

REGAL

MDHP Series High Performance Variable Frequency Drive

LonWorks Option Manual



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Drives

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Before using the product, thank you for using our LonWorks Option Board for MDLV-HP.

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 MDLV-HP 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

LonWorks technology is made by Echelon Corp. and LonWorks Network is often used in factory or building automation. In LonWorks Network, Master/Slave concept doesn't exist and all nodes (Device) of the Network communicate each other by LonTalk protocol. And LonWorks Nodes are independent not depending on the other manufacturing companies. This independency is possible by using Standard Network Variable Type (SNVT) offered by LonWorks and MDHP LonWorks comm. card also use Standard Network Variable Type.

All Network variables are categorized into input and output variables and if the connection is made between input variable and output variable at first by Installation Tool, data communication can be done automatically. When input variable and output variable are connected, be sure to make the same Network variable Type.

2. Technical Features of LonWorks

Protocol	LonTalk
LonWorks Comm. Chip	FT3150-P20 chip from Echelon
LonWorks transceiver	FT-X1
Data types	Peer-to-peer Communication
LonWorks Connector	Pluggable Connector
Channel Type	TP/FT-10
Transfer cable	Free Topology Twisted Pair
Baud rate	78 Kbit/s
Topology	Free Topology (Bus, Star, Loop, combination of these)

3. Installation Guideline

When you install MDHP LonWorks Comm. card, refer to Quick Guide below.

- (1) Take away the packing material of MDHP LonWorks Comm. card and check if MDHP LonWorks Comm. card doesn't get damaged apparently.
- (2) Feed power to MDHP and check if the functions of MDHP are operated correctly. Conducting Keypad operation, check the inverter operation.
- (3) After turning off the power of MDHP, wait at least 10 minutes until the charged voltage of inverter will be discharged. Measuring DC Link voltage, make sure it can reach to safe voltage level.
- (4) Install LonWorks comm. card to MDHP inverter.
 - ✓ Removing the cover of MDHP inverter, install MDHP LonWorks comm. card. Connect Comm. Cable (A, B). As there is no polarity in LonWorks Comm. Cable, you can connect without considering polarity.
 - ✓ If present Node is connected to the last of the Network, using terminating resistance setting switch, conduct terminating setting.
- (5) For the Configuration of LonWorks Comm. card, download External Interface file IS7 LON.XIF) and Resource file from <http://www.regalaustralia.com.au>
- (6) After feeding power to inverter, using MDHP Keypad, check if CNF-30 Option-1 Type is set automatically as LonWorks.
- (7) Conduct LonWorks comm. related parameter setting.
- (8) Examine LED state of MDHP LonWorks comm. card. If the Configuration isn't done before, SERVICE LED is flicked as 0.5Hz.
- (9) After turning off the power of MDHP inverter, wait at least 10 minutes until DC Link voltage is discharged. As the installation of MDHP LonWorks comm. card, close the cover of inverter.
- (10) After feeding power to MDHP inverter once again, using Network Tool, conduct Configuration.

Refer) For communicating with inverter through LonWorks first time, you have to do Configuration at least once. If MDHP LonWorks comm. card is installed in MDHP inverter and Configuration isn't conducted, LonWorks comm. can't be done.

- (11) For Configuration, make SVC switch OFF after making ON.

Refer) When you do Configuration of LonWorks comm. card for the first time at Lon NetWokr using LonMaker, as Configuration Time of the LonMaker itself is long, Communication between inverter and communication card can't be done during that Time, Option-1 Trip can happen. In

this case, after Configuration is completed, push RESET button of Keypad for removing Option-1 Trip.

(12) If Configuration is completed successfully, Service LED has to be Off.

Refer) For commissioning of binding using LonMaker, they have to be performed at Network Process of Neuron Chip. In this case, Network Process is done at Neuron Chip, during that time communication interruption happens between inverter and LonWorks comm. card and Option-1 Trip occurs. At this time, push the RESET button of Keypad for removing Option-1 Trip.

4. Network Connection

MDHP LonWorks Comm. card offers Pluggable connector. Table below explains connector. LonWorks Comm. cable can be connected to connector number 1 and 2. AS LonWorks Comm. doesn't have the polarity, you can connect cable without considering polarity.

Switch location		Terminating Type
1	A	Network cable connection (No polarity in Communication wire)
2	B	
3	S	Shield connection

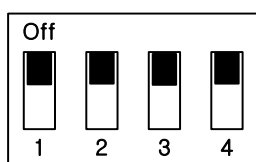
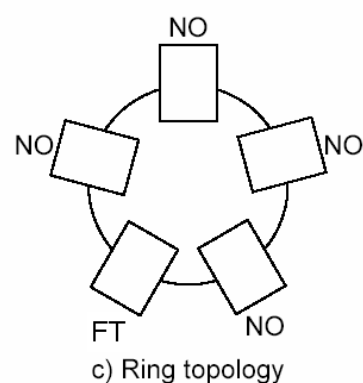
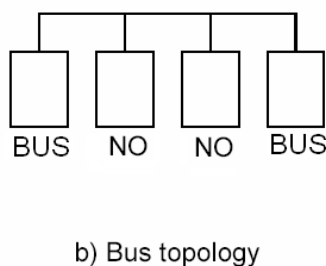
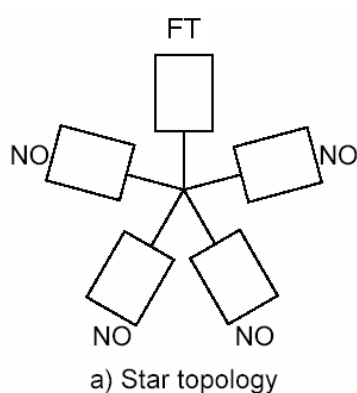
5. Network Termination

Set up the terminal to guarantee the reliability of communication data.

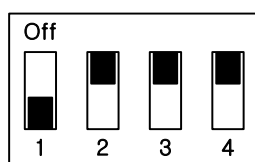
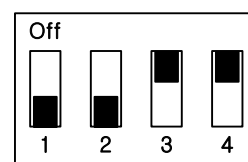
You may set up the terminal of communication cards at both ends (BUS Topology) or a communication card at one side (Free Topology).

MDLV-HP LonWorks communication card contains a terminal resistance. You may determine whether you will use a terminal resistance by DIP switch in the MDLV-HP LonWorks communication card. Set up one or two terminal resistance according to network topology. Free topology uses 50 Ohm resistance and there is one LonWorks device that is terminated with a resistance in the network. In case of Bus topology, it has 100 Ohm as a terminal resistance and two LonWorks devices. This table describes terminated types according to the location of the switch.

Switch position	Terminating Type
FT	Terminating with Free Topology Using 50 Ohm resistor Only one LonWorks device is terminated in Network.
NO	Non-terminating
BUS	Terminating with Bus Topology Using 100 ohm resistor Only 2 LonWorks devices at the last of Network are terminated.



① Terminal resistance

② Bus Topology terminal
(100 Ohm)③ Free Topology terminal
(50 Ohm)

Terminal switch configuration for MDHP LonWorks comm. card

6. Network Cable

- ✓ Belden 85102, unshielded
- ✓ Belden 8471, unshielded
- ✓ Level IV 22AWG, unshielded
- ✓ JY (St) Y 2x2x0.8, shielded
- ✓ TIA568A Cat.5 24AWG

7. LonWorks related Keypad parameter

Table below is about inverter parameters that display LonWorks information.

MDHP LonWorks related Keypad parameter		
Code Number	Parameter Name	Description
CNF-30	Option-1 Type	Comm. card name installed in inverter is displayed. (When LonWorks comm. card is installed, 'LonWorks' is displayed.)
COM-06	FBus S/W Ver	The version of comm. card installed in inverter is displayed.
COM-09	FBus Led	LED ON/OFF information of LonWorks Comm. card is displayed.
COM-10	Opt Parameter1	Neuron ID information is displayed.
COM-11	Opt Parameter2	
COM-12	Opt Parameter3	
COM-94	Comm Update	Comm. related Keypad parameter is Updated.

(1) Option Type (Option card information, CNF-30)

Type of Comm. card installed in MDHP now is displayed automatically. When MDHP LonWorks comm. card is installed, "LonWorks" is displayed automatically.

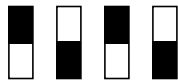
(2) Option Version (Option version information, COM-06)

Version of Comm. card installed in MDHP now is displayed automatically.

(3) FBus Led (COM-09) – Comm. card LED Information Display

- ✓ It displays On/Off status of LED at COM-09 parameter on the keypad which is SVC, COM, ERR and CPU LED on the LonWorks communication card.
- ✓ The order of SVC, COM, ERR and CPU LED (left -> right) which is on COM-09 FBus LED on the keypad displays the information.
- ✓ In orderly SVC, COM, ERR and CPU LED (left -> right) which is the parameter at COM-09 FBus LED on the keypad displays the information.

* COM-09 LED state example



SVC LED	COM LED	ERR LED	CPU LED
ON	OFF	ON	OFF

(4) Neuron ID1~6 (COM-10~12)

Neuron ID is a 6 bytes value which displays the Neuron ID of Neuron Chip on the keypad. The order of COM-10, 11, 12 displays Upper -> Lower information of Neuron ID.

(5) Comm UpDate (COM-94)

When modifying the parameter that is related to the configuration variables of the Drive Object on the keypad, you have to set Comm. Update to 'Yes', in order to write it on the communication card. Comm. Update automatically changes to 'No'.

The Keypad parameters to Comm. Update are as follows.

Code	Code Description
DRV-03	Acc. Time
DRV-04	Dec. Time
DRV-18	Base Freq
DRV-19	Start Freq
DRV-20	Max Freq
BAS-11	Pole Number

※After finishing the commission to LonWorks communication card, you have to set COM-94 Comm.Update 'Yes'. Follow this process, Configuration Property can be applied with the value of the keypad.

※If input of the Max. Freq is more than 163.835 % of Base Freq.Max Freq, nciMaxSpeed is applied with 163.835% after Comm. Update.

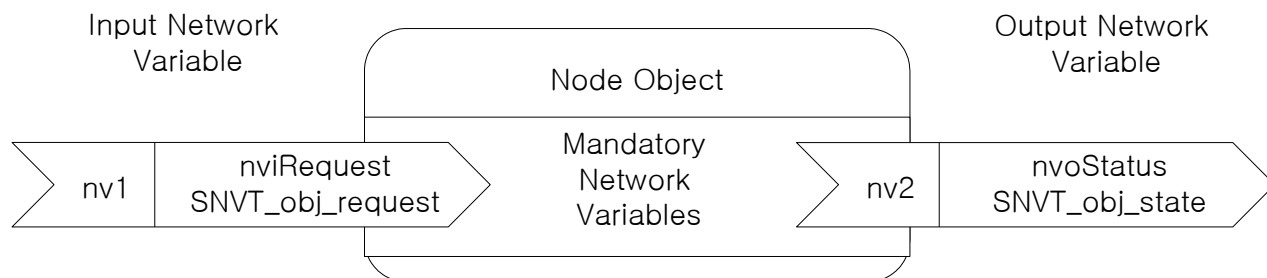
※ When the first configuration of LonWorks communication car on Lon NetWork through

LonMaker, Option-1 trip will be occurred because communication does not completed between inverter and communicated card caused by configuration time of LonMaker itself. After configuration completion, Option-1 Trip will be released by click the RESET button on keypad.

※ When commissioning, binding (connecting the wire) through LonMaker, it is operated by Network Process of Neuron chip. In this case, Option-1 Trip will be occurred for communication loss time between inverter and LownWorks communication card that the amount of time is same as the time of network process on Neuron chip. Option-1Trip will be released by click the RESET button on keypad.

8. Functional Profile

8.1 Node Object



8.1.1 Network Input Variables

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

(1) nviRequest

The input variable of nviRequest is used to Enable or Update Command from network. This input variables support RQ_ENABLE, RQ_DISABLE, RQ_CLEAR_ALARM, RQ_NORMAL, RQ_CLEAR_STATUS, RQ_UPDATE_STATUS, RQ_REPORT_MASK.

8.1.2 Network Output Variables

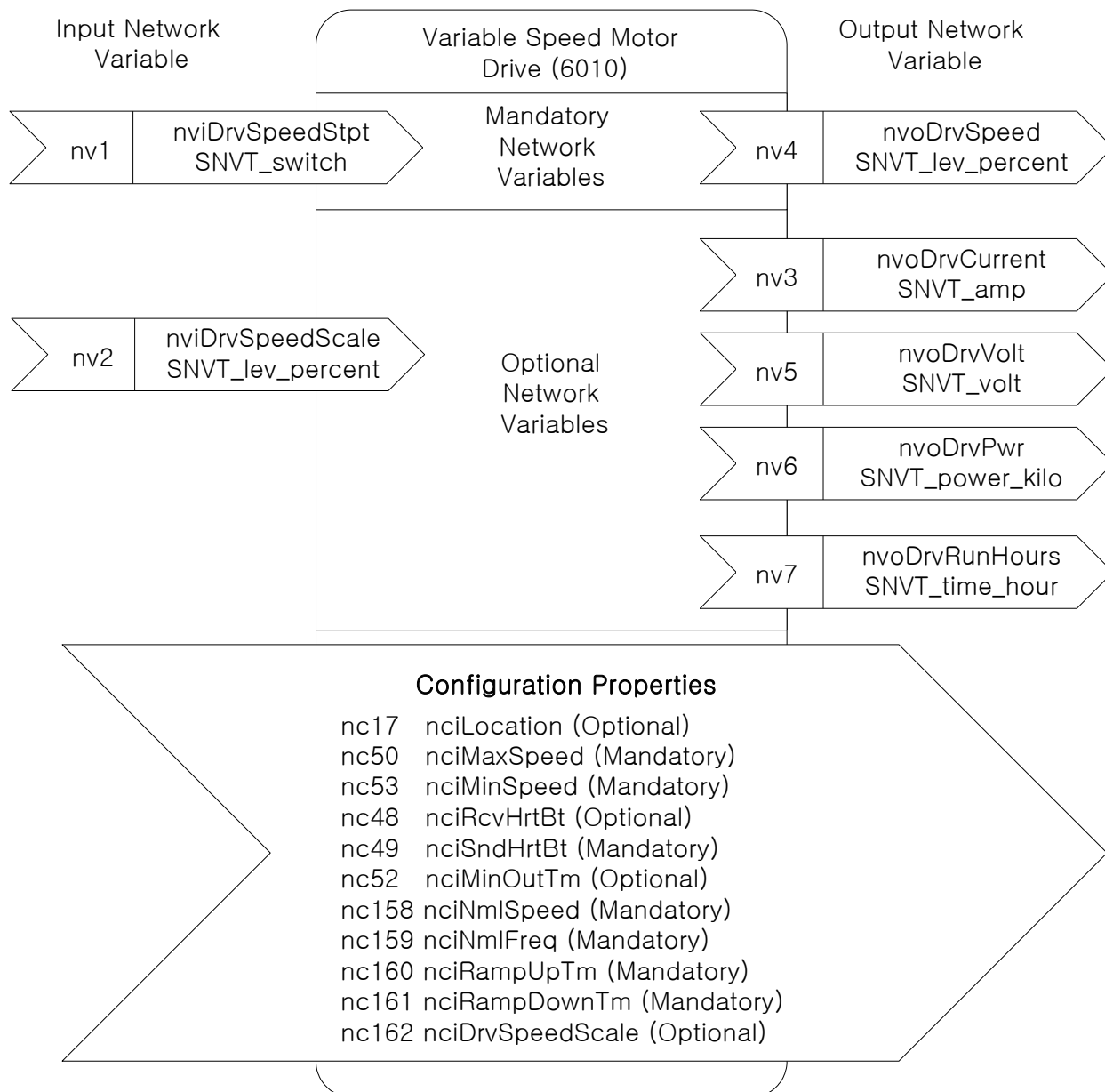
Function	Variable Name	SNVT Type	Min. Value	Max. Value
Node Object Status	nvoStatus	SNVT_obj_status	-	-

(1) nvoStatus

Output variable 'nvoState' reports Node Object status as follows.

Invalid ID	Invalid node ID requested
Report mask	Reporting supported fields.
Disabled	If RQ_DISABLE active
Electrical_fault	Drive is faulted
Manual_control	Drive is in local control
In_alarm	Drive has an alarm

8.2 Drive Object



8.2.1 Network Input Variables

Function	Variable Name	SNVT Type	Min. Value	Max. Value
Drive Speed Setpoint	nviDrvSpeedStpt	SNVT_switch	n/a	n/a
Drive Speed Setpoint Scaling	nviDrvSpeedScale	SNVT_lev_percent	-163.840%	163.835%

(1) nviDrvSpeedStpt**(2) nviDrvSpeedScale****▲ Definition**

Network input SNVT_switch nviDrvSpeedStpt

Network input SNVT_lev_percent nviDrvSpeedScale

▲ Description

nviDrvSpeedStpt and nviDrvSpeedScale are used for the inverter run and speed command. The state variable of nviDrvSpeedStpt is a value that decides the command to whether run or stop the inverter. If the state of nviDrvSpeedStpt is 0, the inverter will stop and the inverter will run when the state value is 1.

nviDrvSpeedScale offers information of the operative direction. If a value of the nviDrvSpeedScale is positive, the motor runs clockwise and if the nviDrvSpeedScale is negative, the motor runs counterclockwise.

Frequency command consists of a combination of nviDrvSpeedScale and nviDrvSpeedStpt. nviDrvSpeedScale and nviDrvSpeedStpt are in % units and the multiplied value of the two is the input for the frequency command of Base Freq. nviDrvSpeedScale provides the scale information of nviDrvSpeedStpt value. For example, if nviDrvSpeedStpt is 100%, nviDrvSpeedScale is -80%. The actual speed is -80% ($1 \times 0.8 = 0.8$). Therefore inverter runs counterclockwise at a speed of Base frequency times 0.8. So, If base frequency is 60.00 Hz, the frequency command value would be 48 Hz ($60.00 \text{ Hz} \times 0.8$).

The input range of nviDrvSpeedScale is -163.840% ~ 163.835%. The resolution of nviDrvSpeedScale is 0.005%. If a value more than +163.84% or lower than -163.845% is put in, this value would be a invalid data.

*Caution: If Run command is put in while a combination of nviDrvSpeedScale and nviDrvSpeedStpt is more than nciMaxSpeed, Run command may be not operate. In this case, put in the combination value of nviDrvSpeedScale and nviDrvSpeedStpt lower than nciMaxSpeed.

▲ Variable information of state of NviDrvSpeedStpt and value

State	Value	Operation freq. and state of inverter
0	-	Stop
1	0	0% freq. command of Base freq.
1	0.5~100.0	0.5 ~ 100.0 % freq. Command of Base freq.
1	100.0	100.0 % freq. Command of Base freq.
0xFF	-	Auto

When you want to do the run commands or frequency command with LonWorks, you should set up the DRV-06 Cmd source of PAR mode to 'FieldBus' and DRV-07 Freq Fef Src of PAR mode to 'FieldBus' by using keypad.

Code Number/ Common Area Address	Code Description	Initial value	Setting range
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int. 485
			FieldBus
			PLC
DRV-07	Freq Ref Src	Keypad-1	Keypad-1
			Keypad-2
			V1
			I1
			V2
			I2
			Int. 485
			Encoder
			FieldBus
			PLC

nviDrvSpeedScale Range -163.840% ~ +163.835%
nviDrvSpeedScale Default 0.000%

▲ Inverter parameters of NviDrvSpeedStpt and nviDrvSpeedScale

Code Number/ Common Area Address	Code Description	Initial value	Setting range
0x0005	Frequency Command	0.00 Hz	0.00 ~ 400.00
0x0006	Run Command	Refer to the description of common area	
DRV-18	Base Frequency	60.00 Hz	30.00 ~ 400.00

Cf.) On network input variable, nviDrvSpeedStpt and nviDrvSpeedScale, you may use Lost Command by using nciRcvHrtBt.

8.2.2 Network Output Variables

Function	Variable Name	SNVT Type	Min. Value	Max. Value
Drive Speed Feedback	nvoDrvSpeed	SNVT_lev_percent	-163.84 %	163.830 %
Actual Motor Current	nvoDrvCurnt	SNVT_amp	0.0 A	3276.6 A
Drive Output Voltage	nvoDrvVolt	SNVT_volt	0.0 V	3276.7 V
Actual Drive Power	nvoDrvPwr	SNVT_power_kilo	0.0 kW	6553.4 kW
Drive total running hours	nvoDrvRunHours	SNVT_time_hour	0 h	65535 h

(1) nvoDrvSpeed

▲ Definition

Network output SNVT_lev_percent nvoDrvSpeed

▲ Description

nvoDrvSpeed outputs the inverter's current operation speed by the percentage value of the base frequency. When the inverter runs clockwise (counterclockwise), the value of nvoDrvSpeed gets a positive (negative) value. For example, if the base frequency is 60.00Hz and the inverter is running counterclockwise with 30.00Hz, nvoDrvSpeed output the value of -50.00%.

Typical Range -163.835 ~ 163.835 % (0.005 %)

▲ Inverter parameter of nvoDrvSpeed

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
0x000A	Output Frequency	-	
0x000E	Status of Inverter (FWD, REV)		
DRV-18	Base Frequency	60.00 Hz	30.00~400.00

(2) nvoDrvCurnt**▲ Definition**

Network output SNVT_amp nvoDrvCurnt

▲ Description

nvoDrvCurnt displays the output current value of the inverter by the unit of Ampere.

Typical Range 0.0 ~ 3276.6 A (0.1 A)

▲ Inverter parameter of nvoDrvCurnt

Code Number/ Common Area Address	Code Description
0x0009	Current

(3) nvoDrvVolt**▲ Definition**

Network output SNVT_volt nvoDrvVolt

▲ Description

nvoDrvVolt displays the output voltage value of the inverter by the unit of Voltage.

Typical Range 0.0 ~ 700.0 V (0.1 V)

▲ Inverter parameter of nvoDrvVoltCurnt

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

(4) nvoDrvPwr**▲ Definition**

Network output SNVT_power_kilo nvoDrvPwr

▲ Description

Output variable of nvoDrvPwr NetWork displays the value of inverter output power by the unit of kW.

Typical Range 0.0 ~ 6553.4 kW (0.1 kW)

▲ Inverter parameter of nvoDrvPwr

Code Number/ Common Area Address	Code Description
MAK-01 0x0001	Inverter Capacity

(5) nvoDrvRunHours**▲ Definition**

Network output SNVT_time_hour nvoDrvRunHours

▲ Description

It displays the whole operation time of inverter.

▲ Inverter parameter of nvoDrvPwr

Code Number/ Common Area Address	Code Description
0x0342 0x0343	Whole operation time of inverter 0x0342 – per day 0x0343 – per Minute

8.2.3 Network Configuration Variable

Function	Variable Name	Optional/ Mandatory	SNVT Type
Location Lable	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	nciNmISpeed	Mandatory	SCPTnomRPM
Nominal Motor Frequency	nciNmIFreq	Mandatory	SCPTnomFreq
Minimum Ramp Up Time	nciRampUpTm	Mandatory	SCPTrampUPTm
Minimum Ramp Down Time	nciRampDownTm	Mandatory	SCPTrampDownTm
Default Value for nviDrvSpeedScale	nciDrvSpeedScale	Optional	SCPTdefScale

Cf.) When you modify the parameter that is related with Configuration variable by keypad and set COM-94 Comm Update parameter to 'Yes' the modified value gets written to the configuration variable.

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
COM-94	Comm UpDate	No	No Yes

(1) Location Lable (Optional)

▲ Definition

Network config input SNVT_str_asc nciLocation

▲ Description

nciLocation uses 6 bytes Location string of Neuron Chip and saves the information of physical location into nciLocation.

Default Empty spaces

(2) Maximum Motor Speed (Mandatory)

▲ Definition

Network config input SNVT_lev_percent nciMaxSpeed

▲ Description

nciMaxSpeed is the value to set the max. speed of the motor. nciMaxSpeed is inputted by the percentage of the nominal frequency (nciNmIFreq) configuration value. For example, if nciNmIFreq 60.00 Hz and nciMaxSpeed is 120%, the max. frequency will be converted from % unit to Hz unit and 72.0 Hz (60.0 x 1.2). The value, 72.00 Hz, is written in the DRV-20 Max Freq and it will be shown on the keypad.

nciMaxSpeed value is not able to modify while the inverter runs. You should stop the inverter first then you can modify the nciMaxSpeed.

The initial value of the nciMaxSpeed is the percentage value, which compares to the Base Freq. of DRV-18 and Max. Freq. of DRV-20. Therefore, the initial value of the nciMaxSpeed will be 100.00 %.

nciMaxSpeed must satisfy the formula below.

$$0 \leq \text{Minimum Speed} \leq \text{Maximum Speed} \leq 163.835$$

Typical Range 100.000 ~ 150.000 % (0.005%)

Default 100.000%

※As shown above, DRV-20 Max Freq is changed by nciMaxSpeed (% value) of nciNmIFreq. Since 40 ~ 400.00 Hz is setting range of Max. Freq., original setting range is preserved when nciNmIFreq has to change below 40 Hz (ex. nciNmIFreq 30Hz, nciMaxSpeed 100.00 %).

▲ Inverter parameter of nciMaxSpeed

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
DRV-18	Base Freq	60.00 Hz	30.00 ~ 400.00
DRV-20	Max Freq	60.00 Hz	40.00 ~ 400.00

(3) Minimum Motor Speed (Mandatory)

▲ Definition

Network config input SNVT_lev_percent nciMinSpeed

▲ Description

nciMinSpeed is the value to set the min. speed of the motor. nciMinSpeed is inputted by the percentage of the nominal frequency (nciNmIFreq) configuration value. For example, nciNmIFreq is 60.0 Hz and nciMinSpeed is 10%, the maximum frequency will be 6.0 Hz (60.0 x 0.1). The value, 6.00 Hz, is written in the DRV-19 Start Freq. and it will be shown on the keypad.

nciMinSpeed value is not able to modify while the inverter runs. You should stop the inverter first and then modify the nciMinSpeed value.

The initial value of nciMinSpeed is the percentage value of the Base Freq. of DRV-18 and Start Freq. of DRV-19. Therefore, the initial value of the nciMinSpeed will be 0.83%.

nciMinSpeed must satisfy the formula below.

$$0 \leq \text{Minimum Speed} \leq \text{Maximum Speed} \leq 163.835$$

Typical Range 0.000 ~ 40.000 % (0.005 %)

Default 0.830%

▲ Inverter parameter nciMinSpeed

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
DRV-18	Base Frequency	60.00 Hz	30.00 ~ 400.00
DRV-19	Start Frequency	0.50 Hz	0.01 ~ 10.00

(4) Receive Heart Beat Time (Optional)

▲ Definition

Network config input SNVT_time_sec nciRcvHrtBt

▲ Description

Decide the maximum update cycle time of the network input variables, nviDrvSpeedStpt and nviDrvSpdScale. If update of nviDrvSpeedStpt and nviDrvSpdScale does not occur during the (nciRcvHrtBt + PRT-13 Lost Cmd Time) time, it recognizes it as a condition of the communication command loss and starts to run as the mode in the communication command loss of PRT-12 Lost Cmd Mode.

If you want to run with mode which is set in the communication command loss, you have to set the DRV-06 Cmd Source to 'Fieldbus' or the DRV-07 Freq Ref Src to 'Fieldbus' as a value, not the value '0.0 sec' of nciRcvHrtBt. Furthermore, PRT 12 Lost Cmd Mode has to be set the value, not 'None'.

If the value of nciRcvHrtBt is to be set 0.0 sec, the function of communication command loss will be disable.

Typical Range	0.0 ~ 120.0 sec (0.1 sec) Invalid data, when input value 0xFFFF (6553.6 sec)
Default	0.0 sec (not using Receive Heart Beat function)

▲ Inverter parameter nciRcvHrtBt

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int. 485
			FieldBus
			PLC
DRV-07	Freq Ref Src	Keypad-1	Keypad-1
			Keypad-2
			V1
			I1
			V2
			I2
			Int. 485
			Encoder
			FieldBus
			PLC
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 communicating with LonWorks, communication command loss time of the inverter, (nciRcvHrtBt +PRT-13 Lost Cmd Time) will be applied. If the value of nciRcvHrtBt is to be set 0.0 sec, the function of communication command loss will be disable.

(5) Send Heart Beat Time(Mandatory)**▲ Definition**

Network config input SNVT_time_sec nciSndHrtBt

▲ Description

Variable nciSndHrtBt means the time of update while the value of data has not changed. It determines the maximum output time of network output variables, such as nvoDrvSpeed, nvoDrvCurnt, nvoDrvVolt, nvoDrvPwr, nvoDrvRunHours.

Typical Range 0.0 ~ 6553.5 sec
 Invalid data, when input value is 0xFFFF (6553.6 sec)
 Default 0.0 sec (not using Send Heart Beat function)

(6) Minimum Out Time (Optional)**▲ Definition**

Network config input SNVT_time_sec nciMinOUTm

▲ Description

It decides the minimum time that network variables, such as nvoDrvSpeed, nvoDrvCurnt, nvoDrvVolt, nvoDrvPwr and nvoDrvRunHours have to wait until they get sent through communication.

The network value does not change by every little variation but it sends out the changed value every nciMinOutTm time. It is used to reduce network traffic.

Typical Range 0.0 ~ 6553.5 sec (0.1 sec)
 Invalid data, when input value is 0xFFFF (6553.6 sec)
 Default 0.0 sec (not using Minimum Out Time function)

(7) Nominal Motor Speed in RPM (Mandatory)**▲ Definition**

Network config input SNVT_freq_hz nciNmISpeed

▲ Description

nciNmISpeed sets up the Base freq. of inverter.

The initial value of nciNmISpeed will become 1800.00 rpm because it is converted from DRV-18 Base Freq into rpm (Base on 60 Hz of the Base Freq and 4 pole number). When the nciNmISpeed value is modified, the value of nciNmISpeed, which is converted from rpm into Hz is reflected in DRV-18 Base Freq.

The below is the formula to convert RPM into Hz. The inverter parameter, BAS-11 Pole Number, means the pole number of the motor. You should set it properly.

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

Valid Range 0 ~ 65535 rpm (1 rpm)

Default 1800 rpm

▲ Inverter parameter of nciNmISpeed

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
BAS-11 0X001B	Pole Number	4	2~48
DRV-18	Base Frequency	60.00 Hz	30.00 ~ 400.00

▲ Caution

nciNmIFreq is automatically changed when you modify nciNmISpeed. For example, when nciNmISpeed is 1800 rpm, nciNmIFreq is 60.00 Hz, BAS-11 Pole Number is 4, and if you change nciNmIFreq to 1700 rpm, then nciNmIFreq will be 56.7 Hz (DRV-18 Base Frequency is rounded up) and DRV-18 Base Frequency of keypad will be 56.66 Hz.

DRV-19 Start Frequency and DRV-20 Max Frequency will be changed together when you modify nciNmISpeed and nciNmIFreq. Referring to the above to the above example, if nciMaxSpeed is 100.00 % and nciMinSpeed 10.000%, DRV-19 Start Frequency will be 5.67 Hz and DRV-20 Max Frequency will be 56.66 Hz.

(8) Nominal Motor Frequency (Mandatory)**▲ Definition**

Network config input SNVT_freq_hz nciNmIFreq

▲ Description

nciNmIFreq sets up the Base Freq of inverter. The nciNmIFreq is an indispensable value to set the minimum (nicMinSpeed) and maximum (nciMaxSpeed) frequency of the motor. (nciMinSpeed and nciMaxSpeed are percentage values of the nciNmIFreq.) The initial value of nciNmIFreq is 60.00Hz, which is same as DRV-18 Base Freq.

Valid Range 30.0~400.0 (0.1 Hz)

Default 60.0 Hz

▲ Inverter parameter of nciNmIFreq

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
DRV-18	Base Frequency	60.00 Hz	30.00 ~ 400.00

(9) Minimum Ramp Up Time (Mandatory)**▲ Definition**

Network config input SNVT_time_sec nciRampUpTm

▲ Description

nciRampUpTm sets up the acceleration time. 'DRV-03 Acc. Time' value will be changed into nciRampUpTm when nciRampUpTm is modified. The initial value of the nciRampUpTm is same as DRV-03 Acc. Time. Therefore, the initial value is 20.0 sec.

Valid Range 0.0~600.0 sec (0.1 sec)

Default 20.0 sec

▲ Inverter parameter of nciRampUpTm

Code Number/ Command area address	Code Description	Initial Value	Setting Range
0x0007/DRV-03	Acc. Time	20.0 sec	0.0 ~ 600.0

(10) Minimum Ramp Down Time (Mandatory)**▲ Definition**

Network config input SNVT_time_sec nciRampDownTm

▲ Description

nciRampDownTm sets up the deceleration time.

Time value will be changed into nciRampDownTm when nciRampDownTm is modified.

The initial value of nciRampDownTm is same as DRV-04 Dcc.Time. Therefore, the initial value is 30.0 sec.

Valid Range 0.0~600.0 sec (0.1 sec)

Default 30.0 sec

▲ Inverter parameter of nciRampDownTm

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
0x0008/DRV-04	Dec. Time	30.0 sec	0.0 ~ 600.0

(11) Default for nviDrvSpeedScale (Optional)**▲ Definition**

Network config input SNVT_lev_percent nciDrvSpeedScale

▲ Description

nciDrvSpeedScale is applied to the initial value of the network output variable, nviDrvSpeedScale.

Valid Range -163.840~ +163.835 (0.005 %)

Default 0.000 %

Cf.)

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 keypad parameter that are closely related to the configuration property variable of Drive Object, such as nciNmIFreq, nciNmISpeed, nciMaxSpeed, nciMinSpeed, nciRampUPTm, and nciRampDownTm.

To modify 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 by keypad and save them into the configuration property variable, such as nciNmIFreq, nciNmISpeed, nciMaxSpeed, nciMinSpeed, nciRampUPTm, and nciRampDownTm, turn off the inverter and turn it on again or you have to set COM-94 Comm Update to 'Yes'.

For example, if you changes the keypad parameters as the table below, nciMaxSpeed is 150.000%, nciMinSpeed is 8.555%, nciNmISpeed is 1370rpm, nciNmIFreq is 45.7Hz, nciRampUpTm is 19.0 sec, and nciRampDownTm is 29.0 sec.

Code	Parameter name	Value	Code	Parameter name	Value
DRV-03	Acc. Tlme	19.0 sec	DRV-04	Dec. Tlme	29.0 sec
BAS-11	Pole Num	4	DRV-18	Base Freq	45.68 Hz
DRV-19	Start Freq	3.91 Hz	BAS-20	Max Freq	68.52 Hz

① nciNmIFreq is down to the first decimal place and DRV-18 is down to the second decimal point place. Therefore, nciNmIFreq is 45.7, because it rounds off at the second decimal place of DRV-18.

$$\textcircled{2} \text{ nciNmISpeed} = \frac{\text{BaseFreq} \times 120}{\text{the number of motor poles}} = \frac{45.68 \times 120}{4} = 1370rpm(1370.4)$$

$$\textcircled{3} \text{ nciMaxSpeed} = \frac{\text{MaxFreq}}{\text{BaseFreq}} \times 100(\%) = \frac{68.52}{45.68} \times 100(\%) = 150.000\%$$

$$\textcircled{4} \text{ nciMinSpeed} = \frac{\text{StartFreq}}{\text{BaseFreq}} \times 100(\%) = \frac{3.91}{45.68} \times 100(\%) = 8.555\%(8.559544\dots)$$

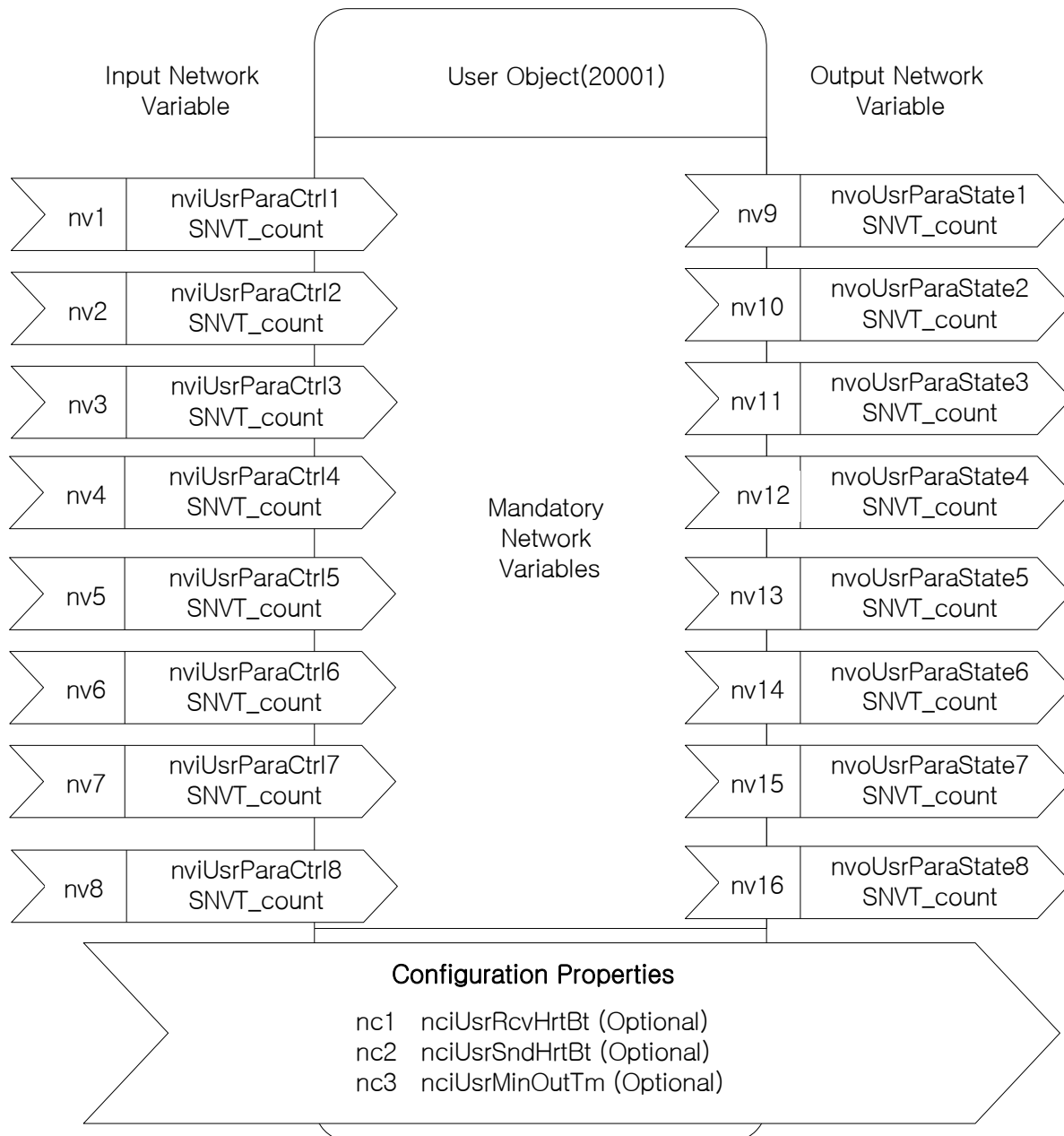
All the Base Freq used in the calculation uses DRV-18 Base Freq.

The Max Freq value should not exceed 163.840 % of the Base Freq. The Maximum value of nciMaxSpeed is 163.840%.

Max. value of nciMaxSpeed is 163.835%.

Cf.) When motor runs to positive direction (in case of Base Freq is 60Hz), nviDrvSpeedScale is 100% and nviDrvSpeedStpt is 100% as 1, the nciDrvSpeedScale will be changed to 50% therefore nviDrvSpeedScale will be changed to 50% (when monitoring) and motor still runs to positive direction with 60Hz. To apply the changed value, the value of nciDrvSpeedScale will be applied to 50% after writing the value of nviDrvSpeedScale or stop and then run the motor. The motor runs to the positive direction with 30 Hz.

8.3 User Object (User Function Profile Type)



8.3.1 Network Input Variables

Function	Variable Name	SNVT Type	Min. Value	Max. Value
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

(1) nviUsrParaCtrl1 ~ nviUsrParaCtrl8

▲ Definition

Network input SNVT_count nviUsrParaCtrl1 (identical until nviUsrParaCtrl8)

▲ Description

nviUsrParaCtrl1 ~ nviUsrParaCtrl8 are added network input variables to provide the LS inverter user with more flexible functions.

The strength of the function is the ability for the user to change the inverter parameter that the user actually wants to change and not the fixed parameter value of the inverter.

When the user puts in the address in parameter COM51 ~ 58 using the keypad, it corresponds one to one to the network variable nviUsrParaCtrl1 ~ nviUsrParaCtrl8 and could change the set up parameter value.

For example, if the user sets COM51 as 0x0005 (freq. setting), COM52 as 0x0006 (Operation command setting) and COM53 as 0x0007 (accelerating time), the user could set the frequency setting through nviUsrParaCtrl1, set the operation command through nviUsrParaCtrl2 and change the accelerating speed through nviUsrParaCtrl3. If you want to make the inverter run counterclockwise at a speed of 60.00 Hz with an accelerating time of 10.00 sec., put in 6000 for nviUsrParaCtrl1, 0x0004 for nviUsrParaCtrl2 and 100 for nviUsrParaCtrl3.

▲ Inverter parameters of nviUsrParaCtrl1 ~ nviUsrParaCtrl8

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

※**Cf.)** When communicating with LonWorks, the COM-50 User Parameter Control Number gets fixed to 8.

8.3.2 Network Output Variables

Function	Variable Name	SNVT Type	Min. Value	Max. Value
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

(1) nvoUsrParaState1 ~ nvoUsrParaState8

▲ Definition

Network output SNVT_count nvoUsrParaState1 (identical until nvoUsrParaState8)

▲ Description

nvoUsrParaState1 ~ nvoUsrParaState8 are added network variables to provide the LS inverter user with more flexible functions. The strength of this function is the ability for the user to change the inverter parameter that the user actually wants to monitor and monitor the value of it. Not the fixed parameter value of the inverter.

When the user puts in the address in parameter COM31 ~ COM38 using the keypad, it corresponds one to one to the network variable nvoUsrParaState1 ~ nvoUsrParaState8 and the inverter's parameter value gets displayed.

For example, if the user sets COM31 as 0x000A (Output Freq.), COM32 as 0x000B (Inverter Output Voltage) and COM33 as 0x941E (Jog Freq.), the variable nvoUsrParaState1 will display the Output Freq value, the variable nvoUsrParaState2 will display the Inverter Output Voltage and nvoUsrParaState3 will display the Jog Freq. If the inverter runs at a speed of 30.00 Hz, the DC link voltage is 150.0V and if the Jog Freq. is set to 20.00, then would be the value for nviUsrParaState1 is 3000, nviUsrParaState2 is 1500, and nviUsrParaState3 is 2000.

▲ Inverter parameter of nvoUsrParaState1 ~ nvoUsrParaState8

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
COM-30	Parameter Status Number	8	8
COM-31	Parameter Status 1	0x000A	0~0xFFFF
COM-32	Parameter Status 2	0x000E	0~0xFFFF
COM-33	Parameter Status 3	0x000F	0~0xFFFF
COM-34	Parameter Status 4	0x0000	0~0xFFFF
COM-35	Parameter Status 5	0x0000	0~0xFFFF
COM-36	Parameter Status 6	0x0000	0~0xFFFF
COM-37	Parameter Status 7	0x0000	0~0xFFFF
COM-38	Parameter Status 8	0x0000	0~0xFFFF

※**Cf.)** When communicating with LonWorks, the COM-30 Parameter Status Number gets fixed to 8.

8.3.3 Network Configuration Variable

Function	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

(1) Receive Heart Beat Time for User Object (Mandatory)

▲ Definition

Network config input SNVT_time_sec nciUsrRcvHrtBt

▲ Description

Decide the maximum Update cycle time of the User Object's network input variables, nviUsrParaCtrl1 ~ nviUsrParaCtrl8. If Update of nviUsrParaCtrl1 and nviUsrParaCtrl8 does not occur during the (nciUsrRcvHrtBt + PRT-13 Lost Cmd Time), it is recognized as communication command loss and starts to run as the mode set in communication command loss of PRT-12.

If you want to use the communication command loss, you have to set the DRV-06 or DRV-07 as a 'FieldBus', not '0.0 sec' of nciUsrPcvHrtBt. Furthermore, the RRT-12 command lost mode has to be set as a value also.

If the value of nciUsrRcvHrtBt is '0.0 sec', communication command loss function is disabled.

Typical Range 0.0 ~ 120.0 sec (0.1 sec)
 Invalid data, when input value is 0xFFFF (6553.6 sec)
 Default 0.0 sec (not using Receive Heart Beat function)

▲ Inverter parameter of nciUsrRcvHrtBt

Code Number/ Common Area Address	Code Description	Initial Value	Setting Range
DRV-06	Cmd Source	Fx/Rx-1	Keypad
			Fx/Rx-1
			Fx/Rx-2
			Int. 485
			FieldBus
			PLC
DRV-07	Freq Ref Src	Keypad-1	Keypad-1
			Keypad-2
			V1
			I1
			V2
			I2
			Int. 485
			Encoder
			FieldBus
			PLC
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 communicating with LonWorks, communication command loss time of inverter, (nciUsrRcvHrtBt +PRT-13 Lost Cmd Time) value does gets applied. If the value of nciUsrRcvHrBt is 0.0 sec, communication command loss function is disabled.

(2) Send Heart Beat Time for User Object (Mandatory)**▲ Definition**

Network config input SNVT_time_sec nciUsrSndHrtBt

▲ Description

It decides maximum output time of the User Object network output variable, User Object nvoUsrParaState1 ~ nvoUsrParaState8.

Typical Range 0.0 ~ 6553.5 sec
 Invalid data, when input value is 0xFFFF (6553.6 sec).
 Default 0.0 sec (not using Send Heart Beat function)

(3) Minimum Out Time for User Object (Mandatory)**▲ Definition**

Network config input SNVT_time_sec nciUsrMinOutTm

▲ Description

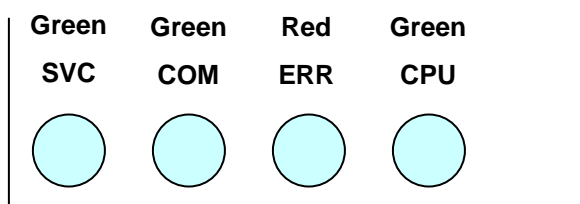
It decides the minimum time that the User Object network variable, nvoUsrParaState1 ~ nvoUsrParaState8 has to wait until it gets sent through communication.

The network value does not changed by every little variable but it sends out the changed nciUsrMinOutTm time. It is used to reduce network traffic.

Typical Range 0.0 ~ 6553.5 sec (0.1 sec)
 Invalid data, when input value is 0xFFFF (6553.6 sec)
 Default 0.0 sec (not using Minimum Out Time function)

9. LED information

There are 4 LED on MDHP LonWorks communication card that indicate the present status of the LonWorks communication card and are lined up as follows on it.



LED name	Color	Function
SERVICE	Green	<p>OFF – Indicates that the MDHP LonWorks communication card is configured.</p> <p>Flickering (0.5Hz) – Indicates that the communication card is not configured.</p> <p>ON – Indicates SERVICE LED is ON when SVC switch is On. Change the SVC switch to Off.</p> <p>Indicates that the MDHP LonWorks communication card has no application and that it is not configured when SERVICE LED is On even though SVC switch is Off.</p>
CPU, ERROR	Green, Red	<p>CPU, ERROR LED flickering at the same cycle – Indicates the error of CAN communication between LonWorks communication card and MDHP. It is able to check the Option error message through keypad.</p>
COMM	Green	<p>OFF – Indicates that LonWorks is not communicating.</p> <p>Flickering – Indicates that it is communicating</p> <p>When COMM LED is flickering, 'On' means that it is transmitting and 'Off' means that it is receiving data.</p>

HEAD OFFICE

19 Corporate Ave / PO Box 2340
Rowville VIC 3178 AUSTRALIA

Tel: +61 (0)3 9237 4000
Fax: +61 (0)3 9237 4010

AUSTRALIA

National Sales
1300 888 853
Drives Technical Support
1800 724 149
www.regalaustralia.com.au
www.regalbeloit.com

REGAL BELOIT AUSTRALIA Pty Ltd
ABN 61 122 303 084

VICTORIA

MELBOURNE
19 Corporate Avenue
Rowville VIC 3178
Tel: +61 (0)3 9237 4040
Fax: +61 (0)3 9237 4050

NEW SOUTH WALES

SYDNEY
6-7 Bushells Place
Wetherill Park NSW 2164
Tel: +61 (0)2 8781 3100
Fax: +61 (0)2 8781 3131

TASMANIA

DEVONPORT
115 Don Road
Devonport TAS 7310
Tel: +61 (0)3 6424 8574
Fax: +61 (0)3 6424 9393

NEW ZEALAND

CMG Electric Motors (NZ) Ltd
18 Jomac Place
Avondale Auckland
NEW ZEALAND
Tel: +64 9820 3550
Fax: +64 9820 8504

SINGAPORE

CMG Electric Motors
(Asia Pacific) Pte Ltd
12 Tuas Loop 637346
SINGAPORE
Tel: +65 6863 3473
Fax: +65 6863 3476

QUEENSLAND

BRISBANE
7 Mahogany Court
Willawong QLD 4110
Tel: +61 (0)7 3246 3246
Fax: +61 (0)7 3246 3210

CAIRNS ("Service - Repairs - Sales")
2/159-161 Newell Street
Bungalow QLD 4870
Tel: +61 (0)7 4033 1109
Fax: +61 (0)7 4033 5553

MACKAY

Paget Mackay QLD 4740
Tel: +61 (0)7 4952 6244
Fax: +61 (0)7 4952 6277

THAILAND

FASCO Motors (Thailand) Limited
29/7-8 Bangkruay-Sainoi Road
Bangkrang, Muang Nonthaburi
District Nonthaburi 11000 THAILAND
Tel: +66 2447 3300
Fax: +66 2447 3500

MALAYSIA

Torin Industries SND BHD
(MALAYSIA)
No. 6536A Jalan Bukit Kemuning
Batu 6 Seksyen 34
40470 Shah Alam Selangor
Tel: +60 3 51246157
Fax: +60 3 51211467

SOUTH AUSTRALIA

ADELAIDE
47 Research Road
Pooraka SA 5095
Tel: +61 (0)8 8359 1321
Fax: +61 (0)8 8359 5675

WESTERN AUSTRALIA

PERTH
21 Colin Jamieson Drive
Welshpool WA 6106
Tel: +61 (0)8 6253 3700
Fax: +61 (0)8 6253 3710