and PRT-12 Lost Cmd Mode is set to any other value than 'None'.

The lost command protection feature is disabled if the 'nciRcvHrBt' variable is set to 0.0 sec.

Typical Range   0.0 – 120.0 sec (0.1 sec increments)

A value of 0xFFFF(6553.5 sec) is invalid data.

Default   0.0 sec (Receive Heart Beat feature is disabled)

Inverter Parameters Related to the 'nciRcvHrtBt' Variable

Code Number/ Common Area Address	Code Description	Default	Settings
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int 485
			FieldBus
			Time Event
DRV-07	Freq Ref Src	Keypad-1	Keypad-1
			Keypad-2
			V1
			Reserved
			V2
			I2
			Int 485
			FieldBus
			Reserved
			Pulse
PRT-12	Lost Cmd Mode	None	None
			FreeRun
			Dec
			Hold Input
			Hold Output
			Lost Preset
PRT-13	Lost Cmd Time	1.0sec	0.1–120.0sec

Caution

When the LonWorks network is used as a command source, the inverter's lost command time becomes the time set at 'nciRcvHrtBt' and PRT-13Lost Cmd Time added together. However, if the 'nciRcvHrtBt' variable is set to 0.0 sec, the lost command protection feature is disabled.

4.2.12 Send Heart Beat Time (Mandatory)

Definition

Network config input SNVT_time_sec   nciSndHrtBt

Description

The 'nciSndHrtBt' variable is used to configure the time it takes to perform a data update on the network, regardless of the presence of changes in the data.

The 'nciSndHrtBt' variable configures the maximum output time for the network output variables 'nvoDrvSpeed', 'nvoDrvCurnt', 'nvoDrvVolt', 'nvoDrvPwr', and 'nvoDrvRunHours.'

Typical Range   0.0 – 6553.4 sec

A value of 0xFFFF (6553.5 sec) is invalid data.

Default   0.0 sec (Send Heart Beat feature is disabled)

4.2.13 Minimum Out Time (Optional)

Definition

Network config input SNVT_time_sec   nciMinOUtTm

Description

The 'nciMinOUtTm' variable is used to configure the minimum wait time before the output variables 'nvoDrvSpeed', 'nvoDrvCurnt', 'nvoDrvVolt', 'nvoDrvPwr', and 'nvoDrvRunHours' are sent to the network.

Rather than reflecting the changes in the variables each time they are made, a network update is performed when the set period of 'nciMinOutTm' has elapsed to reflect the changes. This feature is used to decrease network traffic.

Typical Range   0.0 – 6553.4 sec (0.1 sec increments)

A value of 0xFFFF (6553.5 sec) is invalid data.

Default   0.0 sec (Minimum Out Time feature is disabled)

4.2.14 Nominal Motor Speed in RPM (Mandatory)

Definition

Network config input SNVT_freq_hz   nciNmlSpeed

Description

The 'nciNmlSpeed' variable is used to configure the inverter's base frequency.

The default value for the 'nciNmlSpeed' variable is 1800.00 RPM which is the default base frequency of 50Hz set at DRV-18 Base Freq, expressed in PRM (for a 4-pole motor). When the 'nciNmlSpeed' value is changed, the value (RPM)

33

converted back to Hertz (Hz) is reflected in DRV-18 Base Freq.

The following formula converts an RPM value into Hertz (Hz). In this formula, the number of motor poles is set at M2-10 Pole Num. The motor pole number must be configured correctly to ensure proper operation.

$$\text{The number of rotation per minute} = \frac{\text{Base Frequency (Hz)} \times 120}{\text{the number of motor poles}}$$

Valid Range   0 – 65534 RPM (1 RPM)

Default   1800 RPM

Inverter Parameters Related to the 'nciNmlSpeed' Variable

Code Number/ Common Area Address	Code Description	Default	Range
BAS-11 0X0E0A	Pole Number	4	2–48
DRV-18	Base Frequency	50.00 Hz	30.00 – 400.00

Note

When a change is made to the 'nciNmlSpeed' variable, it is automatically reflected in the 'nciNmlFreq' value. For example, if the current 'nciNmlSpeed' value is set to 1500 RPM, the 'nciNmlFreq' is set to 50.0 Hz, DRV-18 Base Frequency is set to 50 Hz, and BAS-11 Pole Number is set to 4 (poles), decreasing the 'nciNmlFreq' value to 100 RPM changes the 'nciNmlFreq' value to 45 Hz (of the DRV-18 Base Frequency value), and DRV-18 Base Frequency to 45 Hz.

When the values set at 'nciNmlSpeed' or 'nciNmlFreq' are changed, the changes are reflected in DRV-19 Start Frequency and Drv-20 Max Frequency as well. In the example above, if the 'nciMaxSpeed' is set to 100.000% and 'nciMinSpeed' is set to 10.000%, DRV-19 Start Frequency is changed to 5 Hz and Drv-20 Max Frequency is changed to 45 Hz.

4.2.15 Nominal Motor Frequency (Mandatory)

Definition

Network config input SNVT_freq_hz   nciNmlFreq

Description

The 'nciNmlFreq' is used to configure the motor's base frequency. The 'nciNmlFreq' value is essential in configuring the motor's minimum and maximum frequency ('nciMinSpeed' and 'nciMaxSpeed') because these values are expressed as a percentage of the value set at 'nciNmlFreq.' The default 'nciNmlFreq' value is 50 Hz which is the default frequency set at DRV-18 Base Freq.

Valid Range   30.0–400.0 (0.1 Hz)

34

Default   50.0 Hz

Inverter Parameters Related to the 'nciNmlFreq' Variable

Code Number/ Common Area Address	Code Description	Default	Range
DRV-18	Base Frequency	50.00 Hz	30.00 – 400.00

4.2.16 Minimum Ramp Up Time (Mandatory)

Definition

Network config input SNVT_time_sec   nciRampUpTm

Description

The 'nciRampUpTm' variable is used to configure the inverter's acceleration time. When the 'nciRampUpTm' value is changed, it is reflected in DRV-03 Acc Time. The default 'nciRampUpTm' value is 20.0 sec, which is the default acceleration time that is set as DRV-03 Acc Time.

Valid Range   0.0–500.0 sec (0.1 sec increments)
Default   20.0 sec

Inverter Parameters Related to the 'nciRampUpTm' Variable

Code Number/ Common Area Address	Code Description	Default	Range
0x0007 DRV-03	Acc Time (Acceleration time)	20.0 sec	0.0 – 500.0

4.2.17 Minimum Ramp Down Time (Mandatory)

Definition

Network config input SNVT_time_secnciRampDownTm

Description

The 'nciRampDownTm' variable is used to configure the inverter's deceleration time. When the 'nciRampDownTm' value is changed, it is reflected in DRV-04 Dec Time. The default 'nciRampDownTm' value is 30.0 sec, which is the default acceleration time set at DRV-04 Dec Time.

Valid Range   0.0–600.0 sec (0.1 sec increments)
Default   30.0 sec

35

Inverter Parameters Related to the 'nciRampDownTm' Variable

Code Number/ Common Area Address	Code Description	Default	Range
0x0008 DRV-04	Dec Time (Deceleration time)	30.0 sec	0.0 – 600.0

4.2.18 Default for nviDrvSpeedScale (Optional)

Definition

Network config input SNVT_lev_percentnciDrvSpeedScale

Description

The 'nciDrvSpeedScale' value is used as the default value of the network output variable 'nviDrvSpeedScale.'

Valid Range   -163.840– 163.830 (0.005 %)

Default   0.000 %

Note

The inverter parameters DRV-18 Base Freq, DRV-19 Start Freq, DRV-20 Max Freq, BAS-11 Pole Num, DRV-03 Acc Time, and DRV-04 Dec Time are closely related to the configuration property variables 'nciNmlFreq', 'nciNmlSpeed', 'nciMaxSpeed', 'nciMinSpeed', 'nciRampUPTm', and 'nciRampDownTm' in Drive Objects.

After making changes to the parameter values for DRV-18 Base Freq, DRV-19 Start Freq, DRV-20 Max Freq, BAS-11 Pole Num, DRV-03 Acc Time, and DRV-04 Dec Time using the inverter keypad, either turn off the inverter and then turn it back on, or set COM-94CommUpDate to 'Yes' to reflect the changes in the configuration property variables 'nciNmlFreq', 'nciNmlSpeed', 'nciMaxSpeed', 'nciMinSpeed', 'nciRampUPTm', and 'nciRampDownTm'.

For example, if the inverter parameters are set as shown in the following table, the 'nciMaxSpeed' value becomes 120.000%, the 'nciMinSpeed' value becomes 20.000%, the 'nciNmlSpeed' value becomes 1,500 RPM, the 'nciNmlFreq' value becomes 50.0Hz, the 'nciRampUpTm' value becomes 19.0 sec, and the 'nciRampDownTm' becomes 29.0 sec.

Code	Parameter Name	Value	Code	Parameter Name	Value
DRV-03	AccTIme	19.0 sec	DRV-04	Dec TIme	29.0 sec
BAS-11	Pole Num	4	DRV-18	Base Freq	49.99 Hz
BAS-19	Start Freq	10.00 Hz	BAS-20	Max Freq	50.00 Hz

① The 'nciNmlFreq' variable value uses one decimal place and the DRV-18 Base Freq variable uses two decimal places. Because of the difference, the DRV-18 Base Freq value needs to be rounded up to one decimal place before it is adopted as the 'nciNmlFreq' variable. The value set at DRV-18 becomes 50 Hz after it is rounded up to one decimal

36

place, and the 'nciNmlFreq' value is 50 Hz.

$$② \quad \text{nciNmlSpeed} = \frac{\text{BaseFreq} \times 120}{\text{the number of motor poles}} = \frac{49.99 \times 120}{4} = 1{,}500\text{RPM}$$

$$③ \quad \text{nciMaxSpeed} = \frac{\text{MaxFreq}}{\text{BaseFreq}} \times 100(\%) = \frac{60.0}{50.0} \times 100(\%) = 120.000\%$$

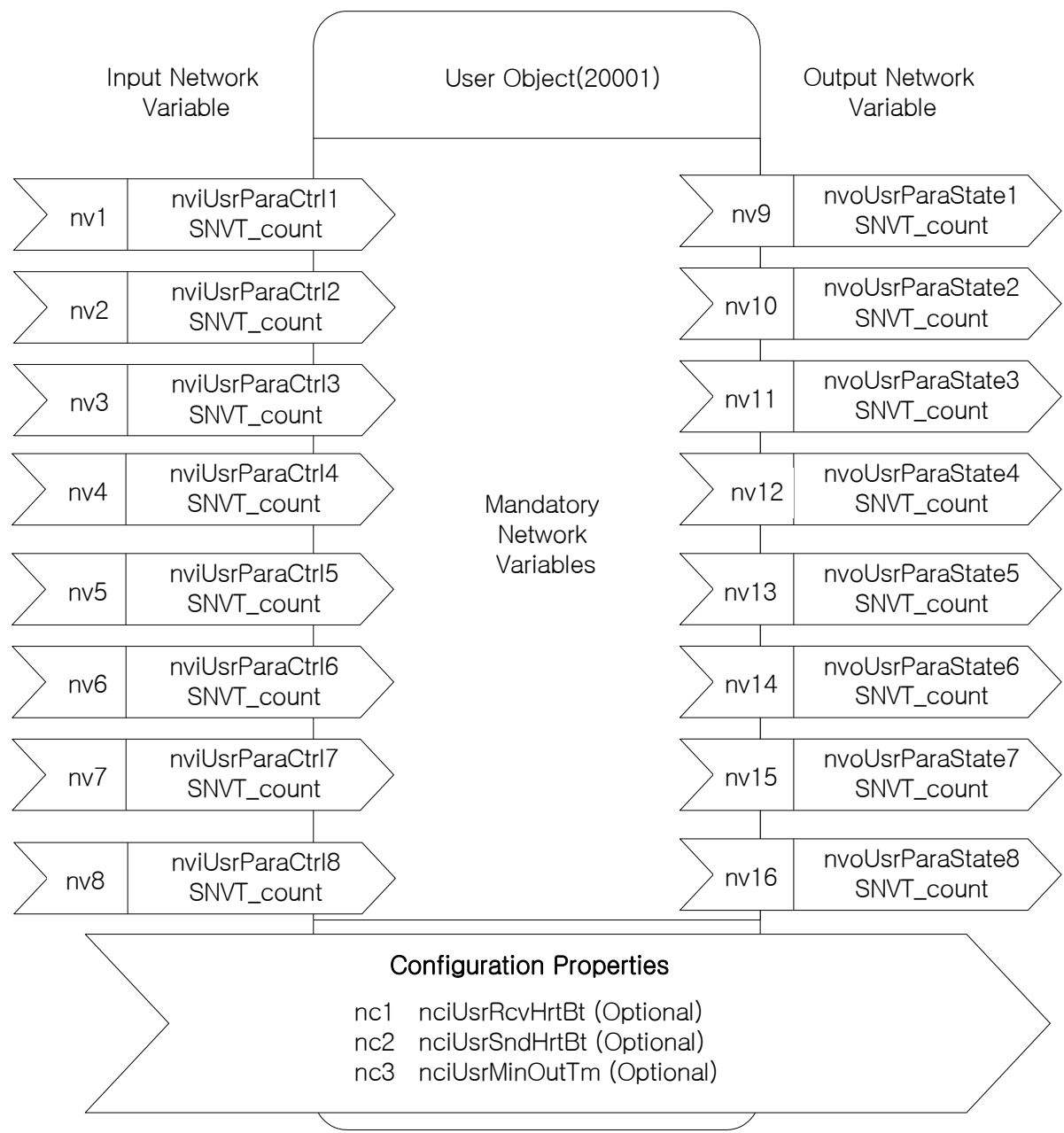$$④ \quad \text{nciMinSpeed} = \frac{\text{StartFreq}}{\text{BaseFreq}} \times 100(\%) = \frac{10.0}{50.0} \times 100(\%) = 20.00\%$$

The 'nciNmlFreq' values must be used in the formula for the base frequency values.

The maximum frequency (MaxFreq) value cannot be set higher than 163.830% of the base frequency (Base Freq). Therefore, the maximum value of the 'nciMaxSpeed' variable is 163.830%.

37

4.2 User Object (User Function Profile Type)

Input Network Variable	User Object(20001)	Output Network Variable	

nv1 — nviUsrParaCtrl1 SNVT_count
nv2 — nviUsrParaCtrl2 SNVT_count
nv3 — nviUsrParaCtrl3 SNVT_count
nv4 — nviUsrParaCtrl4 SNVT_count
nv5 — nviUsrParaCtrl5 SNVT_count
nv6 — nviUsrParaCtrl6 SNVT_count
nv7 — nviUsrParaCtrl7 SNVT_count
nv8 — nviUsrParaCtrl8 SNVT_count

Mandatory Network Variables

nv9 — nvoUsrParaState1 SNVT_count
nv10 — nvoUsrParaState2 SNVT_count
nv11 — nvoUsrParaState3 SNVT_count
nv12 — nvoUsrParaState4 SNVT_count
nv13 — nvoUsrParaState5 SNVT_count
nv14 — nvoUsrParaState6 SNVT_count
nv15 — nvoUsrParaState7 SNVT_count
nv16 — nvoUsrParaState8 SNVT_count

Configuration Properties

nc1   nciUsrRcvHrtBt (Optional)
nc2   nciUsrSndHrtBt (Optional)
nc3   nciUsrMinOutTm (Optional)

Network Input Variables

Function	Variable Name	SNVT Type	Min.	Max.
User Parameter Control1	nviUsrParaCtrl1	SNVT_count	0	65535
User Parameter Control2	nviUsrParaCtrl2	SNVT_count	0	65535
User Parameter Control3	nviUsrParaCtrl3	SNVT_count	0	65535
User Parameter Control4	nviUsrParaCtrl4	SNVT_count	0	65535
User Parameter Control5	nviUsrParaCtrl5	SNVT_count	0	65535
User Parameter Control6	nviUsrParaCtrl6	SNVT_count	0	65535
User Parameter Control7	nviUsrParaCtrl7	SNVT_count	0	65535
User Parameter Control8	nviUsrParaCtrl8	SNVT_count	0	65535

4.3.1 nviUsrParaCtrl1–nviUsrParaCtrl8

Definition

Network input SNVT_count   nviUsrParaCtrl1 –nviUsrParaCtrl8

Description

Network input variables 'nviUsrParaCtrl1–nviUsrParaCtrl8' are used to provide added flexibility while using LS inverters. Because these variables are user-definable to match with the inverter parameters that the users intend to adjust rather than permanently assigned to certain parameters, more convenient and enhanced configuration of the inverter over a network becomes available.

For example, if the user decides to modify COM51–COM58 parameters over the network, these parameters may be assigned to the network variables 'nviUsrParaCtrl1–nviUsrParaCtrl8.' Then, by registering addresses 0x0005 (Frequency Reference), 0x0006 (Command Source) and 0x0007 (Acceleration Time) to the inverter's communication parameters (COM51, COM52, and COM53), users can control the frequency reference with 'nviUsrParaCtrl1', provide run commands with 'nviUsrParaCtrl2,' and adjust acceleration time with 'nviUsrParaCtrl3.'

If the user intends to operate the inverter in the reverse (Rx) direction at 5000 Hz, with a 10.0 sec acceleration time, 'nviUsrParaCtrl1' may be set to 6000, 'nviUsrParaCtrl2' to 0x0004, and 'nviUsrParaCtrl3' to 100.

39

Inverter Parameters Related to the 'nviUsrParaCtrl1– nviUsrParaCtrl8' Variables

Code Number/ Common Area Address	Code Description	Default	Range
COM-50	User Parameter Control Number	3	0–8
COM-51	User Parameter Control 1	0x0005	0–0xFFFF
COM-52	User Parameter Control 2	0x0006	0–0xFFFF
COM-53	User Parameter Control 3	0x0000	0–0xFFFF
COM-54	User Parameter Control 4	0x0000	0–0xFFFF
COM-55	User Parameter Control 5	0x0000	0–0xFFFF
COM-56	User Parameter Control 6	0x0000	0–0xFFFF
COM-57	User Parameter Control 7	0x0000	0–0xFFFF
COM-58	User Parameter Control 8	0x0000	0–0xFFFF

Note

When the inverter is used on a Lon Works network, COM-50 User Parameter Control Number is automatically set to '8'. If the user sets COM-50 to any other value from the keypad, it automatically reverts back to '8.'

Network Output Variables

Function	Variable Name	SNVT Type	Min	Max
User Parameter State1	nvoUsrParaState1	SNVT_count	0	65535
User Parameter State2	nvoUsrParaState2	SNVT_count	0	65535
User Parameter State3	nvoUsrParaState3	SNVT_count	0	65535
User Parameter State4	nvoUsrParaState4	SNVT_count	0	65535
User Parameter State5	nvoUsrParaState5	SNVT_count	0	65535
User Parameter State6	nvoUsrParaState6	SNVT_count	0	65535
User Parameter State7	nvoUsrParaState7	SNVT_count	0	65535
User Parameter State8	nvoUsrParaState8	SNVT_count	0	65535

4.3.2 nviUsrParaState1–nviUsrParaState8

Definition

Network output SNVT_count   NvoUsrParaState1–nvoUsrParaState8

Description

Network input variables 'nvoUsrParaState1 – nvoUsrParaState8' are used to provide flexibility in the monitoring features of the LS inverters. Because these variables are user-definable to match with the inverter parameters that the users intend to monitor, rather than permanently assigned to certain monitoring parameters, easy monitoring of the inverter parameters over a network becomes available.

For example, if the user decides to monitor COM31–COM38 parameters over the network, these parameters may be assigned to the network variables 'nvoUsrParaState1 – nvoUsrParaState8.' Then, by registering addresses 0x000A(Output Frequency), 0x000B(Output Voltage), and 0x941E (Jog Frequency) to the inverter's communication parameters (COM31, COM32, and COM33), users can monitor the output frequency with 'nvoUsrParaState1', the output voltage with 'nvoUsrParaState2,' and the jog frequency with 'nvoUsrParaState3.'

If the inverter is operating at 30 Hz with the DC link voltage of 150.0V and the jog frequency is 20.00 Hz, 'nvoUsrParaState1' displays 3000, 'nvoUsrParaState2' displays 1500, and 'nvoUsrParaState3' displays 2000.

Inverter Parameters Related to the 'nviUsrParaState0– nviUsrParaState7' Variables

Code Number/ Common Area Address	Code Description	Default	Range
COM-30	User Parameter State Number	3	0–8
COM-31	User Parameter State 1	0x000A	0–0xFFFF
COM-32	User Parameter State 2	0x000E	0–0xFFFF
COM-33	User Parameter State 3	0x000F	0–0xFFFF
COM-34	User Parameter State 4	0x0000	0–0xFFFF
COM-35	User Parameter State 5	0x0000	0–0xFFFF
COM-36	User Parameter State 6	0x0000	0–0xFFFF
COM-37	User Parameter State 7	0x0000	0–0xFFFF
COM-38	User Parameter State 8	0x0000	0–0xFFFF

Note

When the inverter is used on a LonWorks network, COM-30 User Parameter Control Number is automatically set to '8'. If the user sets COM-30 to any other value from the Keypad, it automatically reverts back to '8.'

Network Configuration Variable

Feature	Variable Name	Optional/ Mandatory	SNVT Type
Receive Heartbeat Time for User Object	nciUsrRcvHrtBt	Optional	SCPTmaxRcvTime
Send Heartbeat Time for User Object	nciUsrSndHrtBt	Optional	SCPTmaxSndTime
Minimum Send Time for User Object	nciUsrMinOutTm	Optional	SCPTMinOutTime

4.3.3 Receive Heart Beat Time for User Object (Mandatory)

Definition

Network config input SNVT_time_sec   nciUsrRcvHrtBt

Description

The 'nciUsrRcvHrtBt' variable is used to configure the maximum update interval for network input variables 'nviUsrParaCtrl1–nviUsrParaCtrl8.' If the 'nviUsrParaCtrl1–nviUsrParaCtrl8' variables are not updated for the set time ('nciRcvUsrHrBt' time value + PRT-13 Lost Cmd Time), the inverter decides that the command is lost, and runs in the operation mode set at PRT-12 Lost Cmd Mode.

Lost command time protection operates only when the 'nciUsrRcvHrtBt' variable is set to a value other than '0,' DRV-06 Cmd Source and DRV-07 Freq Ref Src is set to any other value than 'Fieldbus,' and PRT-12 Lost Cmd Mode is set to any other value than 'None.'

The lost command protection feature is disabled if the 'nciUsrRcvHrBt' variable is set to 0.0 sec.

Typical Range   0.0 – 120.0 sec (0.1 sec)

A value of 0xFFFF (6553.5 sec) is invalid data.

Default   0.0 sec (Receive Heart Beat is disabled)

Inverter Parameters Related to the 'nciUsrRcvHrtBt' Variable

Code Number/ Common Area Address	Code Description	Default	Settings
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int 485
			FieldBus
			Time Event
DRV-07	Freq Ref Src	Keypad-1	Keypad-1

			Keypad-2
			V1
			Reserved
			V2
			I2
			Int 485
			FieldBus
			Reserved
			Pulse
PRT-12	Lost Cmd Mode	None	None
			FreeRun
			Dec
			Hold Input
			Hold Output
			Lost Preset
PRT-13	Lost Cmd Time	1.0sec	0.1–120.0sec

Note

When the LonWorks network is used as a command source, the inverter's lost command time becomes the time set for the 'nciUsrRcvHrtBt' and PRT-13 Lost Cmd Time added together. However, if the 'nciRcvHrBt' variable is set to 0.0 sec, the lost command protection feature is disabled.

4.3.4 Send Heart Beat Time for User Object (Mandatory)

Definition

Network config input SNVT_time_sec   nciUsrSndHrtBt

Description

The User Object network output variable 'nciUsrSndHrtBt' is used to configure the maximum output times for'nvoUsrParaState1 – nvoUsrParaState8'variables.

Typical Range   0.0 – 6553.4 sec
                             A value of 0xFFFF (6553.5 sec) is invalid data.
Default   0.0 sec (Send Heart Beat is disabled)

43

4.3.5 Minimum Out Time for User Object (Mandatory)

Definition

Network config input SNVT_time_sec   nciUsrMinOUtTm
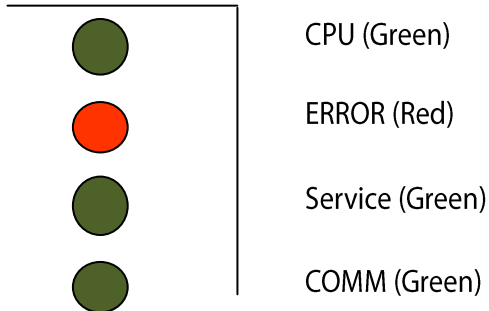
Description

The 'nciUsrMinOUtTm' variable is used to configure the minimum wait time before the network output variables 'nvoUsrParaState1–nvoUsrParaState8' are sent to the network.

Rather than reflecting the changes in the variables each time they are made, a network update is performed when a set period of 'nciUsrMinOutTm' has elapsed to reflect the changes. This feature is used to decrease the network traffic.

Typical Range   0.0 – 6553.4 sec (0.1 sec increments)

                        A value of 0xFFFF (6553.5 sec) is invalid data.

Default   0.0 sec (Minimum Out Time is disabled)

5. LED Information

The MD100HLonWorks communication module has four LEDs that indicate the current operation status of the communication module. The following list shows the LED indicators on the MD100H LonWorks communication module.

CPU (Green)

ERROR (Red)

Service (Green)

COMM (Green)

Indicator	Color	Description
SERVICE	Green	**OFF** – indicates that the MD100H LonWorks communication module has been configured. **Flashing (0.5 Hz)** – indicates that the MD100H LonWorks communication module has not been configured. **ON** – lights when the service switch is turned on. If the LED stays on after turning off the service switch, it means that the MD100H LonWorks communication module does not have the LonWorks application installed in it. **Flashing in 2-sec intervals** – indicates that the MD100H LonWorks communication module has not been configured. **Flashing intermittently** – indicates that electronic interference is affecting the LonWorks network. Inspect network cables to ensure that the connections are secure.
CPU	Green	**Flashing in 1-sec intervals**– indicates that power is supplied to the communication module and the CPU is operating normally.
COMM	Green	**OFF** – indicates that the module is not communicating. **Flashing** – indicates that the module is currently communicating. When the COMM LED flashes, the 'ON' state indicates transmission and the 'OFF' state indicates reception.
ERROR	Red	**CPU, ERROR LED flashing simultaneously**– indicates a CAN (controller area network) communication error. CAN refers to the type of interface used for communication between the LonWorks communication module and the MD100H Inverter. Check the 'Option Trip' messages on the Keypad display. **Flashing intermittently**– indicates that electronic interference is affecting the LonWorks network. Inspect the network cables to ensure that the connections are secure.

Note

Error LED or service LED may flash if one of the two communication cables (A or B) is not wired properly. Inspect the communication cables to ensure that the connections are secure.

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