ABB Drives

Installation and Start-up Guide

LONWORKS® Adapter Module NLON-01

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NLON-01

Installation and Start-up Guide

3BFE 64203126 R0125 REV A
EN
EFFECTIVE: 01.02.2000
SUPERSEDES: 10.05.1999

Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the NLON-01 LONWORKS® Adapter Module. The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

Warnings

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:

Dangerous Voltage Warning: warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.

General Warning: warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.

Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Notes

Readers are notified of the need for special attention or additional information available on the subject with the following symbols:

CAUTION! **Caution** aims to draw special attention to a particular issue.

Note: **Note** gives additional information or points out more information available on the subject.

General Safety Instructions

WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians.

The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when working with the unit. Neglecting these instructions can cause physical injury and death.

WARNING! There are several automatic reset functions in the drive. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not compatible with this kind of operation, or dangerous situations can be caused by such action.

More Warnings and Notes are printed at appropriate instances along the text.

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Chapter 1 – Introduction to This Guide

Overview

This chapter contains a description of the *Installation and Start-up Guide* for the NLON-01 LONWORKS® Adapter Module.

Intended Audience

The Guide is intended for the people who are responsible for installing, commissioning and using a LONWORKS® Adapter Module with an ABB drive. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices, the drive, the use of the drive control panel, and the LONWORKS® protocol family.

What This Guide Contains

The installation and start-up of the NLON-01 LONWORKS® Adapter Module are introduced in this Guide.

It is assumed that the drive is installed and ready to operate before starting the installation of the adapter module. For more information on the installation and start-up procedures of the drive, please refer to its user documentation.

Safety Instructions are featured in the first few pages of this Guide. Safety Instructions describe the formats for various warnings and notations used within this Guide. This chapter also states the safety instructions which apply to the installation and operation of the NLON-01 Module.

Chapter 2 – Overview contains a short description of LONWORKS® networks and the NLON-01, a delivery checklist, and information on the manufacturer's warranty.

Chapter 3 – Mechanical Installation contains placing and mounting instructions for the module.

Chapter 4 – Electrical Installation contains wiring, bus termination and earthing instructions.

Chapter 5 – Programming explains how to program the master station and the drive before the communication through the adapter module can be started.

Chapter 6 – Communication contains a description of how data is transmitted through the NLON-01 and information about resource files.

Chapter 7 – Fault Tracing explains how to trace faults with the Status LEDs on the NLON-01.

Appendix A presents the network variable list of the NLON-01.

Appendix B contains Technical Data.

Appendix C contains a specification of the ambient conditions allowed during transportation, storage and use of the NLON-01.

Terms and Abbreviations

Communication Module	Communication Module is a parameter name/parameter selection name for a device (e.g. a fieldbus adapter) through which the drive is connected to an external serial communication network (e.g. a fieldbus). The communication with the communication module is activated with a drive parameter.
Data Sets and Data Words	Data sets are clusters of data sent through the DDCS link between the NLON-01 Adapter Module and the drive. Each data set consists of three 16-bit words, ie. data words. The Control Word (sometimes called the Command Word) and the Status Word, References and Actual Values (see *Chapter 6)* are types of data words; the contents of some data words are user-definable.
Functional Profile	Functional profiles may contain one or more objects that interact to perform the required profile defined operability. The Variable Speed Motor Drive Profile contains the general LONMARK® Node Object and the application specific Variable Speed Motor Drive Object.
LONMARK®	Products that conform to LONMARK® Interoperability Guidelines, defined by the LONMARK® Interoperability Association, are eligible to carry the LONMARK® logo.
LonTalk®	The communication protocol in LONWORKS® networks.
nci	Configuration property.
Neuron® ID	Every LONWORKS® device or – as synonym – node must have a unique ID. This is called the Neuron® ID. This ID is, on Neuron® Chip-based nodes, stored in the chip itself and cannot be changed.
NLON-01 LONWORKS® Adapter Module	The NLON-01 Adapter Module is one of the optional fieldbus adapter modules available for ABB drives. The NLON-01 is a device through which the drive is connected to a LONWORKS® network.
nv	Network variable.
nvi	Input network variable.
nvo	Output network variable.
Object	Object is a set of one or more network variables implemented as SNVTs with semantic definitions relating the behaviour of the object to the network variable values, in addition to a set of configuration properties. For example, the Variable Speed Motor Drive Object and the Node Object represent two types of objects.
Parameter	A parameter is an operating instruction for the drive. Parameters can be read and programmed with the drive control panel, or through the NLON-01 Module.

Service Pin The Service Pin is used in installing the node. Pressing the Service Pin causes the LONWORKS® node to send the so-called Service Pin Message which includes, among other things, the Neuron® ID. This informs the network or installation tool about the node.

SNVT Standard Network Variable Type.

Further Information

Further information is available on the WWW from **www.lonmark.org** and **www.echelon.com**.

Chapter 2 – Overview

Overview

This chapter contains a short description of the LONWORKS® system and the NLON-01 Adapter Module, a delivery checklist, and warranty information.

The LONWORKS® System

The LONWORKS® system is an open serial communication solution that enables data exchange between all kinds of automation components.

A LONWORKS® network consists of intelligent devices, called nodes, connected by one or more communications media that communicate with one another using the LonTalk® protocol. Nodes are programmed to send messages to one another in response to external events or messages they receive. Each intelligent device, for example a programmable thermostat in a building control system, is a LONWORKS® node. A node is connected to other nodes with appropriate communications media, such as twisted pair cable, RF link, or power line circuit.

LONWORKS® nodes are objects that respond to various inputs and that produce desired outputs. Connecting the inputs and outputs of these network objects enables the network to perform specific tasks.

While the function of any particular node may be quite simple, the interaction among nodes enables a LONWORKS® network to perform complex tasks. A benefit of LONWORKS® networks is that a small number of common node types may perform a broad spectrum of different functions depending on how they are configured and connected.

The NLON-01 LONWORKS® Adapter Module

The NLON-01 LONWORKS® Adapter Module is an optional device for ABB drives which enables the connection of the drive to a LONWORKS® network. Through the NLON-01 LONWORKS® Adapter Module it is possible to:

- Give control commands to the drive (Start, Stop, Run enable, etc.)
- Feed a motor speed or torque reference to the drive
- Give a process actual value or a process reference to the PID controller of the drive
- Read status information and actual values from the drive
- Change drive parameter values
- Reset a drive fault
- Control other LONWORKS® nodes.

The network variables and functions supported by the NLON-01 LONWORKS® Adapter Module are discussed in Chapters 5 and 6.

The adapter module is mounted onto a standard mounting rail inside or outside the drive unit, depending on drive type and configuration. See the user's manual of the drive for module placement options.

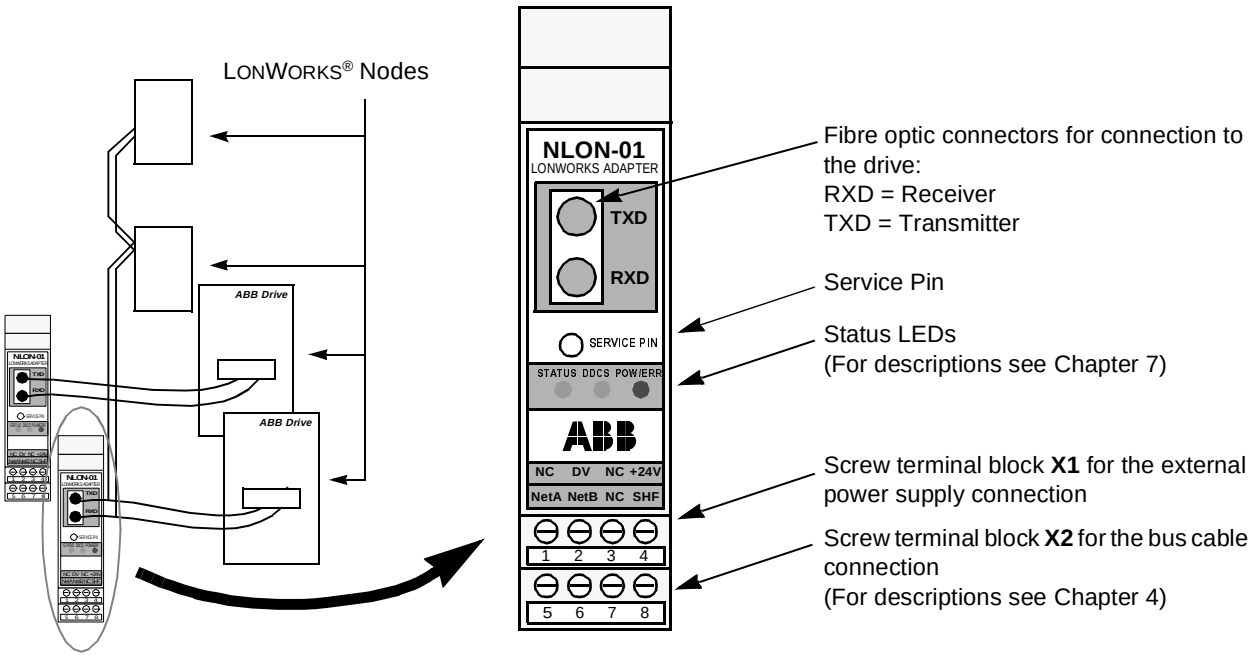


Figure 2-1 The construction of the LONWORKS® network and the face of the NLON-01 Adapter Module.

Compatibility The NLON-01 is compatible with:

- ACS 400
- ACS 600 with Standard Application Program
- ACS 600 with Pump and Fan Control (PFC) Application Program.

Delivery Check The option package for the NLON-01 LONWORKS® Adapter Module contains:

- LONWORKS® Adapter Module, Type NLON-01
- Two pairs (four pieces) of fibre optic cables for connecting the adapter to the drive
- Mounting rail
- This manual, the *NLON-01 Installation and Start-up Guide*.

Warranty and Liability Information

The warranty for your ABB drive and options covers manufacturing defects. The manufacturer carries no responsibility for damage due to transport or unpacking.

In no event and under no circumstances shall the manufacturer be liable for damages and failures due to misuse, abuse, improper installation, or abnormal conditions of temperature, dust, or corrosives, or failures due to operation above rated capacities. Nor shall the manufacturer ever be liable for consequential and incidental damages.

The period of manufacturer's warranty is 12 months, and not more than 18 months, from the date of delivery. Extended warranty may be available with certified start-up. Contact your local distributor for details.

Your local ABB Drives company or distributor may have a different warranty period, which is specified in their sales terms, conditions, and warranty terms.

If you have any questions concerning your ABB drive, contact your local distributor or ABB Drives office.

The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations.

Chapter 3 – Mechanical Installation

Overview

This chapter contains module mounting instructions. Depending on the drive, the module can be installed either inside or outside the drive housing or cabinet. See the user's manual of the drive for module placement options.

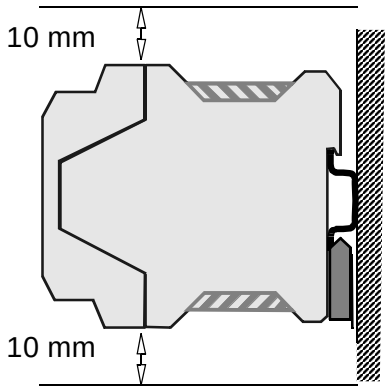
Mounting Outside the Drive

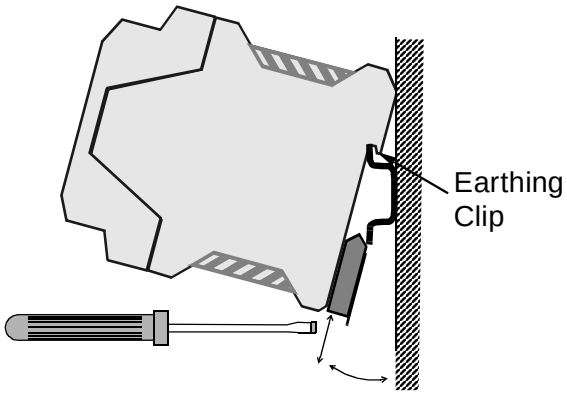
Choose the location for the module. Note the following:

- The cabling instructions in Chapter 4 must be followed.
- The ambient conditions should be taken into account (see Appendix C). The degree of protection of the module is IP 20.
- Observe the free space requirements for the module (see the figure below) and the drive (see the drive documentation).
- Module earth is connected to the mounting rail by means of an earthing clip (see the figure below). The mounting rail onto which the option module is to be mounted must be earthed to a noiseless earth. If the rail is not mounted on a properly earthed base, a separate earthing conductor must be used. The conductor must be as short as possible and its cross-sectional area must be 6 mm^2 at least. ***Note:*** No solid copper conductor may be used (stranded wire allowed only).

Mounting instructions:

1. Switch off all dangerous voltages in the enclosure that the module is to be mounted in.
2. Fasten the rail and ensure the proper earthing as described above.
3. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see below).





Mounting Inside the Drive

The work inside the drive should be carried out by a qualified electrician only.

WARNING! Pay attention to the slowly discharging voltage of the capacitor bank and the voltages that are connected from external control circuits to the inputs and outputs of the drive.

WARNING! Do not touch the printed circuit boards. The integrated circuits are extremely sensitive to electrostatic discharge.

Mounting instructions:

1. Stop the drive.
2. Switch off the power supply of the drive and all dangerous voltages connected to the inputs and outputs.
3. Wait for five minutes to ensure that the capacitors in the intermediate circuit have discharged.
4. Remove the front cover of the drive.
5. Ensure that the mains cable, motor cable and capacitor bank (UDC+ and UDC–) are not powered.
6. Locate the position for the module (see the drive documentation). Fasten the mounting rail to its place if not already installed. Observe the free space requirements for the module (see the figure above).
7. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see the figure above).

Chapter 4 – Electrical Installation

Overview

This chapter contains:

- Cabling instructions
- Instructions for bus termination
- Connection and earthing instructions for the NLON-01 Module and earthing instructions for the bus cable.

WARNING! Before installation, switch off the drive power supply. Wait for five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

Cabling

Arrange the bus cables as far away from the motor cables as possible. Avoid parallel runs. Use bushings at cable entries.

Handle the fibre optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibres with bare hands as the fibre is extremely sensitive to dirt.

The maximum long term tensile load for the fibre optic cable is 1 N. The minimum short term bend radius is 25 mm.

Note: LONWORKS® networks require special cable. It is recommended to use cables defined by LONMARK® Layer 1 – 6 Guidelines. See Appendix B.

Bus Termination

The built-in terminating resistors must be switched on if the NLON-01 module is installed at the end of the bus. Otherwise the resistors must be switched off. Terminating resistors prevent signal reflections from the bus cable ends.

The termination switch is located in the NLON-01 module. The switch has three selections, described in the following table.

SW1 Termination Switch	
BUS	Bus topology, 105 Ω termination at both ends of the line
NC	No termination
FREE	Free topology, 52.5 Ω termination at one of the nodes in one bus segment

The module has to be opened in order to change the selection of the bus termination switch. Follow the instructions given in Figure 4-1.

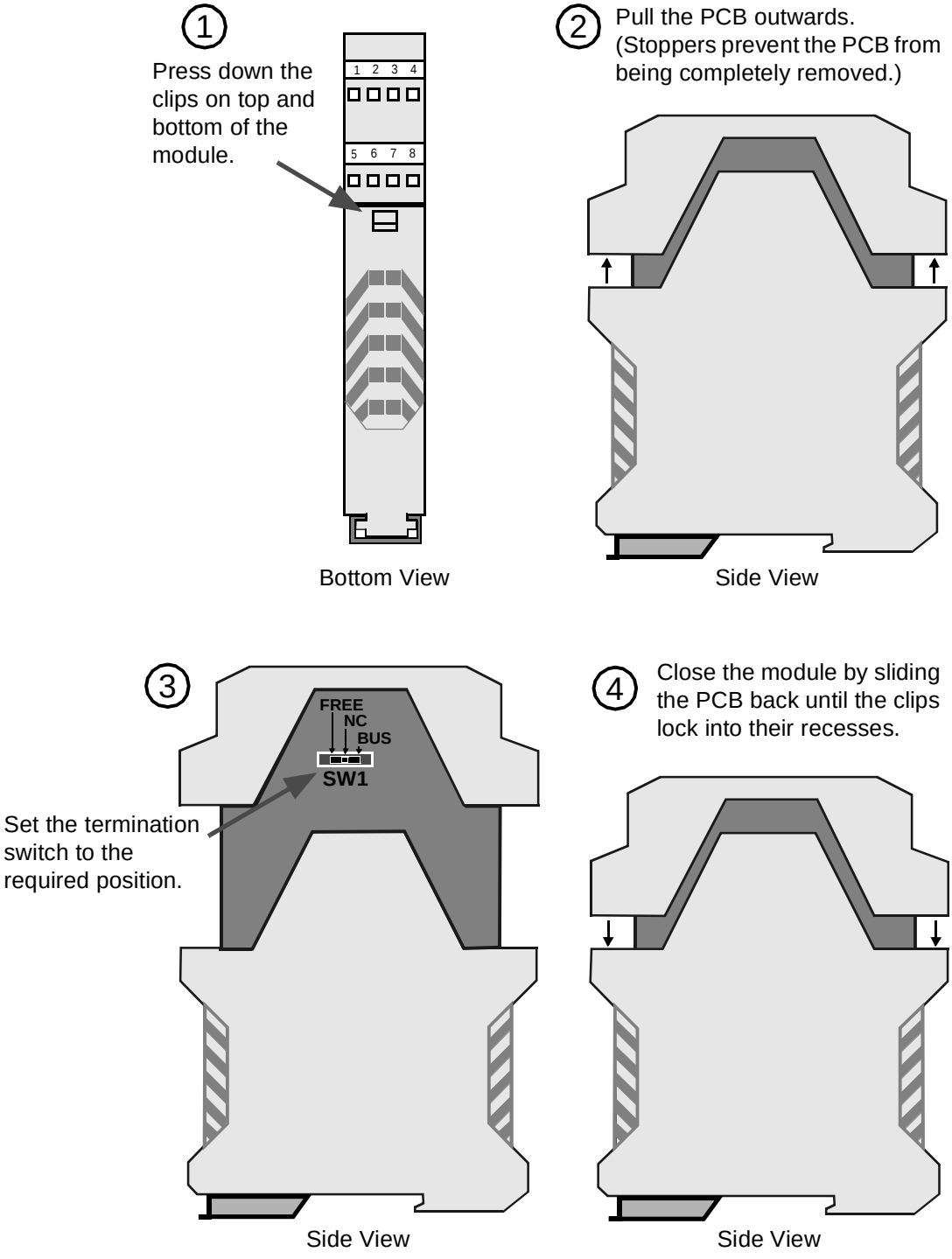


Figure 4-1 Changing the termination setting.

NLON-01 Connections

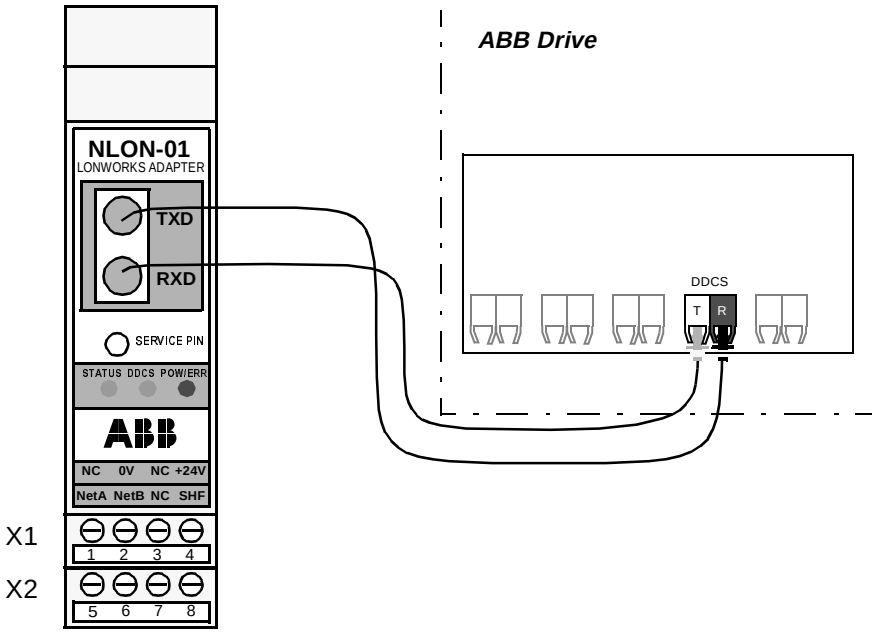


Figure 4-2 Fibre optic link connecting the NLON-01 adapter to the drive.

The NLON-01 module is connected to the drive using a fibre optic cable link. Consult the drive documentation as to the corresponding terminals inside the drive.

The bus cable and the external power supply are connected to terminal blocks X1 and X2 on the NLON-01.

Table 4-1 Description of terminal blocks X1 and X2.

X1		Description
1	NC	not used
2	0 V	Ground
3	NC	not used
4	+24 V	Power supply for the module (24 V d.c. ± 10 %)

X2		Description
5	Net A	Network cable connection
6	Net B	
7	NC	not used
8	SHF	Cable screen AC earthing (via an RC filter)

Earthing

The NLON-01 module earth is connected to the rail onto which the module is mounted. If the rail is fastened to an earthed metallic assembly plate, the module is automatically earthed, and no external earthing wire is needed. If the rail is fastened to a base that is not earthed, the rail must be connected to the nearest earthing terminal. However, the earthing wire should not be connected to the same terminal as the power cable screens. (See the mounting instructions in Chapter 3.)

The NLON-01 has a built-in earthing terminal **SHF** which is internally connected to the NLON-01 module earth via an RC filter. The SHF terminal is typically used for earthing the LONWORKS® cable screen.

Earthing the LONWORKS® Cable Screens

The LONWORKS® cable screen may be directly earthed at one station only. At other stations the screen should be earthed via an RC filter.

The figures below provide wiring examples for bus and free topologies.

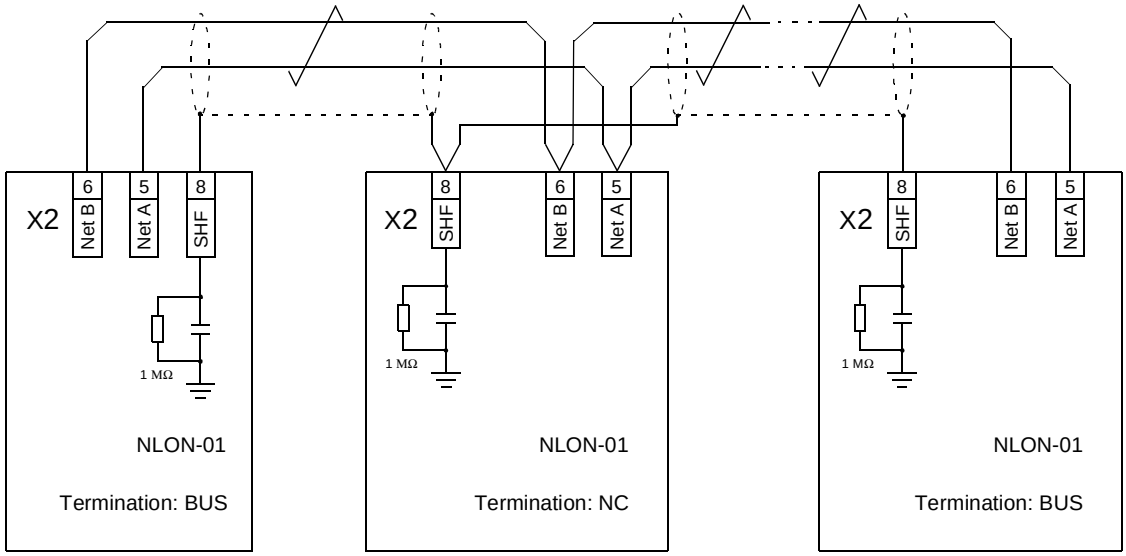
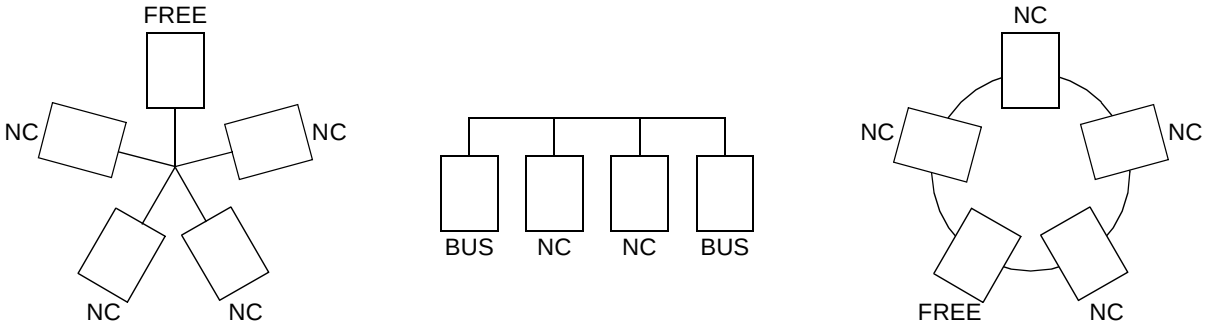


Figure 4-3 Network cable connection (bus topology).



a) Star topology b) Bus topology c) Ring topology

Figure 4-4 Bus termination for different network topologies.

Chapter 5 – Programming

Overview

This chapter gives information on configuring the drive for operation with the LONWORKS® Adapter Module.

Configuring the System

After the NLON-01 LONWORKS® Adapter Module has been mechanically and electrically installed according to the instructions in Chapters 3 and 4, the LONWORKS® network and the drive must be prepared for communication and operation with the module.

The NLON-01 cannot communicate with the drive before it is configured for the LONWORKS® network. The LONWORKS® communication configuration does not require parametrisation of the drive. The LONWORKS® network is configured using a network installation tool. Please refer to the installation tool documentation for network configuration and to Chapter 6 for the resource files.

Configuring the Drive

It is preferable to configure the drive before the NLON-01 is configured for the network. The reason for this is that the NLON-01 reads several parameter values from the drive in order to operate correctly and in order to select different modes. Furthermore, some of the configuration network variable values receive their defaults from the drive. The drive control location parameters should also be set accordingly to enable full and logical operation of the NLON-01.

The following table lists the drive parameters utilised by the NLON-01. The preferable settings and their functions are also covered.

Table 5-1 The drive parameters utilised by the NLON-01.

Parameter	**ACS 400**	**ACS 600 Standard V3.0**	**ACS 600 Standard V5.x or PFC**	**Function**
99.02 APPLICATION MACRO*	Set to PID if corresponding network variables are to be used	Set to PID if corresponding network variables are to be used	Set to PID if corresponding network variables are to be used	Enables the updates of nciPidGain, nciPidTime and nciPidDerTime
99.04 MOTOR CTRL MODE	N/A	Motor control mode	Motor control mode	Initialises NLON-01 operation mode
99.07 MOTOR NOM FREQ*	Motor nominal frequency	Motor nominal frequency	Motor nominal frequency	Initialises the nciNmlFreq value
99.08 MOTOR NOM SPEED*	Motor nominal speed	Motor nominal speed	Motor nominal speed	Initialises the nciNmlSpeed value
10.01 EXT1 STRT/ STP/DIR	COMM MODULE	COMM MODULE	COMM MODULE	Enables NLON-01 control
10.02 EXT2 STRT/ STP/DIR	COMM MODULE	COMM MODULE	COMM MODULE	Enables NLON-01 control
10.03 DIRECTION	REQUEST	REQUEST	REQUEST	If direction change is required
11.02 EXT1/EXT2 SELECT	COMM MODULE	COMM MODULE	COMM MODULE	Enables the use of nciExt1Ext2Sel which selects between nviSpeedStpt and nviRefStpt.
11.03 EXT REF1 SELECT	COMM MODULE	COMM MODULE	COMM MODULE	Enables NLON-01 reference
11.05 EXT REF1 MAXIMUM	Set to motor nominal frequency	Set to motor nominal speed or frequency if scalar control is used	Set to motor nominal speed or frequency if scalar control is used	This value corresponds to nviSpeedStpt value 100% (of nominal speed or frequency)
11.06 EXT REF2 SELECT	COMM MODULE	COMM MODULE	COMM MODULE	Enables NLON-01 reference
11.08 EXT REF2 MAXIMUM	100%	100%	100%	**This value corresponds to nviRefStpt value 100%
15.01 ANALOGUE OUTPUT1	N/A	SPEED in DTC mode, FREQ in scalar mode	N/A	Determines correct speed feedback in nvoDrvSpeed and nvoDrcSpeedActRpm
92.02 D SET 2 VAL 2	N/A	N/A	102 in DTC mode (PFC: 101) 103 in scalar mode (PFC: 102)	Determines correct speed feedback in nvoDrvSpeed and nvoDrcSpeedActRpm
16.01 RUN ENABLE	COMM MODULE	COMM MODULE	COMM MODULE	Run enable from NLON-01
16.04 FAULT RESET SEL	COMM MODULE	COMM MODULE	COMM MODULE	Enables NLON-01 fault reset
16.05 PANEL LOCK*	Local mode block	N/A	N/A	Initialises nciPanelLock value
16.06 PANEL LOCK*	N/A	Local mode block	Local mode block	Initialises nciPanelLock value
20.01 MINIMUM SPEED*	N/A	N/A in scalar mode	N/A in scalar mode ***	Initialises nciMinSpeed value

Parameter	ACS 400	ACS 600 Standard V3.0	ACS 600 Standard V5.x or PFC	Function
20.02 MAXIMUM SPEED*	N/A	N/A in scalar mode	N/A in scalar mode ***	Initialises nciMaxSpeed value
20.07 MINIMUM FREQ*	Minimum frequency value	N/A in DTC mode	N/A in DTC mode ***	Initialises nciMinSpeed value
20.08 MAXIMUM FREQ*	Maximum frequency value	N/A in DTC mode	N/A in DTC mode ***	Initialises nciMinSpeed value
40.01 (80.01 with PFC) PID GAIN*	PID gain	PID gain	PID gain	Initialises nciPidGain value
40.02 (80.02 with PFC) PID INTEG TIME*	PID integration time	PID integration time	PID integration time	Initialises nciPidTime value
40.03 (N/A with PFC) PID DERIV TIME*	PID derivation time	PID derivation time	PID derivation time	Initialises nciPidDerTime value
90.01 D SET 3 VAL 1	N/A	N/A	1001-8999	See drive documentation
90.02 D SET 3 VAL 2	N/A	N/A	1001-8999	See drive documentation
90.03 D SET 3 VAL 3	N/A	N/A	1001-8999	See drive documentation
92.04 D SET 4 VAL 1	N/A	N/A	101-9999	See drive documentation
92.05 D SET 4 VAL 2	N/A	N/A	101-9999	See drive documentation
92.06 D SET 4 VAL 3	N/A	N/A	101-9999	See drive documentation

*If one of the drive parameter values marked with * not using the corresponding configuration network variable is changed, the NLON-01 needs to be re-initialised in order to update the value to it. For example, if the panel lock parameter is changed with the control panel, the NLON-01 needs to be either rebooted or temporarily disabled for the NLON-01 to read the updated value from the drive. The same applies if one of the marked parameters using the dataset input nvi or the nciParValue configuration parameter is changed.

**In ACS600 in Torque control, nviRefStpt value of 50% corresponds to 100% in this parameter.

***With PFC, minimum and maximum frequency settings are always used.

Table 5-2 The NLON-01 information parameters.

Fieldbus Par. No.	Parameter Name	Settings
1	MODULE TYPE	NLON V1.x
2	LOCATION LABEL	nciLocation value
3	NEURON CHIP ID	The ID of the Neuron® Chip
4	MODULE STATE	**(0)** OFF-LINE; **(1)** ON-LINE; **(2)** UNCONFIGURED; **(3)** CONFIGURED

Note: These parameters become visible in the drive only after the NLON-01 has been configured on the network side.

MODULE TYPE This parameter shows the module type as detected by the drive. The value cannot be adjusted by the user. (If this parameter is undefined, the communication between the drive and the module has not been established.)

LOCATION LABEL The location label parameter displays the nciLocation configuration parameter value truncated to 12 characters. This value can only be changed via the network by writing to nciLocation. In ACS 400 the text is not displayed.

NEURON CHIP ID This parameter displays the modules Neuron® chip's ID in hexadecimal format. This is determined by the chip and cannot be changed. In ACS 400 the value is not displayed.

MODULE STATE This parameter indicates the state of the NLON-01.

OFF-LINE
The NLON-01 has been changed to off-line state. In this state the NLON-01 is not operational.

ON-LINE
This state is normally not displayed. However when the module state of the NLON-01 is UNCONFIGURED or CONFIGURED it is at the same time also in ON-LINE state.

UNCONFIGURED
The NLON-01 is on-line but has not been installed to the network.

CONFIGURED
The NLON-01 is installed and ready for operation.

Chapter 6 – Communication

Overview

This chapter describes the NLON-01 operation on a LONWORKS® network.

General

In LONWORKS® networks, the network design emphasis is on designing the network variable connections. The connection design determines the amount of data flow between different nodes, thus determining the decision of transmission media and network topology overall in the network.

In designing the connections, the selection of protocol services is also crucial when determining the network data flow. By default, the network connections use acknowledged messaging with a certain retry count. These can however be changed by the installation tool to optimise the overall network performance.

To be able to realise the required operation of the whole system, a clear picture of the capabilities of individual nodes is needed. These capabilities are determined by the network variables.

NLON-01 Object Diagram

The NLON-01 realises the LONMARK® Functional Profile: Variable Speed Motor Drive Version 1.0. The profile defines a set of network variables and configuration properties. In addition, the NLON-01 has a set of manufacturer defined network variables and configuration properties that are defined in order to realise functions only applicable for ABB Drives.

Note: As the following diagram shows, some of the network variables are not existing for all of the drive types.

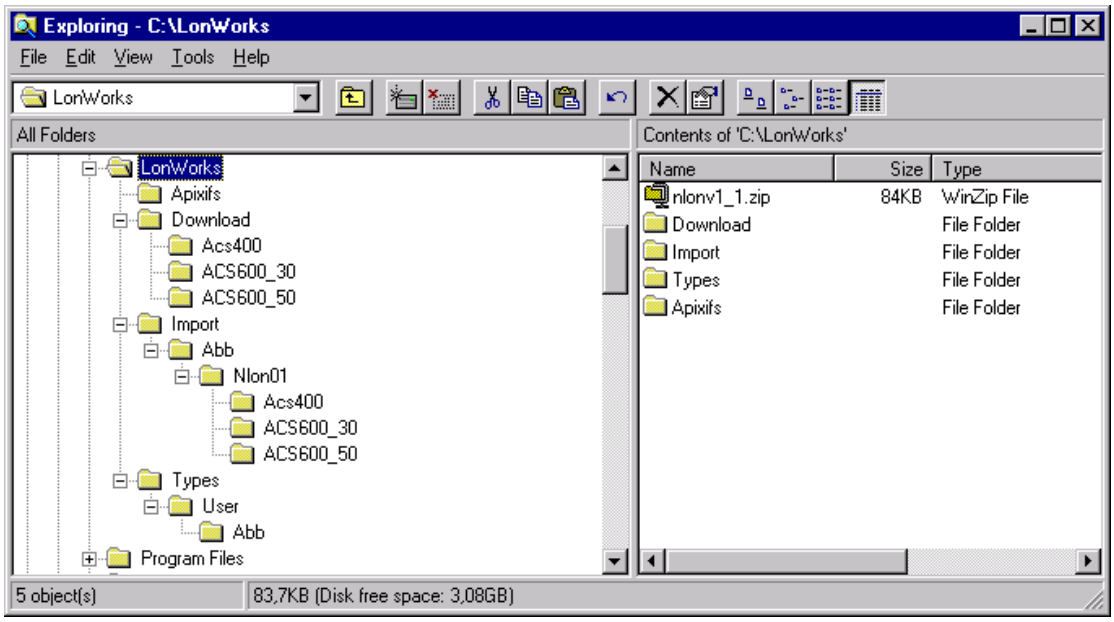
Figure 6-1 The NLON-01 object diagram.

NLON-01 Network Variables A detailed description of all the NLON-01 network variables and configuration properties is given in Appendix A.

Resource Files

For the installation of the NLON-01 with different installation tools, different resource files are needed. If you have not received these files together with the NLON-01 please consult your local ABB representative.

The files provided include resource files for both API-based and LNS-based tools. The downloadable application is also provided for different drive types and applications. The resource files are delivered as a compressed (*.ZIP) file. Copy the ZIP file to your LonWorks directory and unpack the compressed files. The following directory structure is created:



The directory
<LONWORKSDIR>\TYPES\USER\ABB
holds the user type and enumeration file (ABB.TYP), the user type formatting file (ABB.FMT), the functional profile template file (ABB.FPT) and the language file (ABB.ENG).

The directories
<LONWORKSDIR>\IMPORT\ABB\NLON01\ACS600_50
<LONWORKSDIR>\IMPORT\ABB\NLON01\ACS600_30
<LONWORKSDIR>\IMPORT\ABB\NLON01\ACS400
hold the external interface files (*.XIF) and their binary versions (*.XFB) for LNS-based tools.

The directory
<LONWORKSDIR>\APIXIFS
holds the external interface files (*.XIF) for API-based tools.

Downloadable Applications

The NLON-01 is delivered with an application for ACS 600 drives with the Standard Application Program 5.x. The module will not work with another type of drive or application until the corresponding application is loaded to it.

The directories
\DOWNLOAD\ACS600_50
\DOWNLOAD\ACS600_30
\DOWNLOAD\ACS400
contain the downloadable application files (*.NXE, for binary versions *.APB). The way the application is loaded to the NLON-01 depends on the configuration tool used.

Note: The NLON-01 will go to an off-line state (with the POW/ERR LED flashing) if it is connected to an incompatible drive.

Chapter 7 – Fault Tracing

Overview

This chapter describes the functions and indications of the Status LEDs on the NLON-01 LONWORKS® Adapter Module to help solving problems that may arise.

Power-up Errors

The normal power-up procedure is as follows:

- All LEDs are turned on for the duration of the RAM/ROM test. If the test is passed, all LEDs will be turned off.
- The *DDCS* LED will light as the DDCS link between the NLON-01 and the drive is initialised. After initialisation, the *DDCS* LED will remain on.
- All LEDs are lit: LONWORKS® communication and DDCS communication (between NLON-01 and drive) OK.

If the *DDCS* LED flashes or goes out during operation, there are errors on the DDCS link between the module and the drive. If errors occur, check the fibre cables visually for dirt or flaws. Ensure that all connectors are properly inserted. If these measures do not rectify the problem, try new cables. If errors still occur, contact an ABB service representative.

As parameters are copied from the NLON-01 to the drive during the activation of the module, you can generally observe the functioning of the link by checking the Communication Module Parameters of the drive.

Status LEDs

There are three status LEDs on the NLON-01 Module, labelled *STATUS*, *DDCS* and *POW/ERR*.

STATUS

Status LED indications:

State	LED (Green)
Applicationless and unconfigured	ON
Unconfigured but with an application	Flashing (0.5 Hz)
Configured, OFF-line	OFF
Configured	OFF

DDCS DDCS LED indications:

State	LED (Green)
Initialising DDCS	Flashing (10 Hz)
*Service message exchange active	Flashing (2 Hz)
Cyclic data exchange active	ON
No Activity / Configured OFF-line	OFF

*If cyclic data exchange and service message exchange are active at the same time, the LED is ON.

POW/ERR Power / Error LED indications:

State	LED (Green/Red)
Power ON, no errors	Green
Hardware failure	Red
DDCS initialisation error, drive not supported	Red, flashing (1 Hz)
LON communication timeout. See nciRcvHrtBt (Receive Heartbeat) function in Appendix A.	Red, flashing (2 Hz)

Appendix A – List of Network Variables

Input Network Variables (nvi's)

Node Object Request `network input SNVT_obj_request nviObjRequest;`

This input is used to enable control commands and updates to and from network (RQ_ENABLE, RQ_DISABLE) and in parallel to reset faults of the drive (RQ_CLEAR_ALARM). RQ_DISABLE stops the drive with the selected stop mode and disables node operation. In addition requests RQ_NORMAL, RQ_CLEAR_STATUS, RQ_UPDATE_STATUS and RQ_REPORT_MASK are supported.

Drive Speed Setpoint `network input SNVT_switch nviDrvSpeedStpt;`

This input network variable provides a low resolution speed setpoint. It may also be used to receive heartbeat. This nv is to be used when control location EXT1 is chosen with nciExt1Ext2Sel.

Valid Range

State	Value	Equivalent Percent Value	Requested Speed
0	N/A	N/A	STOPPED
1	0	0%	0%
1	1 to 200	0.5 to 100.0%	0.5 to 100.0%
1	201 to 255	100.0%	100.0%
0xFF	N/A	N/A	AUTO (Invalid)

Default Value The default value is AUTO (state = 0xFF). This value will be adopted at power-up. This network variable input uses the Receive Heartbeat function. The value of actual speed setpoint depends on nviSpdScl and nciDrvSpdScl.

Scaling This reference value is moved to dataset 1 index REF1. The value of parameter 11.05 EXT REF1 MAX defines the speed reference value used with value 100% to 20000. Set 11.05 to motor nominal speed to enable scaling according to the Drive Profile.

Drive Reference Setpoint `network input SNVT_switch nviRefStpt;`

This input network variable provides a low resolution reference setpoint. It may also be used to receive heartbeat. This nv is used when control location EXT2 is chosen.

Valid Range

State	Value	Equivalent Percent Value	Requested Reference
0	N/A	N/A	STOPPED
1	0	0%	0%
1	1 to 200	0.5 to 100.0%	0.5 to 100.0%
1	201 to 255	100.0%	100.0%
0xFF	N/A	N/A	AUTO (Invalid)

Default Value The default value is AUTO (state = 0xFF). This value will be adopted at power-up. This network variable input uses the Receive Heartbeat function. The value of actual reference setpoint depends on nviSpdScl and nviDrvSpdScl.

Scaling This reference value is moved to dataset 1 index REF2 with value 100% to 20000. See the User's Manual of the drive for further information.

Speed Setpoint Scaling `network input SNVT_lev_percent nviSpdScl;`

This input network variable provides scaling for nviSpeedStpt and nviRefStpt values. For example, if nviDrvSpeedStpt is 100% and nviSpdScl is -150%, then the actual speed setpoint value is -150%, i.e. 1.5 times nominal speed in the reverse direction. It may also be used to receive heartbeat.

Valid Range -163 to 163%

Default Value Defined by nciDrvSpdScl.

Reset Fault `network input SNVT_switch nviResetFault;`

This input network variable provides an input to the motor to clear the fault status in the drive.

Note: The nviRequest RQ_CLEAR_ALARM may be used in parallel with nviResetFault.

Valid Range See SNVT_switch.

State	Value	Command
0	0%	Enable Reset Fault
1	100%	Reset Fault

On a transition from '0' to '1', this input network variable clears the fault condition in the drive. Following a fault reset, this variable should be reset to '0' to enable the next fault reset.

Default Value The motor drive shall power-up in 'Enable Rest Fault' state.

Dataset3 Index1 Value (not in ACS 600 3.0 or ACS 400)

```
network input  SNVT_count_inc  nviDSet3Idx1;
```

This variable receives the data which is defined by parameter 90.01. The scaling is the integer scaling defined in the User's Manual of the drive. The default value is 0.

Dataset3 Index2 Value (not in ACS 600 3.0 or ACS 400)

```
network input  SNVT_count_inc  nviDSet3Idx2;
```

This variable receives the data which is defined by parameter 90.02. The scaling is the integer scaling defined in the User's Manual of the drive. The default value is 0.

Dataset3 Index3 Value (not in ACS 600 3.0 or ACS 400)

```
network input  SNVT_count_inc  nviDSet3Idx3;
```

This variable receives the data which is defined by parameter 90.03. The scaling is the integer scaling defined in the User's Manual of the drive. The default value is 0.

Output Network Variables (nvo's)

Node Object Status

```
network output SNVT_obj_status nvoStatus
```

This nvo 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

Drive Status

```
network output SNVT_state nvoDrvStatus;
```

This output network variable provides the status of the drive. This output network variable is used as a heartbeat to monitor the health of the drive.

Valid Range As Status Word of the drive. See the drive manual.

Drive Current

```
network output SNVT_amp nvoDrvCurnt;
```

This output network variable provides the drive current in amperes. This output network variable is used as a heartbeat to monitor the health of the drive.

Drive Speed

```
network output SNVT_level_percent nvoDrvSpeed;
```

This output network variable provides the speed of the drive as a percentage of the nominal speed (DTC mode) or the nominal frequency (scalar mode). This output network variable is used as a heartbeat to monitor the health of the drive.

Drive Power `network output SNVT_power_kilo nvoDrvPwr;`

This output network variable provides the drive power in kilowatts. This output network variable is used as a heartbeat to monitor the health of the drive.

Drive Energy `network output SNVT_count nvoDrvEnrgy;`

This output network variable provides the energy consumed by the motor in units defined in the User's Manual of the drive.

Output Frequency `network output SNVT_freq_hz nvoFreqAct;`

Output frequency in Hz.

Output Speed `network output SNVT_count_inc nvoSpeedActRpm;`

Output speed in rpm. This output network variable is used as a heartbeat to monitor the health of the drive.

Note: This network variable is only available with ACS 600 (Standard Application Program) in DTC Mode.

Output Torque `network output SNVT_count_inc nvoTorqAct;`

Motor torque in units defined in the User's Manual of the drive.

Drive Temperature `network output SNVT_temp_p nvoDrvTemp;`

Drive power semiconductor (Power Plate) temperature in °C.

Operation Hour Counter `network output SNVT_count nvoDrvRunHours;`

Total power-on time in whole hours.

PID Controller ACT1 `network output SNVT_lev_percent nvoPidAct1;`

PID controller feedback value 1 in percent.

PID Controller ACT2 `network output SNVT_lev_percent nvoPidAct2;`

PID controller feedback value 2 in percent.

DC Bus Voltage `network output SNVT_volt nvoDcBusVolt;`

DC bus voltage in volts. This output network variable is used as a heartbeat to monitor the health of the drive.

Parameter Value Out `network input SNVT_count_inc nvoParValue;`

Value selected by nciParRead.

Fault1, Fault2, Fault3 (ACS 400 only)

```
network output  SNVT_count  nvoFault1;
network output  SNVT_count  nvoFault2;
network output  SNVT_count  nvoFault3;
```

These nv's are the fault codes for the latest, second lates and 3rd latests faults. See ACS 400 User's Manual for explanation of codes.

Control Location

```
network output SNVT_lev_disc nvoCtrlLoc;
```

Active control location.
Local = 1 and 2, EXT1 = 3, EXT2 = 4 (ACS 600 3.0)
Local = 0, EXT1 = 1, EXT2 = 2 (ACS 600 5.x and ACS 400)

Dataset4 Index1 Value (not in ACS 600 3.0 or ACS 400)

```
network output  SNVT_count_inc  nvoDSet4Idx1;
```

This variable sends the data which is defined by parameter 92.04. The scaling is the integer scaling defined in the User's Manual of the drive.

Dataset4 Index2 Value (not in ACS 600 3.0 or ACS 400)

```
network output  SNVT_count_inc  nvoDSet4Idx2;
```

This variable sends the data which is defined by parameter 92.05. The scaling is the integer scaling defined in the User's Manual of the drive.

Dataset4 Index3 Value (not in ACS 600 3.0 or ACS 400)

```
network output  SNVT_count_inc  nvoDSet4Idx3;
```

This variable sends the data which is defined by parameter 92.06. The scaling is the integer scaling defined in the User's Manual of the drive.

Configuration Properties (nci's)

EXT1/EXT2 Selection

```
network input config SNVT_switch nciExt1Ext2Sel;
```

Selects between nviDrvSpeedStpt and nviDrvRefStpt. Parameter 11.02 must be set to COMM. MODULE to enable EXT1/EXT2 selection via the NLON-01.

Default Value EXT1

Scaling OFF = EXT1, ON = EXT2

Send Heartbeat

```
network input config SNVT_time_sec nciSndHrtBt;
```

This input configuration network variable provides the maximum send time for the variables nvoDrvSpeed, nvoDrvStatus, nvoSpeedActRpm, nvoDrvCurnt, nvoDrvPwr and nvoDcBusVolt. The default value is 0 (disabled).

Receive Heartbeat `network input config SNVT_time_sec nciRcvHrtBt;`

This configuration property is used to define the time in which the input network variables nviSpeedStpt, nviRefStpt or nviSpdScl need to be updated. If a timeout occurs, the module stops the dataset communication with the drive. The action to be taken by the drive depends on user configuration (see drive manual for communication loss functions).

The valid range is any value between 0.0 sec and 6553.4 sec. Setting nciRcvHrtBt to 0 disables the Receive Heartbeat mechanism. The default value is 0.

Minimum Send Time `network input config SNVT_time_sec nciMinOutTm;`

This input configuration network variable defines the minimum period of time before the **network output variables** can be re-sent.

The valid range is any value between 0.0 to 6553.4 secs. Setting nciMinOutTm to 0 disables transmission limiting. The default value is 0.

Hysteresis `network input config SNVT_lev_percent nciHysteresis;`

This input config nv determines the hysteresis of change before nvoDrvSpeed is updated. Minimum Send Time has a higher priority than Hysteresis.

The valid range is 0 to 100% of the value of nvoDrvSpeed (0% disables checking of value change, i.e. the value is updated when changed). The default value is 0.

Location Label `network input config SNVT_str_asc nciLocation;`

This configuration property can optionally be used to provide more descriptive physical location information than can be provided by the Neuron® Chip's 6 byte location string. The location relates to the object, not to the node. The default value is a string of empty spaces.

Motor Nominal Speed `network input config SNVT_rpm nciNmlSpeed;`

This configuration property is used to provide the nominal speed of the motor. This value is necessary to determine the minimum and maximum speeds for the motor based on the configuration properties nciMinSpeed and nciMaxSpeed (entered as percent of nominal). The default value is read from drive parameter 99.08.

Nominal Frequency `network input config SNVT_freq_hz nciNmlFreq;`

This configuration property is used to provide the nominal frequency of the motor. This value is necessary to determine the minimum and maximum frequency for the motor when in scalar control. The default value is read from drive parameter 99.07.

Minimum Speed `network input config SNVT_lev_percent nciMinSpeed;`

This configuration property is used to define the minimum speed of the motor. Its value is entered in percent of nominal speed, as defined by the Nominal Speed (nciNomSpeed) configuration value. In scalar control mode or ACS 400, this value defines the minimum frequency according to the following example:

If nciNmlFreq = 50 Hz, nciNmlSpeed 1420 rpm and nciMinSpeed = -100%, the minimum frequency is -50 Hz.

The default value is read from drive parameter 20.01 or 20.07. The value of the minimum speed must be validated against the value of the maximum speed as follows:

-163.0 ≤ minimum speed ≤ maximum speed ≤ 163.0

Maximum Speed `network input config SNVT_lev_percent  nciMaxSpeed;`

This configuration property is used to define the maximum speed of the motor. Its value is entered in percent of nominal speed, as defined by the Nominal Speed (nciNomSpeed) configuration value. In scalar control mode or ACS 400, this value defines the maximum frequency according to the following example:

If nciNmlFreq = 50 Hz, nciNmlSpeed 1420 rpm and nciMaxSpeed = 100%, the maximum frequency is 50 Hz.

The default value is read from drive parameter 20.02 or 20.08.

The value of the maximum speed must be validated against the value of the minimum speed as follows:

-163.0 ≤ minimum speed ≤ maximum speed ≤ 163.0

Ramp Up Time `network input config SNVT_time_sec  nciRampUpTm;`

This configuration property is used to set the ramp-up time. The default value is read from drive parameter 22.02.

Ramp Down Time `network input config SNVT_time_sec  nciRampDownTm;`

This configuration property can optionally be used to set the ramp-down time. The default value is read from drive parameter 22.03.

Current Limit `network input config SNVT_amp nciCurrLimit;`

This input configuration network variable limits the drive maximum output current. The default value is read from drive parameter 20.03.

PID Gain `network input config SNVT_lev_percent nciPidGain;`

PID controller gain in percent. The default value is read from drive parameter 40.01 (80.01 with PFC Application Program).

PID Integration Time

```
network input config SNVT_time_sec nciPidTime;
```

PID controller integration time in seconds. The default value is read from drive parameter 40.02 (80.02 with PFC Application Program).

PID Derivation Time

```
network input config SNVT_time_sec nciPidDerTime;
```

PID controller derivation time in seconds. The default value is read from drive parameter 40.03.

Note: This network variable has no effect with the ACS 600 PFC Application Program.

Panel Operation Lock (not in ACS 600 3.0)

```
network input config SNVT_lev_disc nciPanelLock;
```

Disables the panel to override remote control.

OFF = Not locked, otherwise locked

The default value is read from drive parameter 16.06 (ACS 600) or 16.05 (ACS 400).

Parameter Value in Selection

```
network input config SNVT_count nciParWrite;
```

Chooses the parameter value to be written to the drive.

The valid range is 1001 to 9999.

Parameter Value In

```
network input config SNVT_count_inc  nciParValue;
```

This nci is used as a value input for the user selected parameter nciParWrite. The scaling is defined by integer scalings described in the User's Manual of the drive.

Parameter Value Out Selection

```
network input config SNVT_count nciParRead;
```

Chooses the parameter value to be read from the drive.

The valid range is 101 to 9999.

Speed Setpoint Scaling Default Value

```
network input config SCPTdefScale (lev_percent)
nciDrvSpdScl
```

Default value for nviSpdScl.

The valid range is -163% to 163%.

Stop Mode Selection (not in ACS 600 3.0)

```
network input config SNVT_switch nciStopMode;
```

This input network variable selects between coast and ramp stop.

Default Value COAST

Scaling OFF = COAST, ON = RAMP

Ramp Stop Level (not in ACS 600 3.0)

`network input config SNVT_lev_percent nciStopLevel`

Stop level value in ramp stop mode (ACS 400 and ACS 600 5.x). The value is related to nvoDrvSpeed i.e. the value 5 corresponds to nvoDrvSpeed = 5% and the value 50 corresponds to nvoDrvSpeed = 50%.

The valid range is 5% to 100%. The default is 5% and it is interpreted as an unsigned value.

Appendix B – Technical Data

DDCS Link

Compatible Devices: All ABB Fieldbus Adapter modules, ABB ACS 300, ACS 400, ACS/ACP/ACF 600, DCS 400, DCS 500 Drives

Size of the Link: 2 stations

Medium: Fibre optic cable

- Construction: Plastic core, diameter 1 mm, sheathed with plastic jacket
- Attenuation: 0.31 dB/m
- Maximum Length between Stations: 10 m

Table B-1 DDCS link cable specifications.

Parameter	Minimum	Maximum	Unit
Storage Temperature	-55	+85	°C
Installation Temperature	-20	+70	°C
Short Term Tensile Force		50	N
Short Term Bend Radius	25		mm
Long Term Bend Radius	35		mm
Long Term Tensile Load		1	N
Flexing		1000	cycles

Topology: Point-to-point

Serial Communication Type: Asynchronous, half Duplex

Transfer Rate: 4 Mbit/s

Protocol: Distributed Drives Communication System (DDCS)

Connectors: Blue – receiver; grey – transmitter

LONWORKS® Network

NLON-01 Compatible Devices: All devices equipped with FTT-10A compatible transceivers

Size of the Network Segment: Max. 64 nodes

Medium: Special LON® cable

- Termination: Built in the NLON-01 Module
- Cable specifications: See the following tables

Table B-2 LONWORKS® Network cable specifications.

	Control / Signalling-grade 16 AWG (1.3 mm)	**General Purpose-grade 16 AWG (1.3 mm)**	**Data-grade Level 4 22 AWG (0.65 mm)**	**JY (St) Y 2×2×0.8 20.4 AWG (0.8 mm)**
D-C Resistance (at 20 °C) loop maximum	28.2 Ω/km	28.2 Ω/km	118 Ω/km	74.0 Ω/km
D-C Resistance Unbalance (max.)			5%	
Mutual Capacitance of a Pair (max.)	58 nF/km	74 nF/km	56 nF/km	100 nF/km
Pair-to-Ground Capacitance Unbalance (max.)			3.28 nF/km	
Impedance (nominal)	95 Ω at 1.0 MHz	100 Ω at 1.0 MHz	102 Ω ±15% at 772 kHz 100 Ω ±15% at 1, 4, 8, 10, 16 and 20 MHz	
Attenuation (at 20 °C) (max.)			15 dB/km at 772 kHz 18 dB/km at 1.0 MHz 36 dB/km at 4.0 MHz 49 dB/km at 8.0 MHz 56 dB/km at 10.0 MHz 72 dB/km at 16.0 MHz 79 dB/km at 20.0 MHz	
Pair Twists per Metre	20 (nominal)	20 (minimum)		5 (minimum)
Cable Parameters	- single twisted pair - stranded 19/29 - unshielded - Tefzel Insulation & Jacket High Temperature 150 °C max.	- single twisted pair - stranded 19/29 - unshielded - PVC Insulation & Jacket Medium Temperature 80 °C max.	- twisted pair, single or multiple - typically solid and unshielded	- wire pair: red/black - per DIN VDE 0815 - 4-wire helical twist - solid - shielded

Table B-3 LONWORKS® Network, maximum bus lengths.

		Control / Signalling-grade 16 AWG (1.3 mm)	**General Purpose-grade 16 AWG (1.3 mm)**	**Data-grade Level 4 22 AWG (0.65 mm)**	**JY (St) Y 2×2×0.8 20.4 AWG (0.8 mm)**
Doubly-Terminated Bus Topology	Bus Length	2200 m	2200 m	1150 m	750 m
	Stub Length	3 m	3 m	3 m	3 m
Singly-Terminated Free Topology	Node-to-Node Distance	500 m	400 m	400 m	320 m
	Total Wire Length	500 m	500 m	500 m	500 m

Topology: Supports free topology wiring, and will accommodate bus, star, loop, or any combination of these topologies

Serial Communication Type: Asynchronous, half Duplex

Transfer Rate: 78 kbit/s

Protocol: LonTalk®

Documents: LONMARK® Layers 1-6 Interoperability Guidelines, version 3.0

NLON-01

Enclosure: Plastic, dimensions 100 × 22.5 × 115 mm (H×W×D); degree of protection IP 20

Mounting: Onto a standard mounting rail

Settings: Via installation tool

Current Consumption: 30 mA at 24 V d.c.

Connectors:

- Light transmitter (grey) and receiver (blue) (Hewlett-Packard Versatile Link) for connection to the drive
- Two Combicon MSTBT 2,5/4-ST (4-pole, cross-section 2.5 mm^2 max.) screw terminal blocks for the fieldbus and power supply:

X1		Description
1	NC	not used
2	0 V	Ground
3	NC	not used
4	+24 V	Power supply for the module (24 V d.c. ± 10 %)

X2		Description
5	Net A	Network cable connection
6	Net B	
7	NC	not used
8	SHF	Cable screen AC earthing (via an RC filter)

General:

- All materials are UL/CSA approved
- Complies with EMC Standards EN 50081-2 and EN 50082-2

Appendix C – Ambient Conditions

Ambient Conditions, Operation

Ambient operating conditions refer to the conditions the option module is subjected to when installed for stationary use.

Air Temperature: 0 to +50 °C

Relative Humidity: 5 to 95 %, no condensation allowed. Maximum allowed relative humidity is 60 % in the presence of corrosive gases.

Contamination Levels:
Chemical gases: IEC 721-3-3, Class 3C2
Solid particles: IEC 721-3-3, Class 3S2

Installation Site Altitude: 0 to 2000 m above sea level. If the installation site is higer than 2000 m above sea level, please contact your local ABB distributor or office for further information.

Vibration: Max 0.3 mm (2 to 9 Hz), max 1 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 70 m/s^2, 22 ms (IEC 68-2-27)

Ambient Conditions, Storage

Ambient storage conditions refer to the conditions the option module is subjected to during storage in the protective package.

Temperature: -40 to +70 °C.

Relative Humidity: Less than 95 %, no condensation allowed

Atmospheric Pressure: 70 to 106 kPa

Vibration: Max 0.3 mm (2 to 9 Hz), max 1 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

Ambient Conditions, Transportation

Ambient transportation conditions refer to the conditions the option module is subjected to during transportation in the protective package.

Temperature: -40 to +70 °C

Relative Humidity: Less than 95 %, no condensation allowed.

Atmospheric Pressure: 60 to 106 kPa

Vibration: Max 3.5 mm (2 to 9 Hz), max 15 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

Bump: Max 300 m/s^2, 6 ms (IEC 68-2-29)

Free Fall: 250 mm

NLON-01/EN
3BFE 64203126 R0125 REV A
EFFECTIVE: 01.02.2000
SUPERSEDES: 10.05.1999

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