



LonWorks (LN-01)

User Manual

Echelon, LON, LonMaker, NodeBuilder, LonBuilder, LonPoint, LNS, LONWORKS, LonTalk, i.LON, Neuron, 3120, 3150, LonMark, the LonUsers Logo, the Echelon Logo and the LonMark Logo are registered trademarks of Echelon Corporation. Other trademarks belong to their respective owners.

The information supplied by this document is subject to change without notice. No responsibility or liability for the correctness of the information supplied within this document is assumed.

Table of Contents

Chapter 1 Overview	1-1
1.1 Introduction	1-1
1.2 LN-01 Communication Interface	1-1
1.3 Dimension	1-1
Chapter 2 Installation	2-1
2.1 Specification	2-1
2.2 Installation	2-1
2.3 Wiring	2-3
2.4 Network Initialization of LN-01 Communication Interface	2-4
2.5 Service Pin	2-4
2.6 Text Device Interface File (.XIF)	2-4
Chapter 3 Network configuration	3-1
3.1 Network Topology	3-1
3.2 Specification	3-1
3.3 Configuration	3-1
3.4 Replace LN-01	3-1
Chapter 4 Using Network Variables on LN-01 Communication Interface	4-1
4.1 Standard Network Variable Type (SNVT) Table	4-1
4.1.1 NVIs (network variables for inputting to Delta AC Drive)	4-1
4.1.2 NVOs (Network variables outputted to network integrated tool from the AC Drive)	4-2

4.2 Functional Profile.....	4-3
4.3 Using LN-01 to Communicate with the AC Drive.....	4-4
4.4 Read/Write AC Drive Parameters.....	4-5
4.5 Run/Stop Command.....	4-7
4.6 Sending Frequency Command to the AC Drive.....	4-7
Chapter 5 Troubleshooting.....	5-1
5.1 Power LED	5-1
5.2 SP LED.....	5-2
5.3 Service LED	5-2

CHAPTER 1 OVERVIEW

1.1 Introduction

This manual provides instructions of the installation and setup for LN-01 that used to communication with Delta AC Drives (firmware version of AC drive should conform with LN-01 as table 1-1 below) via LonWorks Network.

Delta AC Drive	
Series	Firmware Version
VFD-B	4.00 以上
VFD-M	3.00 以上
VFD-S	2.50 以上
VFD-F	1.90 以上

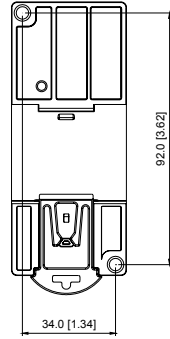
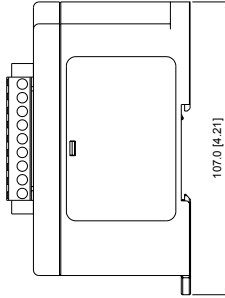
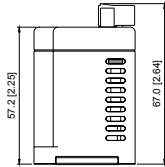
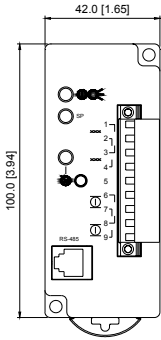
Table 1-1

1.2 LN-01 Communication Interface

LN-01 communication interface is a comprised of a control card with a Neuron chip. Through the use of LN-01 unit in the LonWorks Network, AC drives are able to communicate with other devices.

1.3 Dimension

Chapter 1 Overview | LN-01



CHAPTER 2 INSTALLATION

2.1 Specification

Power Supply	16-30VDC, 750mW
Transmission Rate	Modbus: ASCII 7, N, 2, Baud rate: 9600
LonTalk	free topology with FTT-10A 78 Kbps
LonTalk Terminal	9 terminals, wire gauge: 28-12 AWG, wire strip length: 7-8mm
RS-485 Port	6 pins with RJ-11

2.2 Installation

1. Please refer to Figure 2-1 to mount LN-01 on the DIN rail.

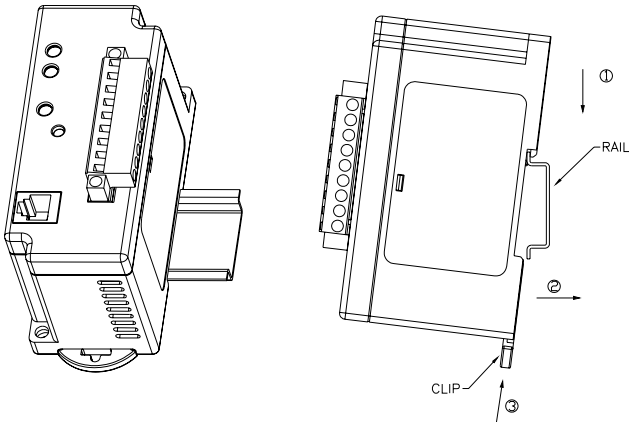


Figure 2-1

2. Table below shows LonTalk system wiring. RJ-11, a safety device, is used to prevent user plug-in the device in the wrong direction.





Terminal	Symbol	Function
1		These are twisted pair cable connect to LonTalk system. Terminals 1 and 2 should be used as one group, and same for terminals 3 and 4.
2		
3		
4		
5	N/A	N/A
6		Power input terminals for 16-30 VDC. Power input is polarity sensitive. (No need to consider which polarity to connect. Need only connect 16-30 VDC to LN-01 input terminals directly)
7		
8		
9		Terminals 6 and 7 should be used as one group, and same for terminals 8 and 9 (see NOTE below).

Table 2-1: Terminal definition for LonTalk system



If 16-30V DC input is connected to one group for example terminals 6&7, Lonworks then is connected to the other terminals group which is 8&9. Or vice versa.

- LED indicator: Figure 2-2, sequence from top to bottom is Power LED, SP LED and service LED.
- Service pin locates at the right lower corner of Service LED.
- If power is on and LN-01 is not configured, LED status will be as follows: Power LED is steady green, SP LED is off (red or green) and service LED will blink in red LED at rate of 1/2 Hz.
- Configuring the LN-01 by using Lonwork integrated tool.
- After configuration, power LED, SP LED should be green and service LED should be OFF. If LED shows differently, refer to user manual chapter 5 for troubleshooting.

2.3 Wiring

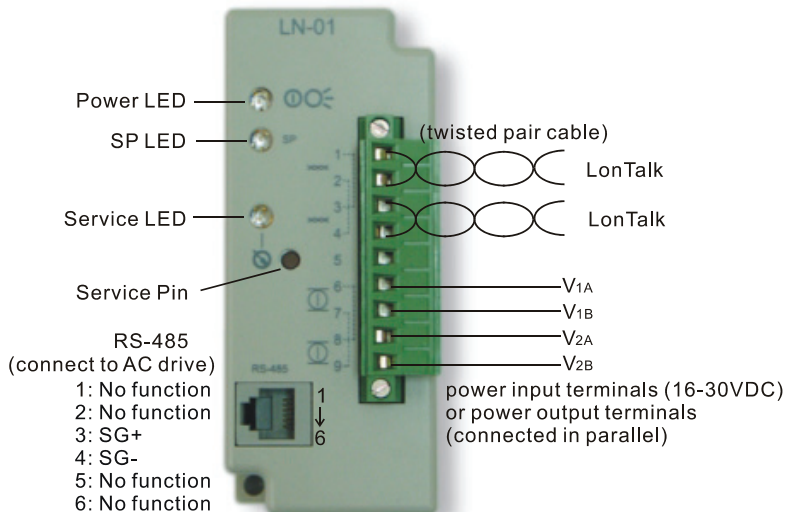


Figure 2-2

NOTE

Power input terminals/power output terminals (connected in parallel): If there is 16-30V DC input into one group (either V₁ or V₂), the other group then be used as power output terminals which are parallel connect to LonWorks device. Power input is polarity sensitive due to bridge rectification used inside.

2.4 Network Initialization of LN-01 Communication Interface

The LN-01 communication interface contains a Neuron chip with a unique address. LN-01 needs to be initialized to get ready for communication interface after hardware installation. Setting node address on the Lonworks network is determined either via installation tools or via network management tools during the installation. Neuron ID is a 48 bits number used to identify each Neuron chip. LN-01 will send the Neuron ID via service pin to be identified in the Lonworks network.

2.5 Service Pin

Bi-directional service pin is used to monitor the internal firmware status. As just mentioned above, LN-01 sends Neuron ID of Neuron chip to Lonworks via this pin. Before connecting to the LonWorks network via network tools, user needs to press the Service Pin (as shown in figure 2-2) to send the unique 48-bit neuron ID for LonWorks network identification. After successful configuration, LN-01 connects to the LonWorks network and the Service LED should be OFF. If Service LED is NOT OFF, it means that configuration is failed. Refer to chapter 5 Troubleshooting for details.

2.6 Text Device Interface File (.XIF)

This file contains the definition of each interface device. Through use of network tools, user is capable of knowing the device in the network.

File name "LN-01_xxx.XIF" is used by LN-01. This file, which saved in the disk, has topology of 78 Kbps. "xxx" in the file name describes the firmware version.

CHAPTER 3 NETWORK CONFIGURATION

3.1 Network Topology

The network structure that LN-01 adopts is free topology. In hardware, LN-01 uses FT3150 (transceiver) and FT-X1 (communication transformer). (FT3150 and FT-X1 are designed to be used in pair) The terminal block is insensitive polarity due to FT-X1 characteristics.

3.2 Specification

RS-485 communication is in ASCII format with protocol 9600, 7, N, 2
LON supports Free Topology, Bit rate 78kbps and 64 devices per channel.

3.3 Configuration

LN-01 will start its function in LonWorks network after configuring via LonWorks network integrated tool.

After configuring, power LED, SP LED should be green and service LED should be OFF. If LED shows differently, refer to chapter 5 troubleshooting for details.

3.4 Replace LN-01

When LN-01 is malfunction or can't configure to network during operation, you can replace by a new LN-01 and execute "Replace" command in LonWorks integrated environment to make new LN-01 work properly.

This page intentionally left blank

CHAPTER 4 USING NETWORK VARIABLES ON LN-01 COMMUNICATION INTERFACE

4.1 Standard Network Variable Type (SNVT) Table

Modifying network variables input (NVIs) through Lonwork integrated tool is also to send command to the AC drive. Network variables output is only used for the monitor of network integrated tool but cannot change status. Refer to following for details.

4.1.1 NVIs (network variables for inputting to Delta AC Drive)

Command	Variable Name	SNVT type	Field	Min. (OFF)	Max. (ON)	Resolution
STOP	nviSTOP	SNVT_switch	state	0	1	1
RESET	nviRESET	SNVT_switch	state	0	1	1
RUN	nviRUN	SNVT_switch	state	0	1	1
JOG	nviJOG	SNVT_switch	state	0	1	1
Forward/Reverse	nviFDRV	SNVT_switch	state	0	1	1
Freq. Command	nviFreqCmd	SNVT_flow_p	N/A	0	65534	0.01
Parameter Command	nviParaCmd	SNVT_preset	N/A	N/A	N/A	N/A

Table 4-1

nviSTOP:

When state=1, AC drive will stop.

nviRESET:

Should AC drive fails such as LV, OC happened, nviRESET is used to display if that fault has been cleared.

nviRUN:

When state=1, AC drive will run.

nviJOG:

When state=1, AC drive will jog.

nviFDRV:

When state=1, it changes AC drive running direction. For example, if AC drive is forward, it changes to reverse. Or vice versa.

nviFreqCmd:

Using frequency command to AC drive. Refer to the example below for details.

nviParaCmd:

Read/write AC drive parameters. Refer to the example below (4.3) for details. NVs output from Delta AC Drive.

4.1.2 NVOs (Network variables outputted to network integrated tool from the AC Drive)

Command	Variable Name	SNVT type	Min.	Max.	Resolution
Setting Frequency	nvoF	SNVT_freq_f	0	3.40282E38	N/A
Actual Frequency	nvoH	SNVT_freq_f	0	3.40282E38	N/A
User Define Unit	nvoU	SNVT_freq_f	0	3.40282E38	N/A
Output Current	nvoA	SNVT_freq_f	0	3.40282E38	N/A
Number of GROUP	nvoGROUP	SNVT_flow	0	65534	1
AC Drive Status	nvoErrCODE	SNVT_freq_f	0	3.40282E38	N/A

Table 4-2

nvoF:

Showing the AC drive frequency. NvoF will change to nviFreqCmd once nviFreqCmd is changed.

nvoH:

Showing the AC drive output frequency. nvoH=0 when drive stops. nvoH will increase gradually till nvoH=nvoF when drive runs.

nvoU:

Display user defined unit.

nvoA:

Display output current.

nvoGROUP:

Showing the parameters group number of AC drive. It varies based upon AC drive model type and firmware version.

nvoErrCODE:

Showing the AC drive status. If nvoErrCODE=0, means AC drive works properly. If nvoErrCODE is greater than 0, means AC drive is abnormal and nvoErrCODE displays the error code. Using VFD-S drive (version 2.50) as example, nvoErrCODE is 14 when fault LV occurs. Please refer to the AC drive user manual for troubleshooting and fault correction.

4.2 Functional Profile

The variable speed motor drive object is shown in the figure below:

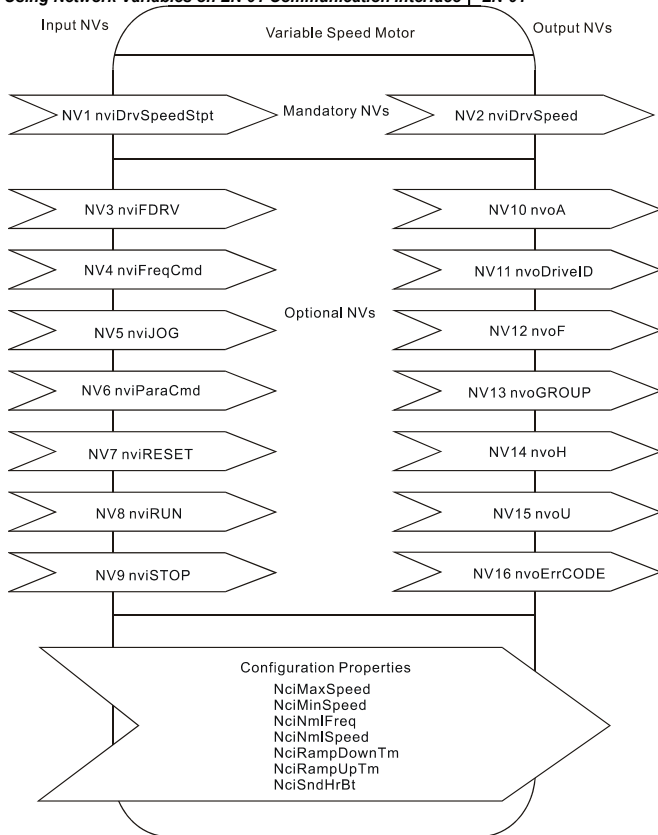


Figure 4-1

4.3 Using LN-01 to Communicate with the AC Drive

The AC drive, that is connected to LonWorks network, is now can be monitored via LN-01 after LN-01 is configured.

The AC drive parameters are now can be programmed via commands. Using the VFD-S series as examples, read/write the parameter of Run/Stop command and frequency command to the AC drive are shown below.

- ◆ Before connecting to LN-01, the AC drive should be set as table 4-3.

Delta AC drive	VFD-B	VFD-M	VFD-S	VFD-F
Baud rate 9600	P09-01=01	P-89=01	P09-01=01	P09-01=01
ASCII 7, N, 2	P09-04=00	P-92=00	P09-04=00	P09-04=00 P09-05=00
Source of Frequency Command	P02-00=04 or 05	P-00=04	P02-00=04 or 05	P02-00=04
Source of Operation Command	P02-01=03 or 04	P-01=03 or 04	P02-01=03 or 04	P02-01=03 or 04
Max. Output Freq.	P01-00=50~400	P-03=50~400	P01-00=50~400	P01-00=50~120

Table 4-3

4.4 Read/Write AC Drive Parameters

NviParaCmd is used to read/write AC Motor Drive parameters

LN_REPORT_VALUE (read parameters)

LN_RECALL (write parameters)

LN_LEARN_VALUE (no function)

LN_LEARN_CURRENT (no function)

LN_NUL (no function)

Example 1: write 400 to AC drive parameter 05-11

```
nviParaCmd.learn=LN_RECALL
```

```
nviParaCmd.selector=1291(decimal) *NOTE
```

```
nviParaCmd.value[0]=0 (Not used)
```

```
nviParaCmd.value[1]=0 (Not used)
```

```
nviParaCmd.value[2]=01 (High byte)
```

```
nviParaCmd.value[3]=90 (Low byte)
```

```
nviParaCmd.day=0
```

```
nviParaCmd.hour=0
```

```
nviParaCmd.minute=0
```

```
nviParaCmd.second=0
nviParaCmd.millisecond=0
```



Conversion is needed due to a different system numbers are used between nviParaCmd.selector and AC drive (nviParaCmd.selector uses decimal and AC drive parameters uses hexadecimal). Example of writing decimal 400 to parameter 05-11 of AC drive is illustrated below.

Step 1:

Convert 400 (decimal) to 0x0190 (hexadecimal) first, and fill in the high byte nviParaCmd.value[2] with 0x01 and low byte nviParaCmd.value[3] with 0x90.

Step 2:

Convert the parameter 05-11 value 0x050B in hexadecimal, to decimal 1291 and then

```
nviParaCmd.selector=1291
```

```
nviParaCmd.value[2]=01
```

```
nviParaCmd.value[3]=90
```

Now decimal 400 can be written into AC drive parameter 05-11.

	Parameter	Settings
Delta AC Drive	05.11	400
After conversion	0x050B (hex) 1291 (decimal)	0x0190 (hex)
LN-01 NVs	nviParaCmd=1291	nviParaCmd.value[2]=01 nviParaCmd.value[3]=90

Table 4-4

Example 2: read parameter 02-02 of AC drive

```
nviParaCmd.learn=LN_REPORT_VALUE
nviParaCmd.selector=514(decimal) * NOTE
nviParaCmd.value[0]=0 (Not used)
nviParaCmd.value[1]=0 (Not used)
nviParaCmd.value[2]=0 (Not used)
nviParaCmd.value[3]=1
nviParaCmd.day=0
nviParaCmd.hour=0
```

```
nviParaCmd.minute=0
nviParaCmd.second=0
nviParaCmd.millisecond=0
```

**NOTE**

Again, conversion is needed due to different system numbers are used between `nviParaCmd.selector` and the AC drive (`nviParaCmd.selector` is in decimal and AC drive parameters are in hexadecimal). Example below illustrates read AC drive parameter 02-02.

Step 1:

Parameter 02-02 is 0x0202 (hexadecimal).

Step 2:

Convert 0x0202 (hexadecimal) to 514 (decimal). Then set `nviParaCmd.selector=514` to read AC drive parameter 02-02.

	Parameter	Settings
Delta AC Drive	02.02	N/A
After conversion	0x0202 (hex) 514 (decimal)	N/A
LN-01 NVs	<code>nviParaCmd=514</code>	<code>nviParaCmd.value[2]=00</code> <code>nviParaCmd.value[3]=01</code>

Table 4-5

4.5 Run/Stop Command

`nviRUN.state=1`, AC drive runs

`nviSTOP.state=1`, AC drive stops

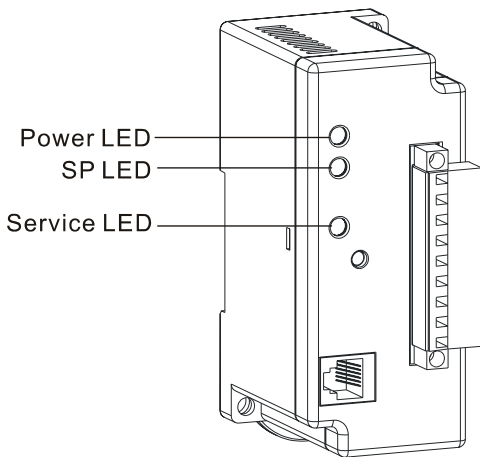
Functions above are valid only when the operation command source is set to RS-485 first.

4.6 Sending Frequency Command to the AC Drive

Function above is valid if the operation command source and frequency command source are set to RS-485 first. Take VFD-S AC drive for example, if you want to set frequency to greater than 60.00 Hz, the Max output frequency shall be set to greater than 60.00Hz first (refer to Table 4-3 to set Max. output frequency). If user wants to set frequency to 75.40Hz (nviFreqCmd=75.40), it should set Max output frequency in Table 4-3 to 75.40Hz first.

CHAPTER 5 TROUBLESHOOTING

There are three LEDs in front panel of LN-01. If the communication is normal, power LED, SP LED should be green (red LED means abnormal communication) and service LED should be OFF. If LEDs display do not match, refer to the below for details.



5.1 Power LED

State	Description	Corrective Actions
Green LED	Power is on and LN-01 works.	
LED is OFF	Power on or program is abnormal	<ol style="list-style-type: none">1. Check if power is 24V or plug is loose.2. Check if flash memory IC is well-inserted to the socket.

5.2 SP LED

State	Description	Corrective Actions
Green LED	It communicates to AC drive	
Blinked Green LED	LN-01 reads default setting from AC drive	
Red LED	Disconnect or time-out	<ol style="list-style-type: none"> 1. Check if cable is loose. 2. Check if the communication protocol is properly set.

5.3 Service LED

State	Description	Corrective Actions
LED blinks at 1/2 Hz rate	This is the normal situation for an un-configured device	
LED is OFF	Bad hardware device	Check if anything wrong with power supply, clock or Neuron chip.
LED is ON continuously, even when power is first applied to the device.	Bad hardware device	<p>Check if anything wrong with power supply, clock or Neuron chip.</p> <p>Check if there is a short circuit between pin 17 and 18.</p>
LED blinks at power-up, goes OFF, then ON solid.	This is the normal situation for an application-less device.	If the device is not an application-less, then it could be memory problems or application code errors. A self-test failure can also turn the LED ON solid.