

MOTOR CONTROL

REGAL

MD100P Series, Fan & Pump Variable Frequency Drive

LonWorks Option Manual



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Drives

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Thank you for purchasing MD100P LONWORKS 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 MDLV-100P 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 was born in Echelon Co. LONWORKS Network is generally used for factory or building automation. There is no Master/Slave concept in the LONWORKS network but all the nodes (devices) communicate with each other through LONTalk protocol. And LONWORKS nodes don't have dependence on other manufacturers. The independence is only available by using Standard Network Variable Type (SNVT), which is provided by LONWORKS. The 100P LONWORKS communication card also supports the Standard Network Variable type variables.

All network variables have input and output variables. Data communication will automatically get started when you connect the input and output variables with the Installation Tool. To connect input variables with output variables, their types of the network should be identical.

2. Technical features of LONWORKS

Protocol	LonTalk
LONWORKS Com. 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, or compound of the previous)

3. Guidelines to install

Refer to the Quick Guide below to install 100P LONWORKS communication card.

- 1) Open the package of the 100P LONWORKS and check the communication card for external damages.
- 2) Verify the function of 100P with the power connected whether the functions operate well or not. And check inverter operation by operating keypad.
- 3) Turn the power of 100P off and wait at least 5 minutes until the voltage of the inverter gets discharged. Check if the voltage level is in a safe range by measuring the DC link voltage.
- 4) Install the 100P LONWORKS communication card to an 100P inverter.
 - 4-1) Uncover the 100P inverter and mount the 100P LONWORKS communication card
 - 4-2) Connect communication cable (A, B). Connect the cable not considering polarity, for LONWORKS communication cable has no polarity.
 - 4-3) If the node is located at the end of the network, use the terminal resistance selection switch to set the terminal.
- 5) Download an external interface file (lonCerusVFD.xif) and the appropriate resource file (lonCerusVFD.apb or lonCerusVFD.nxe) for use by your Network Tool. You can download the files from our homepage <http://www.cerusind.com>
- 6) Turn on the power of inverter and verify COM-01 Opt B/D with the 100P keypad whether it is automatically set to LonWorks or not.
- 7) Set the related parameters for LonWorks communication on the inverter.
- 8) Examine LED status of the 100P LONWORKS communication card. SERVICE LED will blink by 0.5Hz if you didn't configure the card.
- 9) Wait at least 5 minutes after the 100P is turned off to discharge DC Link voltage. It is the end of the installation, cover up the lid of the inverter.

Cf.) You must set up the configuration before you try to communicate by LONWORKS communication. It is not available to communicate with LONWORKS communication without the configuration.

- 10) Turn on the 100P again and turn the SVC switch on and off to configure the communication.
- 11) When the configuration is finished successfully, the SERVICE LED will be turned off.

4. Network connection

100P LONWORKS communication card offers a pluggable connector.

This table describes about the connector. LONWORKS communication cable should be connected to No. 1 and 2 of the connector. You may connect the cable without considering polarity because LONWORKS communication has no polarity.

Switch location		Terminal type
1	A	Network cable connection (No polarity)
2	B	
3	S	Shield connection

5. Network Termination

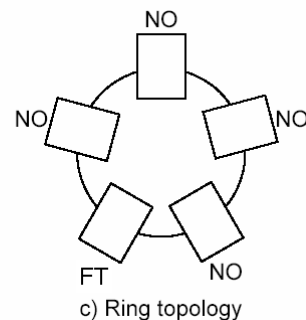
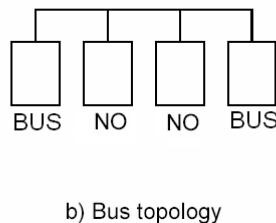
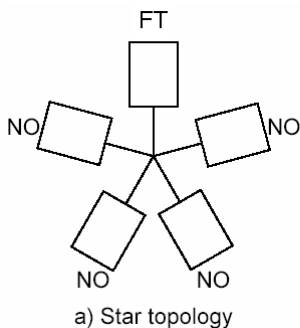
Set up the terminal to guarantee the reliability of communication data.

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

100P LONWORKS communication card contains a terminal resistance. You may determine whether you will use a terminal resistance by DIP switch in the 100P LONWORKS communication card. Set up one or two terminal resistances according to network topology. Free Topology uses 500Ω resistance. And there is one LONWORKS device that is terminated with a resistance in the network. In case of Bus Topology, it has 100Ω as a terminal resistance and two LONWORKS devices.

This table describes terminal types according to the location of the switch.

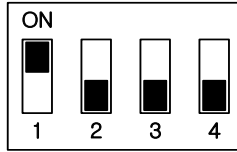
Switch location	Terminal type
FT	Free Topology 500Ω terminal resistance Set up one terminal for LONWORKS communication card of the network
NO	No use of terminal resistance
BUS	Bus Topology 105Ω terminal resistance Set up two terminals for LONWORKS communication card of the network.



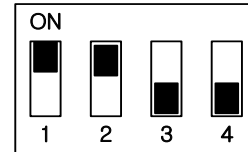
Terminal types of network topologies



① Terminal resistance



② BUS Topology terminal (100 Ω)



③ Free Topology terminal

Terminal switch configurations of 100P LONWORKS communication 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. Keypad parameters of LONWORKS

These are inverter parameters that display information of LONWORKS.

Keypad parameters of 100P LONWORKS		
Code Number	Parameter	Details
COM-01	Opt B/D	It displays the name of the communication card that has been installed on the inverter. (It indicates 'LonWorks' when a LONWORKS communication card is installed.)
COM-03	Opt Version	It displays the version of the communication card.
COM-61	Opt Para-1	Display Neuron ID 1 (Decimal, MSB)
COM-62	Opt Para-2	Display Neuron ID 2 (Decimal)
COM-63	Opt Para-3	Display Neuron ID 3 (Decimal)
COM-64	Opt Para-4	Display Neuron ID 4 (Decimal)
COM-65	Opt Para-5	Display Neuron ID 5 (Decimal)
COM-66	Opt Para-6	Display Neuron ID 6 (Decimal)
COM-67	Comm UpDate	Update keypad parameters of communication

(1) Option Type (Option card information, COM-01)

It automatically displays the type of the communication card on 100P. It indicates 'LonWorks' when a LONWORKS communication card is installed.

(2) Option Version (Option version information, COM-02)

It automatically displays the version of communication card on 100P.

(3) Neuron ID1~6 (COM61~66)

Neuron ID is a 6 bytes value which displays the Neuron ID of Neuron Chip on the keypad. It is displayed by decimal numeration.

(4) Comm UpDate (COM-67)

When modifying the parameter that is related to the configuration variables of the drive object on the keypad, you have to set the Comm UpDate to “Yes,” in order to write it on the communication card. Comm UpDate automatically changes to “No.”

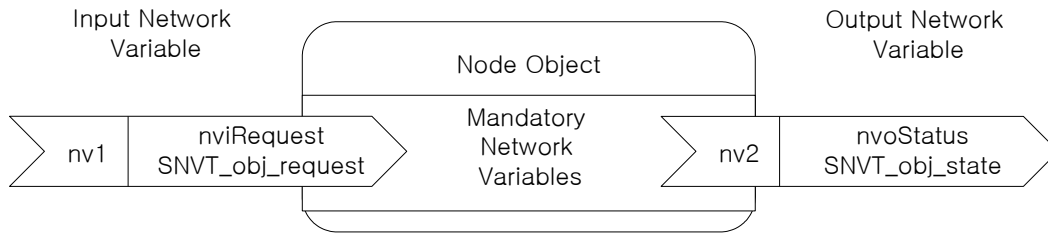
The keypad parameters to apply Comm UpDate are as follows.

Code	Code Description
DRV-03	Acc. Time
DRV-04	Dec. Time
FU1-30	Max Frequency
FU1-31	Base Frequency
FU1-32	Start Frequency
FU2-41	Pole Number

After finishing the commission to LONWORKS communication card, you had better set COM-67 Comm Update ‘Yes’. Follow this process, Configuration Property can be applied with the value of the Keypad.

8. Functional Profile

8.1 Node Object



8.1.1 Network Input Variables

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

(1) nviRequest

The input, nviRequest is used to enable or update commands from network. This input supports RQ_ENABLE, RQ_DISABLE, RQ_CLEAR_ALARM, RQ_NORMAL, RQ_CLEAR_STATUS, RQ_UPDATE_STATUS and RQ_REPORT_MASK.

8.1.2 Network Output Variables

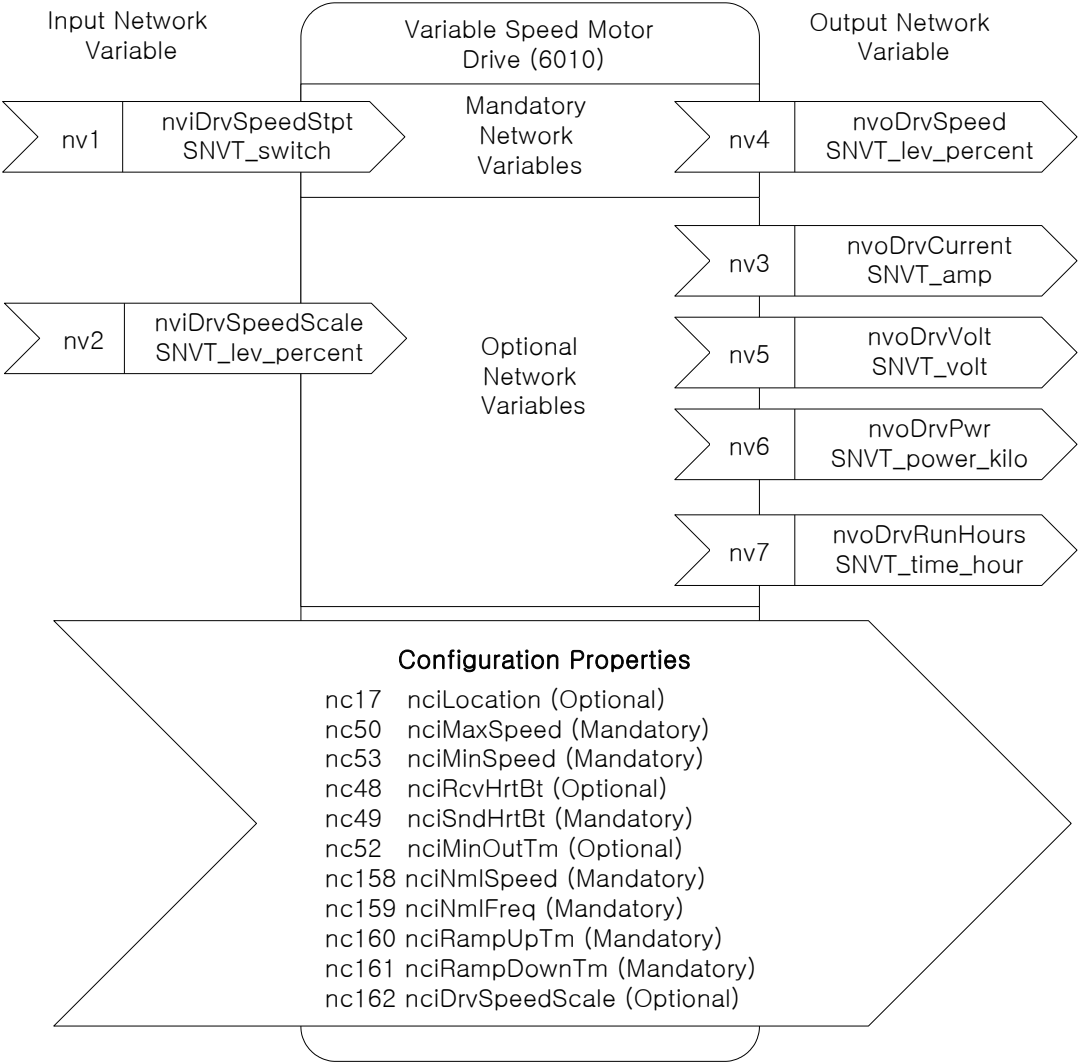
Function	Variable	SNVT Type	Min. value	Max. value
Node Object Status	nvoStatus	SNVT_obj_status	-	-

(1) nvoStatus

This nvoStatus reports node object status.

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	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%	163.840%

(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. The value of both 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% and nviDrvSpeedScale is -80%, the actual speed is -80% (1 X 0.8 = 0.8). Therefore, the inverter runs counterclockwise at a speed of the base frequency times 0.8. So, if the base frequency is 50.00 Hz, the frequency command value would be 48Hz (50.00Hz X 0.8).

The input range for nviDrvSpeedScale is -163.840% ~ 163.830%. Therefore, if a value of 0x7fff(+163.835%) is put in, this value would be a invalid data.

State and Value information of NviDrvSpeedStpt

State	Value	Run frequency / status of inverter
0	-	Stop
1	0	0% frequency operation of the base frequency
1	0.5~100.0	0.5~100.0% frequency operation of the base frequency
1	100.0	100.0% frequency operation of the base frequency
0xFF	-	Auto

When you want to do the run or the frequency command with LONWORKS, you should set up the COM-02 Opt mode of the COM group to “Cmd + Freq” by using the keypad. Set the COM-02 Opt mode to “Command” to operate the run command only with LONWORKS and “Freq” is for the use of the frequency command.

Code Number/ Common area address	Code Description	Default	Setting range
COM-02	Opt mode	None	None
			Command
			Freq
			Cmd + Freq

nviDrvSpeedScale Range -163.840% ~ 163.830%

nviDrvSpeedScale Default 0.000%

▲ Inverter parameters of NviDrvSpeedStpt, nviDrvSpeedScale

Code Number/ Common area address	Code Description	Default	Setting range
0x0005	Frequency Command	0.00 Hz	0.00 ~ 120.00
0x0006	Run Command	Refer to the description of common area	
FU1-31	Base Frequency	50.00 Hz	30.00~120.00

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

8.2.2 Network Output Variables

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

(1) nvoDrvSpeed

▲ Definition

Network output SNVT_lev_percent nvoDrvSpeed

▲ Description

nvoDrvSpeed outputs the inverter's current run speed by the percentage value of the base frequency. When the inverter runs clockwise (counterclockwise), the value of the nvoDrvSpeed gets a positive (negative) value. For example, if the base frequency is 50.00Hz and the inverter is running counterclockwise with 25.00Hz, novDrvSpeed outputs the value of -50.00%.

Typical Range -163.840 ~ 163.830 % (0.001 %)

▲ Inverter parameters for nvoDrvSpeed

Code Number/ Common area address	Code Description	Default	Setting range
DRV-00 0x000A	Output Frequency		-
0x000E	Status of Inverter (FWD, REV)		
FU1-31	Base Frequency	50.00 Hz	30.00~120.00

(2) nvoDrvCurnt

▲ Definition

Network output SNVT_amp nvoDrvCurnt

▲ Description

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

Typical Range 0.0 ~ 3276.6 A (0.1 A)

▲ Inverter parameters for nvoDrvCurnt

Code Number/ Common area address	Code Description
DRV-08 0x0009	Current

(3) nvoDrvVolt

▲ Definition

Network output SNVT_volt nvoDrvVolt

▲ Description

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

Typical Range 0.0 ~ 700.0 V (0.1 V)

▲ Inverter parameters for nvoDrvVoltCurnt

Code Number/ Common area address	Code Description
DRV-11 0x000B	Output voltage

(4) nvoDrvPwr

▲ Definition

Network output SNVT_power_kilo nvoDrvPwr

▲ Description

nvoDrvPwr, the value of a network output variable, displays the output power of the inverter by the unit of kW.

Typical Range 0.0 ~ 6553.4 kW (0.1 kW)

▲ Inverter parameters for nvoDrvPwr

Code Number/ Common area address	Code Description
MAK-01 0x0001	Capacity of the inverter

(5) nvoDrvRunHours**▲ Definition**

Network output SNVT_time_hournvoDrvRunHours

▲ Description

It displays the whole operation time of the inverter.

▲ Inverter parameters for nvoDrvPwr

Code Number/ Common area address	Code Description
FU2-85	Whole operation time

8.2.3 Network Configuration Variable

Function	Variable	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	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

Cf.) When you modify the parameter that is related to the configuration variable and set Comm UpDate parameter to 'Yes', the modified value gets written to the configuration variable.

Code Number/ Common area address	Code Description	Default	Setting range
COM-67	Comm UpDate	No	No Yes

(1) Location Label (Optional)

▲ Definition

Network config input SNVT_str_asc nciLocation

▲ Description

nciLocation uses 6bytes Location string of Neuron Chip and saves the information of the 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 (nciNmlFreq) configuration value. For example, if nciNmlFreq is 50.0Hz and nciMaxSpeed is 120%, the maximum frequency will be 60.0Hz (50.0 X 1.2). The value, 60.0Hz, is written in the FU1-30 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 value.

The initial value of the nciMaxSpeed is the percentage value of the FU1-30 Max Freq, which compares to the FU1-31 Base Freq. Therefore, the initial value of the nciMaxSpeed will be 100.00%.

nciMaxSpeed must satisfy the formula below.

$$-163.840 \leq \textit{Minimum Speed} \leq \textit{Maximum Speed} \leq 163.840$$

Typical Range 100.000 ~ 150.000 % (0.001%)

Default 100.000%

※ As shown above, FU1-30 Max Freq is changed by nciMaxSpeed(%) of nciMinFreq(nciMinSpeed). Since 40~120.00Hz is the setting range for Max Freq, original setting value of Max Freq is preserved when nciNmlFreq has to change below 40Hz (ex. nciNmlFreq 30Hz, nciMaxSpeed 100.00%).

▲ Inverter parameters for nciMaxSpeed

Code Number/ Common area address	Code Description	Default	Setting range
FU1-31	Base Frequency	50.00 Hz	30.00 ~ 400.00
FU1-30	Max Frequency	50.00 Hz	30.00 ~ 400.00

※When you input the FU1-30 Max Freq value and set Comm Update as 'Yes' to apply the nciMaxSpeed value and if the FU1-30 Max Freq is more than 160% of the FU1-31 Base Freq, FU1-30 Max Freq value is changed to 100% of the Base Freq. For example, if the Base Freq is 50.00 Hz, the Max Freq is 120.00 Hz, and Comm Update is 'Yes', then the Max Freq will be automatically changed to 50.00 Hz.

(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 (nciNmlFreq) configuration value. For example, if nciNmlFreq is 50.0Hz and nciMinSpeed is 10%, the maximum frequency will be 5.0Hz (50.0 X 0.1). The value, 5.00Hz, is written in the FU1-32 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 the nciMinSpeed is the percentage value of the FU1-32 Start Freq, which compares to the FU1-31 Base Freq. Therefore, the initial value of the nciMaxSpeed will be 0.8%.

nciMinSpeed must satisfy the formula below.

$$-163.840 \leq \textit{Minimum Speed} \leq \textit{Maximum Speed} \leq 163.840$$

Typical Range 0.000 ~ 40.000 % (0.001 %)

Default 0.000%

※ As shown above, FU1-30 Max Freq is changed by nciMaxSpeed(%) of nciMinFreq(nciMinSpeed). Since 40~120.00 Hz is the setting range for Max Freq, original setting value of Max Freq is preserved when nciNmlFreq has to change below 40Hz (ex. nciNmlFreq 30Hz, nciMaxSpeed 100.00%).

▲ Inverter parameters for nciMaxSpeed

Code Number/ Common area address	Code Description	Default	Setting range
FU1-31	Base Frequency	50.00 Hz	30.00 ~ 120.00
FU1-32	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 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 IO-93.

If you want to run with the mode which is set in the communication command loss, you have to set the COM-02 Opt mode as a value, not "None." Furthermore, the IO-92 Lost Cmd mode has to be set as a value also.

Typical Range 0.0 ~ 120.0 sec (0.1 sec)
 Invalid Data, when input value is 0xFFFF(6553.5 sec)
 Default 0.0 sec (not using Receive Heart Beat function)

▲ Inverter parameters for nciRcvHrtBt

Code Number/ Common area address	Code Description	Default	Setting range
IO-92	COM Lost Cmd	None	None
			FreeRun
			Stop
COM-02	Opt mode	None	None
			Cmd
			Freq
			Cmd+Freq

Caution) When communicating with LONWORKS, communication loss time of the inverter, IO-93 COM Time Out value, does not get applied.

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

Network config input SNVT_time_sec nciSndHrtBt

▲ Description

It determines the maximum output time of the network output variables, such as nvoDrvSpeed, nvoDrvCurnt, nvoDrvVolt, nvoDrvPwr, and nvoDrvRunHours.

Typical Range 0.0 ~ 6553.4 sec

Invalid Data, when input value is 0xFFFF(6553.5 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 min. 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 ~ 6553.4 sec (0.1 sec)

Invalid Data, when input value is 0xFFFF(6553.5 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 FU1-31 Base Freq into rpm (Base on 50Hz 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 FU1-31 Base Freq.

The below is the formula to convert RPM into Hz. The inverter parameter, M2-10 Pole Num, means the pole number of the motor. You should set it properly.

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

Valid Range 0 ~ 65534 rpm (1 rpm)

Default 1500 rpm

▲ Inverter parameters for nciNmISpeed

Code Number/ Common area address	Code Description	Default	Setting range
FU2-41 0X0017	Pole Number	4	2~48
FU1-31	Base Frequency	50.00 Hz	30.00 ~ 120.00

▲ Caution

nciNmIFreq is automatically changed when you modify nciNmISpeed. For example, when nciNmISpeed is 1500rpm, nciNmIFreq is 50.0Hz, FU1-31 Base Frequency of Keypad parameter is 50.00Hz, and BAS-11 Pole Number is 4, and if you change nciNmIFreq to 750rpm, then nciNmIFreq will be 25Hz(FU1-31 Base Frequency is rounded up) and FU1-31 Base Frequency of Keypad parameter will be 25Hz.

DRV-19 Start Frequency and DRV-20 Max Frequency will be changed together when you modify nciNmISpeed and nciNmIFreq. Referring to the above example, if nciMaxSpeed is 100.000% and nciMinSpeed is 10.000%, DRV-19 Start Frequency will become 5Hz and DRV-20 Max Frequency will be 5Hz.

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

Network config input SNVT_freq_hz nciNmlFreq

▲ Description

nciNmlFreq sets up the Base Freq of inverter. The nciNmlFreq is a indispensable value to set the minimum(nciMinSpeed) and maximum(nciMaxSpeed) frequency of the motor. nciMinSpeed and nciMaxSpeed are percentage values of the nciNmlFreq. The initial value of nciNmlFreq is 50.0Hz, which is same as FU1-31 Base Freq.

Valid Range 30.0~400.0 (0.1 Hz)

Default 50.0 Hz

▲ Inverter parameters for nciNmlFreq

Code Number/ Common area address	Code Description	Default	Setting range
FU1-31	Base Frequency	50.00 Hz	30.00 ~ 120.00

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

Network config input SNVT_time_sec nciRampUpTm

▲ Description

nciRampUpTm sets up the acceleration time. DRV-01 Acc. Time value will be changed into nciRampUpTm when nciRampUpTm is modified. The initial value of the nciRampUpTm is same as DRV-01 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 parameters for nciRampUpTm

Code Number/ Common area address	Code Description	Default	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. DRV-02 Dec. Time value will be changed into nciRampDownTm when nciRampDownTm is modified.

The initial value of nciRampDownTm is same as DRV-02 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 parameters for nciRampDownTm**

Code Number/ Common area address	Code Description	Default	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 ~ 163.830 (0.005 %)

Default 0.000 %

Cf.) FU1-31 Base Freq, FU1-30 Max Freq, FU1-32 Start Freq, FU2-41 Pole Num, DRV-01 Acc Time, and DRV-02 Dec Time are keypad parameters that are closely related to the configuration property variables of drive object, such as nciNmIFreq, nciNmISpeed, nciMaxSpeed, nciMinSpeed, nciRampUPTm, and nciRampDownTm.

To modify FU1-31 Base Freq, FU1-30 Max Freq, FU1-32 Start Freq, FU2-41 Pole Num, DRV-01 Acc Time, and DRV-02 Dec Time and save them into the configuration property variables, such as nciNmIFreq, nciNmISpeed, nciMaxSpeed, nciMinSpeed, nciRampUPTm, and nciRampDownTm, turn off the inverter and turn it on again.

For example, if you change the keypad parameters as the table below, nciMaxSpeed is 120.000%, nciMinSpeed is 20.000%, nciNmISpeed is 15000 rpm, nciNmIFreq is 50.0 Hz, nciRampUpTm is 19.0 sec, and nciRampDownTm is 29.0 sec.

Code	Parameter	Value	Code	Parameter	Value
DRV-01	Acc. Time	19.0 sec	DRV-02	Dec. Time	29.0 sec
FU1-30	Max Freq	50.00 Hz	FU1-31	Base Freq	49.99 Hz
FU1-32	Start Freq	10.00 Hz	FU2-41	Pole Num	4

① nciNmlFreq is down to the first decimal place and FU1-31 Base Freq is down to the second decimal place. Therefore, the nciNmlFreq is 45.7Hz, because it rounds off at the second decimal place of FU1-31.

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

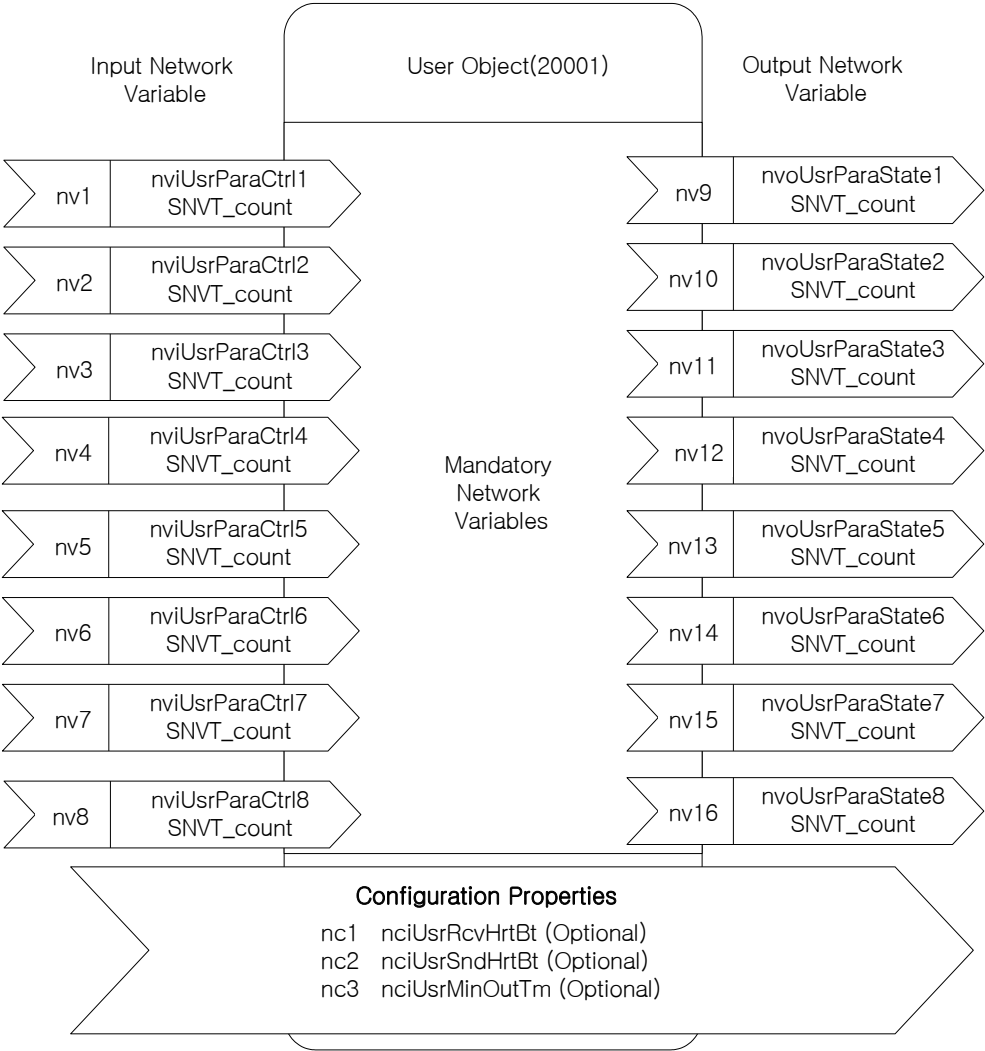
$$\textcircled{3} \text{ nciMaxSpeed} = \frac{\text{MaxFreq}}{\text{BaseFreq}} \times 100(\%) = \frac{68.52}{45.68} \times 100(\%) = 150.000\%$$

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

All the Base Freq used in the calculation uses nciNmlFreq to calculate.

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

8.3 User Object (User Function Profile Type)



8.3.1 Network Input Variables

Function	Variable	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 output variables to provide the Cerus 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 change and not the fixed parameter value of the inverter.

When the user puts in the address in parameter COM41~COM48 using the keypad, it corresponds one to one to the network variables, nviUsrParaCtrl1 ~ nviUsrParaCtrl8 and could change the set up parameter value.

For example, if the user sets COM41 as 0x0005 (Freq. setting), COM42 as 0x0006 (Operation command setting) and COM43 as 0x0007 (Accelerating time), the user could set the Frequency 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 50.00Hz with an accelerating time of 10.0 sec., put in 6000 for nviUsrParaCtrl1, 4 for nviUsrParaCtrl2 and 100 for nviUsrParaCtrl3.

▲ Inverter parameters for nviUsrParaCtrl1 ~ nviUsrParaCtrl7

Code Number/ Common area address	Code Description	Default	Setting range
COM-40	User Parameter Control Number	8	0~8
COM-41	User Parameter Control 1	0x0005	0~0xFFFF
COM-42	User Parameter Control 2	0x0006	0~0xFFFF
COM-43	User Parameter Control 3	0x0000	0~0xFFFF
COM-44	User Parameter Control 4	0x0000	0~0xFFFF
COM-45	User Parameter Control 5	0x0000	0~0xFFFF
COM-46	User Parameter Control 6	0x0000	0~0xFFFF
COM-47	User Parameter Control 7	0x0000	0~0xFFFF
COM-48	User Parameter Control 8	0x0000	0~0xFFFF

Cf.) When communicating with LONWORKS, the COM-40 User Parameter Control Number gets fixed to 8. Even if you change the value of COM-40 on the keypad, 8 will automatically reappear.

8.3.2 Network Output Variables

Function	Variable	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) nviUsrParaState1 ~ nviUsrParaState8

▲ Definition

Network output SNVT_count NvoUsrParaState1 (identical until nvoUsrParaState8)

▲ Description

nvoUsrParaState1 ~ nvoUsrParaState8 are added network output variables to provide the Cerus 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 variables, 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, nvoUsrParaState2 will display the Inverter Output Voltage value and nvoUsrParaState3 will display the Jog Freq. value. If the inverter runs at a speed of 30.00Hz, the DC link voltage is 150.0V and if the Jog Freq. is set to 20.00, then would be the value for nviUsrParaState1, 3000, nviUsrParaState2, 1500 and nviUsrParaState3, 2000.

▲ Inverter parameters for nviUsrParaState0 ~ nviUsrParaState7

Code Number/ Common area address	Code Description	Default	Setting range
COM-30	User Parameter State Number	8	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

Cf.) When communicating with LONWORKS, the COM-30 User Parameter State Number gets fixed to 8. Even if you change the value of COM-30 on the keypad, 8 will automatically reappear.

8.3.3 Network Configuration Variable

Function	Variable	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 time, it recognizes it as a communication command loss and starts to run as the mode set in COM Lost Cmd of IO-93.

If you want to use the communication command loss, you have to set the COM-02 Opt mode as a value, not "None." Furthermore, the IO-92 COM Lost Cmd mode has to be set as a value also.

Typical Range 0.0 ~ 120.0 sec (0.1 sec)
 Invalid Data, when input value is 0xFFFF(6553.5 sec)
 Default 0.0 sec (not using Receive Heart Beat function)

▲ Inverter parameters for nciRcvHrtBt

Code Number/ Common area address	Code Description	Default	Setting range
IO-92	COM Lost Cmd	None	None
			FreeRun
			Stop
COM-02	Opt mode	None	None
			Cmd
			Freq
			Cmd+Freq

notice) When communicating with LONWORKS, communication loss time of the inverter, IO-93 COM Time Out value, does not get applied.

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

Network config input SNVT_time_sec nciUsrSndHrtBt

▲ Description

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

Typical Range 0.0 ~ 6553.4 sec

Value input, 0xFFFF (6553.5 sec) is invalid data.

Default 0.0 sec (It does not use the Send Heart Beat function)

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

Network config input SNVT_time_sec nciUsrMinOUTm

▲ Description

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

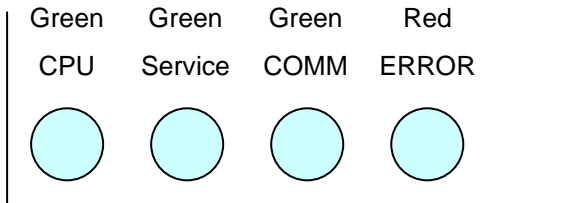
Typical Range 0.0 ~ 6553.4 sec (0.1 sec)

Value input, 0xFFFF (6553.5 sec) is invalid data.

Default 0.0 sec (It does not use the Minimum Out Time function)

9. LED Information

There are 3 green LEDs and 1 red LED that indicate the present status of the 100P LONWORKS Communication card and are lined up as follows on it.



LED name	Color	Status
SERVICE	Green	<p>Off – Indicates that the 100P LONWORKS communication card is configured.</p> <p>Blinking (0.5Hz) – Indicates that the communication card is not configured.</p> <p>On – Indicates that the 100P LONWORKS communication card has no application and that it is not configured.</p>
CPU, ERROR	Green, Red	<p>CPU, ERROR blink at the same cycle – Indicates error between LONWORKS communication card and 100P. Able to check option error message through keypad.</p> <p>CPU, ERROR blink in alternation – Indicates that there is no problem in Can communication. .</p>
COMM	Green	<p>Off – Indicates that LONWORKS is not communicating.</p> <p>Blinking – Indicates that it is communicating.</p> <p>When the COMM LED is blinking, “light on” means that it is transmitting and “light off” means that it is receiving data.</p>

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