ACS 160

Installation and Start-up Guide

LONWORKS® Adapter Module
CFB-LON

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Installation and Start-up Guide

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Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the CFB-LON 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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Appendix A – List of Network Variables

Chapter 1 – Introduction to This Guide

Intended Audience

The Guide is intended for the people who are responsible for commissioning and using a CFB-LON LONWORKS® Adapter Module with the ACS 160 drive. The reader is expected to have a basic knowledge of

- electrical fundamentals and wiring practices
- the drive and its control panel
- the host controller software.

Compatibility

This manual is compatible with ACS 160 software version **1.0.0.0** or later, and CFB-LON module version **A** or later.

Before You Start

It is assumed that the drive is installed and ready to operate before starting the installation of the adapter module.

In addition to conventional installation tools, have the drive manuals available during the installation as they contain important information not included in this guide. The drive manuals are referred to at various points of this guide.

What This Guide Contains

This manual contains information on the wiring, configuration and use of the CFB-LON module.

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.

Chapter 2 – Overview contains a short description of the LONWORKS® system and the CFB-LON LONWORKS®

Adapter Module, a delivery checklist, and warranty information.

Chapter 3 – Installation contains wiring instructions.

Chapter 4 – Programming explains how to program the master station and the drive before the communication through the adapter module can be started.

Chapter 5 – Communication contains a description of how data is transmitted through the CFB-LON and information about resource files.

Chapter 6 – Status LEDs explains the status LED indications of the CFB-LON module.

Appendix A lists the Network Variables.

Appendix B contains Technical Data.

Appendix C contains a specification of the ambient conditions allowed during transportation, storage and use of the CFB-LON module.

Terms and Abbreviations

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.

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 CFB-LON Module.

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

There is a Service Pin pushbutton on the CFB-LON circuit board. It is also possible to connect an external pushbutton to the terminal block of the CFB-LON. See Chapter 3.

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 CFB-LON module, a delivery checklist, and warranty information.

The LONWORKS® System

The LONWORKS® system is an open 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 CFB-LON Module

The CFB-LON LONWORKS® Adapter Module is an optional device which enables the connection of an ACS 160 drive to a LONWORKS® network.

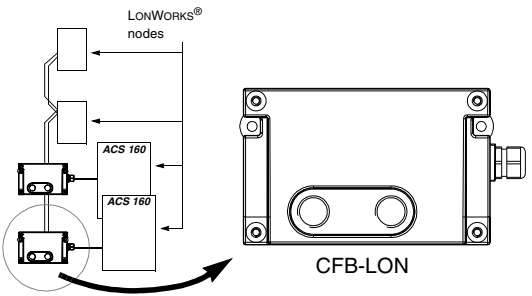


Figure 2-1 The construction of a LONWORKS® network.

Through the CFB-LON, it is possible to:

- Give control commands to the drive (Start, Stop, Run enable, etc.)
- Feed a motor speed reference to the drive
- Read status information and actual values from the drive
- Change drive parameter values
- Reset a drive fault.

The network variables and functions supported by the CFB-LON LONWORKS® Adapter Module are discussed in Chapter 5.

The adapter module is mounted onto the side of the ACS 160 drive. See the *ACS 160 User's Manual* for more information.

Delivery Check

The option package of the CFB-LON LONWORKS® Adapter Module contains:

- LONWORKS® Adapter Module, Type CFB-LON
- 2 pcs M16×1.5 cable glands with O ring
- 2 pcs M4×12 mounting screws
- this manual, the *CFB-LON 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.

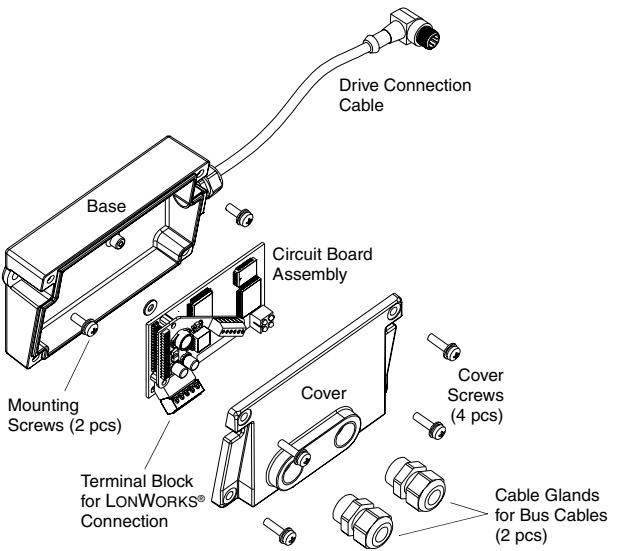
The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations.

Chapter 3 – Installation

WARNING! Follow the safety instructions given in this Guide and in the *ACS 160 User's Manual.*

WARNING! The CFB-LON contains components sensitive to electrostatic discharge (ESD). Wear an earthing wrist band when handling the circuit board assembly. Do not touch the boards unnecessarily.

Exploded View of the CFB-LON



Mounting

The CFB-LON is to be mounted onto the ACS 160 drive with two screws as shown in the *ACS 160 User's Manual*. This also provides the earthing of the module housing.

Drive Connection

The CFB-LON uses the control panel connector of the drive. (However, leave the CFB-LON disconnected at this point since the control panel is needed later for setting up the communication parameters.)

The CFB-LON is powered through the drive control panel connector.

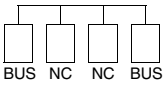
The LONWORKS® *Connection*

The CFB-LON provides a cable entry for the LONWORKS® cable. The cables are connected to a detachable terminal header, which enables the disconnection of the CFB-LON without interrupting the data transfer to other devices.

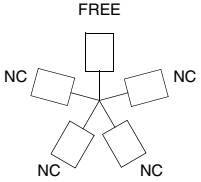
Note: LONWORKS® networks require special cable. It is recommended to use cables defined by LONMARK® Layer 1 – 6 Guidelines. See Appendix B.

Bus Termination

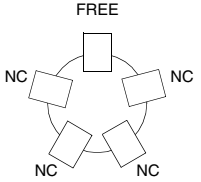
The bus must be terminated according to the topology as follows:



Bus topology



Star topology

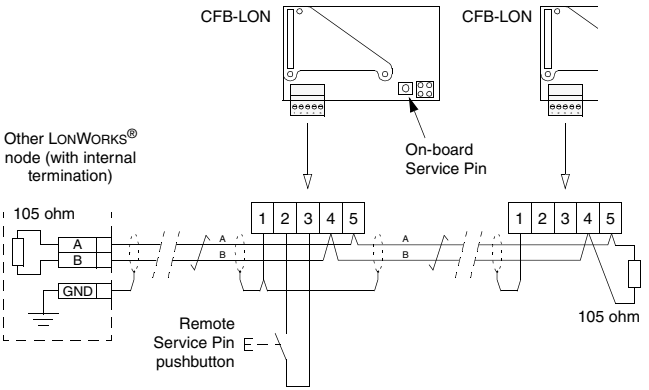


Ring topology

Description	
BUS	105 ohm resistor between data lines A and B at nodes at each end of bus
NC	No termination
FREE	52.5 ohm resistor between data lines A and B at one node in a bus segment

Procedure To connect the LONWORKS® cables, follow this procedure:

1. Lead the bus cables to the space where the ACS 160 and the CFB-LON are installed in. Arrange the bus cables as far away from any power cables as possible. Avoid parallel runs. Use grommets or cable glands at all cable lead-throughs for protection.
2. Remove the cover of the CFB-LON module. Fasten the cable glands to the cover (if not done already).
3. Lead the bus cables through the cable glands and the cover. Loosen the clamping nuts of the cable glands if necessary.
4. Detach the terminal header from its receptacle on the circuit board assembly and make the connections. (Also install the termination resistors if required at this particular node. See section ***Bus Termination*** above.) The diagram below shows two CFB-LON modules in a bus-topology LONWORKS® network.



Bus Connector Terminal Designations

Terminal		Description
1	SHIELD	Cable screen
2	GND	Ground
3	Service Pin	For connecting a remote Service Pin pushbutton
4	Net B	Network cable connection
5	Net A	

5. Re-insert the terminal header into its receptacle.
6. Configure and initialise the module according to the instructions in Chapter 4.
7. Replace the cover of the CFB-LON.
8. Tighten the clamping nuts of the cable glands.

Chapter 4 – Programming

Overview

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

The recommended sequence is as follows:

1. Set the parameters given in Table 4-7. (See section *Configuring the Drive* below).
2. Power down the drive, disconnect the control panel, and plug in the CFB-LON.
3. Make the network configuration using a network installation tool. (See section *Configuring the Network* below).
4. Power down the drive, disconnect the CFB-LON, and plug in the control panel.
5. Set the CFB-LON communication parameters given in Table 4-8.
6. Power down the drive, disconnect the control panel, plug in the CFB-LON, and power up the drive.

Configuring the Drive

It is preferable to configure the drive before the CFB-LON is configured for the network. The reason for this is that the CFB-LON 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 CFB-LON.

The following table lists the drive parameters utilised by the CFB-LON. The recommended settings and their functions are also covered.

Table 4-7 The drive parameters utilised by the CFB-LON.

Parameter	Recommended Setting	Function
9902 APPLICATION MACRO*	Set to **6** PID-CONTROL if corresponding network variables are to be used	Enables the updates of nciPidGain, nciPidTime and nciPidDerTime
9907 MOTOR NOM FREQ*	Motor nominal frequency	Initialises the nciNmlFreq value
9908 MOTOR NOM SPEED*	Motor nominal speed	Initialises the nciNmlSpeed value
1001 EXT1 COMMANDS	**10** COMM	Enables CFB-LON control
1002 EXT2 COMMANDS	**10** COMM	Enables CFB-LON control
1003 DIRECTION	**3** REQUEST	If direction change is required
1102 EXT1/EXT2 SEL	**8** COMM	Enables the use of nciExt1Ext2Sel which selects between nviSpeedStpt and nviRefStpt.
1103 EXT REF1 SELECT	**8** COMM	Enables CFB-LON reference

Parameter	Recommended Setting	Function
1105 EXT REF1 MAX	Motor nominal frequency	This value corresponds to nviSpeedStpt value 100% (of nominal speed or frequency)
1106 EXT REF2 SELECT	**8** COMM	Enables CFB-LON reference
1108 EXT REF2 MAX	100%	This value corresponds to nviRefStpt value 100%
1501 AO CONTENT	—	Determines correct speed feedback in nvoDrvSpeed and nvoDrcSpeedActRpm
1601 RUN ENABLE	**6** COMM	Run enable from CFB-LON
1604 FAULT RESET SEL	**7** COMM	Enables CFB-LON fault reset
1605 LOCAL LOCK*	**1** LOCKED	Initialises nciPanelLock value
2007 MINIMUM FREQ*	Minimum frequency value	Initialises nciMinSpeed value
2008 MAXIMUM FREQ*	Maximum frequency value	Initialises nciMinSpeed value
4001 PID GAIN*	PID gain	Initialises nciPidGain value
4002 PID INTEG TIME*	PID integration time	Initialises nciPidTime value
4003 PID DERIV TIME*	PID derivation time	Initialises nciPidDerTime value

*If one of the drive parameter values marked with * not using the corresponding configuration network variable is changed, the CFB-LON 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 CFB-LON needs to be either rebooted or temporarily disabled for the CFB-LON 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.

Table 4-8 The CFB-LON configuration parameters.

Parameter No.	Parameter Name	Settings
5101	Module Type	**0** None; …; **7** CFB-LON; …; **9** Other This parameter must be set to **7**.

Configuring the Network

The CFB-LON 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.

Resource Files

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

Chapter 5 – Communication

Overview

This chapter describes the CFB-LON operation on a LONWORKS® network.

General

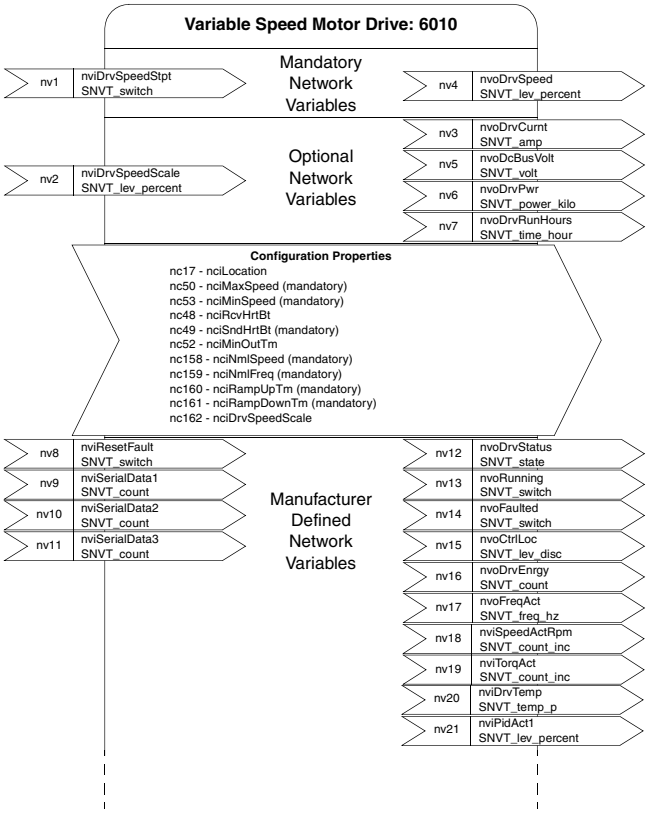
In LONWORKS® networks, the network design emphasis is on designing the network variable connections. The connection design determines the amount of data flow between different nodes, thus determining the decision of transmission media and network topology overall in the network.

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.

CFB-LON Object Diagram

The CFB-LON realises the LONMARK® Functional Profile: Variable Speed Motor Drive Version 1.1. The profile defines a set of network variables and configuration properties. In addition, the CFB-LON has a set of manufacturer defined network variables and configuration properties that are defined in order to realise functions only applicable for ABB Drives.


Variable Speed Motor Drive: 6010
Mandatory Network Variables
nv1
nviDrvSpeedStpt
SNVT_switch
nv4
nvoDrvSpeed
SNVT_lev_percent
Optional Network Variables
nv2
nviDrvSpeedScale
SNVT_lev_percent
nv3
nvoDrvCurnt
SNVT_amp
nv5
nvoDcBusVolt
SNVT_volt
nv6
nvoDrvPwr
SNVT_power_kilo
nv7
nvoDrvRunHours
SNVT_time_hour
Configuration Properties
nc17 - nciLocation
nc50 - nciMaxSpeed (mandatory)
nc53 - nciMinSpeed (mandatory)
nc48 - nciRcvHrtBt
nc49 - nciSndHrtBt (mandatory)
nc52 - nciMinOutTm
nc158 - nciNmlSpeed (mandatory)
nc159 - nciNmlFreq (mandatory)
nc160 - nciRampUpTm (mandatory)
nc161 - nciRampDownTm (mandatory)
nc162 - nciDrvSpeedScale
Manufacturer Defined Network Variables
nv8
nviResetFault
SNVT_switch
nv9
nviSerialData1
SNVT_count
nv10
nviSerialData2
SNVT_count
nv11
nviSerialData3
SNVT_count
nv12
nvoDrvStatus
SNVT_state
nv13
nvoRunning
SNVT_switch
nv14
nvoFaulted
SNVT_switch
nv15
nvoCtrlLoc
SNVT_lev_disc
nv16
nvoDrvEnrgy
SNVT_count
nv17
nvoFreqAct
SNVT_freq_hz
nv18
nviSpeedActRpm
SNVT_count_inc
nv19
nviTorqAct
SNVT_count_inc
nv20
nviDrvTemp
SNVT_temp_p
nv21
nviPidAct1
SNVT_lev_percent

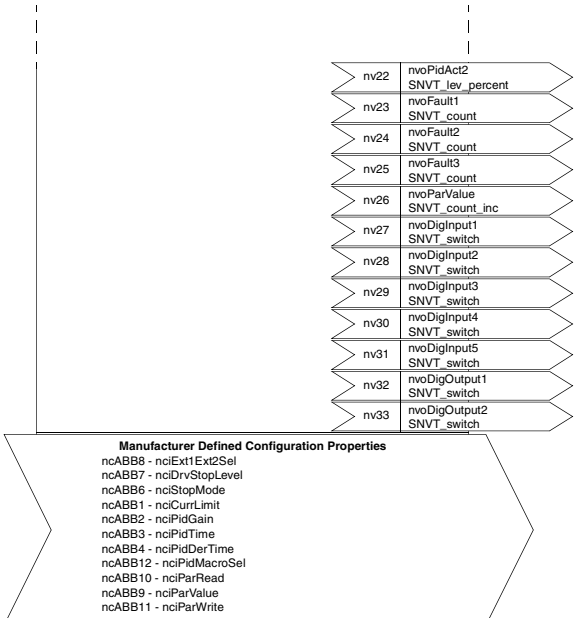


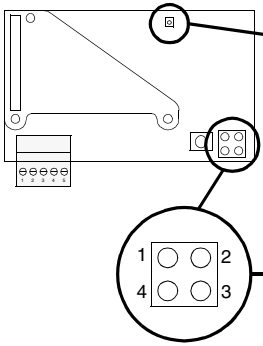
Figure 6-1 The CFB-LON object diagram.

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

Chapter 6 – Status LEDs

Status LEDs

There are five – one watchdog and four fieldbus – status LEDs on the printed board assembly of the CFB-LON module.



Watchdog LED Indication	Description
FLASHING GREEN (1 Hz)	Module initialised and running OK
FLASHING GREEN (2 Hz)	Module not initialised
FLASHING RED (1 Hz)	RAM check fault
FLASHING RED (2 Hz)	Program FLASH check fault
ORANGE	Firmware download enabled

LED No.	Indication/Description
1	Not used.
2	OFF: Configured and installed GREEN: Unconfigured and applicationless. Errors detected by the Neuron Self Test routine FLASHING GREEN: Node has an application but is unconfigured
3	FLASHING RED: A Wink command is received on the network
4	GREEN: Initialised and running OK FLASHING RED: Software error RED: Hardware error

Appendix A – List of Network Variables

Input Network Variables (nvi's)

nviObjRequest `network input SNVT_obj_request nviObjRequest;`

This input is used to enable control commands and updates from network. The status of the node is reported in nvoObjStatus.

Valid Range

RQ_UPDATE_STATUS	updates nvoObjStatus.
RQ_CLEAR_STATUS	clears nvoObjStatus.
RQ_CLEAR_ALARM	resets fault in the drive.
RQ_REPORT_MASK	reports supported requests in nvoObjStatus.
RQ_NORMAL, RQ_ENABLE	the normal request were node function as normal.
RQ_DISABLE	stops the drive with the selected stop mode and disables the operation.
RQ_ENABLE	enables the drive for operation after a RQ_DISABLE.

Commands not listed above will be reported as invalid_request in nvoObjStatus.

nviSpeedStpt `network input SNVT_switch nviDRvSpeedStpt;`

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

Valid Range

State	Value	Equivalent Percent	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)

Defaul Value Default value is AUTO (state = 0xFF). This value will be adapted at power-up. This network variable input may use the Receive Heartbeat function depending on if Receive Heartbeat function is setup for use. The actual value of drive speed does also depend on nviDrvSpeedScale.

nviDrvSpeedScale `network input SNVT_lev_percent nviDrvSpeedScale;`

This input network variable provides scaling for nviDrvSpeedStpt and nviRefStpt values. For example if nviDrvSpeedStpt value is 100% and nviDrvSpeedScale value is -150%, the actual speed setpoint value is -150%, meaning 1.5 times the nominal speed in the reverse direction.

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

Default Value Defined by nciDrvSpeedScale.

nviResetFault `network input SNVT_switch nviResetFault;`

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

Valid Range

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 set to '0' to enable the next reset fault.

Default Value The module will power-up in a 'Enable Reset Fault' state.

nviSerialData1, nviSerialData2, nviSerialData3

```
network input SNVT_count nviSerialData1;
network input SNVT_count nviSerialData2;
network input SNVT_count nviSerialData3;
```

These input network variables provide inputs to Ser Link Data 1, 2 and 3.

Valid Ranges 0 .. 255

Default Values 0

Output Network Variables

nvoObjStatus

```
network output SNVT_obj_status
nvoObjStatus;
```

This nvo reports node object status.

Valid Range

invalid ID	Invalid node ID requested
report mask	Reporting supported fields
disabled	If RQ_DISABLE active
electrical_fault	The faulted bit in Status Word
in_alarm	Alarm bit in Status Word

nvoDrvCurnt `network output SNVT_amp nvoDrvCurnt;`

This output network variable provides the drive current in amperes.

Valid Range -3,276.8 .. 3,276.7 A (0.1 A)

nvoDrvSpeed `network output SNVT_lev_percent nvoDrvSpeed;`

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

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nvoDrvStatus `network output SNVT_state nvoDrvStatus;`

This output network variable provides the status of the drive.

Valid Range As Status Word of the drive.

nvoRunning `network output SNVT_switch nvoRunning;`

This output indicates if the motor is running or not.

Valid Range

TRUE, 100% Motor is running.
FALSE, 0% Motor is not running.

nvoFaulted `network output SNVT_switch nvoFaulted;`

This output provides information of the fault status of the drive.

Valid Range

TRUE, 100% Drive is in faulted mode.
FALSE, 0% Normal mode.

nvoCtrlLoc `network output SNVT_lev_disc nvoCtrlLoc;`

Active control place.

Valid Range Local = 0, EXT1 = 1, EXT2 = 2

nvoDrvPwr `network output SNVT_power_kilo nvoDrvPwr;`

This output network variable provides the drive power in kilowatts.

Valid Range 0 .. 6,553.5 kW (0.1 kW).

nvoDrvEnrgy `network output SNVT_count nvoDrvEnrgy;`

This output network variable provides the energy consumed by the motor in units defined by drive manual.

nvoFreqAct `network output SNVT_freq_hz nvoFreqAct;`

Output frequency in Hz.

Valid Range 0 .. 6553.5 Hz (0.1 Hz).

nvoSpeedActRpm `network output SNVT_count_inc nvoSpeedActRpm;`

Output speed in Rpm's.

nvoTorqAct `network output SNVT_count_inc nvoTorqAct;`

Motor torque in units defined by drive manual.

nvoDrvTemp `network output SNVT_temp_p nvoDrvTemp;`

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

Valid Range -274 .. 6,279.5 °C (0.1 °C)

nvoDrvRunHours `network output SNVT_time_hour nvoDrvRunHours;`

Total power on time in whole hours.

Valid Range 0 .. 65535 h (1 h).

nvoPidAct1 `network output SNVT_lev_percent nvoPidAct1;`

PID controller feedback value 1.

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nvoPidAct2 `network output SNVT_lev_percent nvoPidAct2;`

PID controller feedback value 2.

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nvoDcBusVolt `network output SNVT_volt nvoDcBusVolt;`

DC bus voltage.

Valid Range -3,276.8 .. 3,276.7 V (0.1 V)

nvoFault1, nvoFault2, nvoFault3

`network output SNVT_count nvoFault1;`

`network output SNVT_count nvoFault2;`

`network output SNVT_count nvoFault3;`

These variables are the fault codes for the latest, the second latest and the third latest faults in the drive.

Valid Ranges See Table A-1 for explanation of fault codes.

nvoParValue `network output SNVT_count nvoParValue;`

This variable contains the data read at parameter set by *nciParRead*.

nvoDigInput1 to nvoDigInput5

```
network output SNVT_switch nvoDigInput1;
```
to
```
network output SNVT_switch nvoDigInput5;
```

These variables contain the statuses of Digital Input 1 (DI1) to Digital Input 5 (DI5).

Valid Ranges

State	Value	Command
0	0%	Low
1	100%	High

nvoDigOutput1, nvoDigOutput2

```
network output SNVT_switch nvoDigOutput1;
network output SNVT_switch nvoDigOutput1;
```

These variables contain the statuses of Digital Output 1 (relay) and Digital Output 2 (relay).

Valid Ranges See nvoDigInput1.

Configuration Network Variables

nciSndHrtBt

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

This input configuration network variable provides the maximum send time in seconds for the variables nvoDrvSpeed, nvoDrvStatus and nvoSpeedActRpm.

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.

Default Value Default value = 0 (disabled).

nciRcvHrtBt `network config input SNVT_time_sec nciRcvHrtBt;`

This configuration property is used to control the maximum time that elapses after the last update to input network variables nviDrvSpeedStpt or nviRefStpt. If timeout occurs, the module stops the dataset write update. The function which will be carried out by the drive depends on the user configuration (action programmable in the drive).

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.
The value 0 disables the Receive Heartbeat mechanism.

Default Value Default value is 0 (disabled).

nciMinOutTm `network config input SNVT_time_sec nciMinOutTm;`

This input configuration network variable controls the minimum period of time in seconds before the network output variables can be propagated (resent).

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.
The value 0 disables transmission limiting.

Default Value Default value = 0 (disabled).

nciLocation `network config input 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 and not to the node.

Valid Range NULL terminated ASCII string of 31 bytes.

Default Value Default value = ASCII string containing all zeros ('\0').

nciNmlSpeed `network config input 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 speed for the motor, based on the configuration properties nciMinSpeed, nciMaxSpeed (entered as percent of nominal).

Valid Range 0 .. 65,534 revolutions/minute (1 RPM).
The value 0xFFFF represents invalid data.

nciNmlFreq `network config input SNVT_freq_hz;`

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.

Valid Range 0 .. 6553.5 Hz (0.1 Hz)

nciMinSpeed `network config input SNVT_lev_percent nciMinSpeed;`

This configuration property is used to define the minimum speed of a motor. It's value is entered as a percentage of nominal speed, as defined by the Nominal Speed (nciNmlSpeed) configuration value.

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

$-163.0\% \leq \text{minimum speed} \leq \text{maximum speed} \leq 163.0\%$

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nciMaxSpeed `network config input SNVT_lev_percent nciMaxSpeed;`

This configuration property is used to define the maximum speed of a motor. It's value is entered as a percent of nominal speed, as defined by the Nominal Speed (nciNomSpeed) configuration value.

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%

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nciRampUpTm `network config input SNVT_time_sec nciRampUpTm;`

This configuration property is used to provide to set the ramp up time of the drive in seconds.

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.

nciRampDownTm `network config input SNVT_time_sec nciRampUpTm;`

This configuration property is used to provide to set the ramp down time of the drive in seconds.

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.

nciCurrLimit `network config input SNVT_amp nciCurrLimit;`

This input configuration network variable limits the drive maximum output current.

Valid Range -3,276.8 .. 3,276.7 A (0.1 A)

nciPidGain `network config input SNVT_lev_percent nciPidGain;`

PID controller gain in percents.

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

nciPidTime `network config input SNVT_time_sec nciPidTime;`

PID controller integration time in seconds.

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.

nciPidDerTime `network config input SNVT_time_sec nciPidDerTime;`

PID controller derivation time in seconds.

Valid Range 0.0 .. 6553.4 s (0.1 s).
The value 0xFFFF represents invalid data.

nciPidMacroSel `network config input SNVT_switch nciPidMacroSel;`

Selects which PID controller (1 or 2) nciPidGain, nciPidTime and nciPidDerTime should control.

Valid Range

State	Value	Command
0	0%	PID 1 Selected
1	100%	PID 2 Selected

nciDrvSpeedScale `network config input SNVT_lev_percent nciDrvSpeedScale;`

Default value for nviDrvSpeedScale.

Valid Range -163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

Default Value 0

nciStopMode `network config input SNVT_switch nciStopMode;`

This input network variable is used to choose between coast and ramp stop.

Valid Range OFF = COAST, ON = RAMP

Default Value COAST

nciStopLevel `network config input SNVT_lev_percent nciStopLevel;`

Stop level value in ramp stop mode. Value relative to nvoDrvSpeed i.e. value 5% corresponds to nvoDrvSpeed value 5% and 50% to 50%.

Valid Range Valid range 5% .. 100%
-163.84% .. 163.83% (0.005% or 50 ppm).
The value 0x7FFF represents invalid data.

Default Value Default value 5%.

nciExt1Ext2Sel `network config input SNVT_switch nciExt1Ext2Sel;`

Select between nviDrvSpeedStpt and internal speed control in the drive. The parameter 11.02 must be set to COMM to enable ext1/ext2 selection from the LonWorks network.

Valid Range OFF = EXT1, ON = EXT2

Default Value The default value is read from the drive. Otherwise EXT1

nciParValue `network config input 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.

nciParRead `network config input SNVT_count nciParRead;`

Chooses the parameter value to be read from the drive.

nciParWrite `network config input SNVT_count nciParWrite;`

Chooses the parameter value to be written to the drive.

Fault Codes

Table A-1 Fault Codes

Fault Code	Type	Fault Code Parameter
0	No Fault	0x0000
1	Overcurrent	0x2300
2	DC Overvoltage	0x3210
3	ACS160 Overtemp	0x4310
4	Short Circuit	0x2340
5	Output Overload	0x2310
6	DC Undervoltage	0x3120
7	Analogue Input 1	0x7081
8	Analogue Input 2	0x7082
9	Motor Overtemp	0x4210

10	Panel Loss	0x5300
11	Parametering	0x6320
12	Motor Stall	0x7120
13	Serial Comm. Loss	0x7510
14	External Fault Signal	0x9000
15	Output Earth Fault	0x2120
16	DC Bus Ripple	0x3100
17	Underload	0x7120
18	Reserved	0x0000
19	Reserved	0x0000
20	AI Out of Range	0x1000
21-29	Hardware Error	0x5081-0x5089
30	BR Res Overload	0x7110

Appendix B – Technical Data

LONWORKS® Network

CFB-LON 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 CFB-LON Module
- Cable specifications: See the following tables

Table B-1 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)**
DC resistance (at 20 °C) loop maximum	28.2 Ω/km	28.2 Ω/km	118 Ω/km	74.0 Ω/km
DC 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	

	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)**
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-2 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

CFB-LON

Enclosure: Cast aluminium, dimensions 124 × 79 × 42 mm (without cable glands)

Degree of Protection: IP65

Mounting: Onto ACS 160 drive

Settings: Via drive interface (control panel)

Connectors:

- One Phoenix Contact MC1,5/5-ST-3,81 (5-pole, cross-section 1.5 mm^2 max.) screw terminal block for fieldbus connection:

Terminal		Description
1	SHIELD	Cable screen
2	GND	Ground
3	Service Pin	For connecting an external Service Pin pushbutton
4	Net B	Network cable connection
5	Net A	

General:

- Complies with EMC Standards EN 50081-1 and EN 50082-2

Appendix C – Ambient Conditions

Operation

The following conditions apply to stationary use of the module.

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

Temperature: -10 to +50 °C

Contamination Levels (IEC 721-3-3):
Chemical gases: Class 3C3
Solid particles: Class 3S3

Sinusoidal Vibration (IEC 721-3-3, 2nd Edition 1994-12):
Max 3 mm (2 to 9 Hz)
Max 10 m/s^2 (9 to 200 Hz)

Shock (IEC 721-3-3, 2nd Edition 1994-12):
Max 250 m/s^2, 6 ms

Storage and Transportation

The following conditions apply to storage and transportation of the module in the protective package.

Temperature: -40 to +70 °C

Contamination Levels (IEC 721-3-3):

Storage:	Chemical gases: Class 1C2 Solid particles: Class 1S3
Transportation:	Chemical gases: Class 2C2 Solid particles: Class 2S2

Shock (IEC 721-3-3, 2nd Edition 1994-12):
Max 300 m/s^2, 18 ms

CFB-LON/EN
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