ABB Drives

User's Guide

FLN Protocol
ACS/H 400 AC Drives

ABB Automation Inc.

Direct FLN Interface
For ACS/H 400 AC Drives

User's Guide

ACH400-FLN-US-04
3AUA489002B6073 R0101
Effective: 4/1/01
Supersedes: None

Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing into a network and operating the direct FLN interface.
The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual incorporates two types 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 grounded.

Do not attempt any work on a powered drive. After switching off the main power, 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 discharged before beginning work.

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

There can be dangerous voltages inside the drive from external control circuits even when the drive's main 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 if such action can create a dangerous situation.

More Warnings and Notes are printed throughout this manual where applicable.

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Chapter 1 – Introduction

This chapter describes the purpose and contents of this manual, describes the intended audience, explains conventions used in this manual, and lists related publications.

How To Use This Manual

The purpose of this manual is to provide you with the information necessary to install, start-up, and program an ACS/H 400 Adjustable Frequency AC Drive for the direct Siemens Building Technologies Landis Division's FLN connection. This manual also gives recommendations for external connections, wiring, routing, and cable sizes.

Chapter 1 - Introduction, the chapter you are reading now, introduces you to the *ACS/H 400 FLN Installation & Start-up Manual* and conventions used throughout the manual.

Chapter 2 - Overview of the FLN connection gives an overview of the direct FLN serial communication implementation for the ACS/H 400 drives. This chapter describes all the different services provided by the network.

Chapter 3 - Installation describes planning for the network installation. This chapter also includes the requirements and connections for the serial interface wiring.

Chapter 4 - Programming describes how to program the ACS/H 400 drives for the FLN. This chapter also lists all the new and modified parameters, which are required for the serial communication network.

Chapter 5 - Start-up Procedure describes safety, installation inspection, how to check and setup the communication parameters.

Chapter 6 - Fault Tracing describes troubleshooting procedures through fault counters, fault queue, and tracing faults to their origins.

Appendix A – Point List lists all the FLN points from the ACS/H 400 drive with the units and scaling.

Intended Audience

The audience for this manual has:

- Knowledge of standard electrical wiring practices, electronic components, and electrical schematic symbols.
- Minimal knowledge of ABB product names and terminology.
- Previous experience in installing, operating, and programming the ACS 400 or ACH 400 drives.

The audience for this manual will install, start-up, and diagnose the drives for the FLN installation. The audience will also program and setup the ACS/H 400 drives for the communication network.

Conventions Used In This Manual

Listed below are terms and language conventions used in this manual. These terms and conventions are defined here to help you understand their meanings and applications throughout this manual.

Parameter

A parameter is an operating instruction for the drive. Parameters can be read and programmed with the drive control panel.

Point

A point is an actual value or operating instruction for the drive, which can be read and programmed from the FLN through the ACS/H 400 FLN interface.

LAN

Local Area Network

Terminal Block

A terminal block is a group of wire connections on a drive. This manual expresses specific terminal blocks and connections as a letter, usually X, a number, a colon (:), and another number. The letter and number to the left of the colon represent the name of the terminal block, for example, X1. The number to the right of the colon represents the terminal connection, for

example 4, on the terminal block. In this manual, a terminal connection numbered 4, located on a terminal block named X1, is expressed as X1:4.

Related Publications

For related information about the drive, refer to the ABB *ACH 400 AC Drives for Speed Control of 3 to 40 Hp, 230 Volt and 3 to 50 Hp, 460 Volt AC Induction Motors User's Manual*.

Chapter 2 – Overview of the FLN Connection

This chapter describes the general features of the FLN. For more detailed information on the use of the FLN, please consult the appropriate Siemens Building Technologies Landis Division's documentation.

Introduction

The FLN protocol is a master – slave type serial communication protocol used by the Siemens Building Automation Landis Division System 600 system.

In the System 600 architecture, the FLN connects controllers (like ACH 400 drives) to field panels.

This chapter is not intended to describe the protocol in detail, it is intended to describe the use of the FLN with the ACS/H 400 drives' connection.

System 600 Overview

System 600 has three levels of communication networks. FLN is used as a Local Area Network on the Floor level. A simplified overview of the architecture is shown in *Figure 2-1 'System 600 Architecture'*

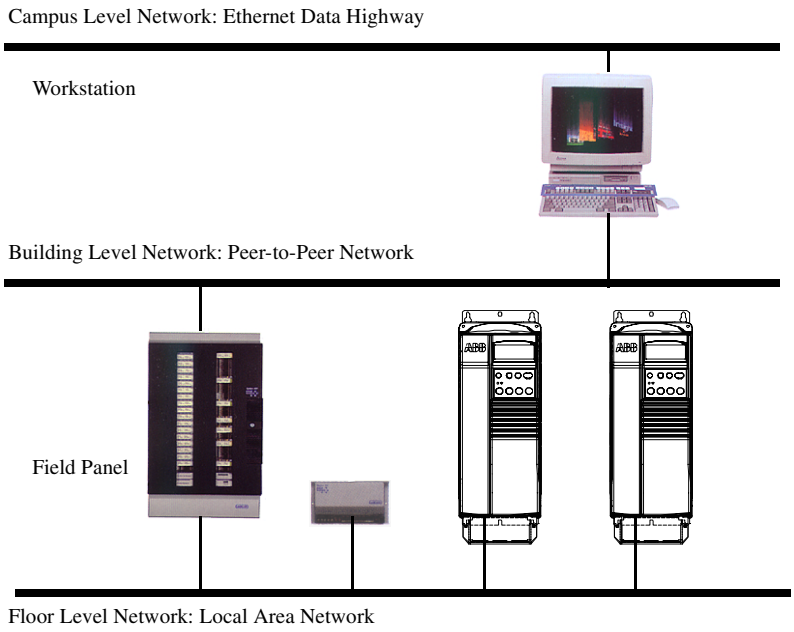


Figure 2-1 System 600 Architecture

On the FLN network, each ABB drive can be accessed by the full complement of System 600 features, including English and SI units, point data-base inside the drive, and full scaling.

ABB drives have a pre-defined set of Analog and Digital I/O points. A complete list of these points is provided in *'Appendix A - FLN Points'* of this manual.

One FLN segment can support a maximum of 32 FLN devices.

Application

The System 600 unique application identification number is 2719 for ACH 400 Direct FLN Interface. This is used to identify the list of points for the drive in the system.

Chapter 3 – Installation

This chapter describes the installation of the FLN network for the ACS/H 400 Drives using the RS-485 connection. It describes the planning of the network installation, required hardware wiring, and programming considerations for the drive.

Introduction

The FLN connection to the ACS/H 400 drives is based on an industry standard RS-485 physical interface. This chapter will not deal with Siemens Building Technologies FLN performance or feature capabilities, but will simply show how the drives need to be physically wired to the network.

Network planning should include the following topics:

- Define the types and quantities of the devices which will be connected to the network.
- Define what control information will be sent down to the drives.
- Define what feedback information will be sent from the drives to the controlling system.

During the planning phase, ensure that all NEC and local code restrictions are followed.

Controlling the drive

The drive can receive control through the FLN connection by having the System 600 send Analog and/or Digital output point values down to the drive. The control location places must be setup for COMM for the control information which needs to be received from the System 600.

Control actions which are available are described in detail in *Chapter 4 – Programming* of this manual.

Feedback from the drive

The System 600 can read any Analog and Digital Input point back from the drive. Each one of the Input points on the drive has a predefined meaning, which is described in *Chapter 4 – Programming* in this manual.

Hardware Installation

The FLN network is based upon the industrial RS-485 standard. The RS-485 connection is made using a shielded, twisted pair cable.

On the FLN for the ACS/H 400 drives, the wiring connections described below are recommended. This connection method ensures minimal noise on the network while keeping the connections simple and affordable.

Wiring

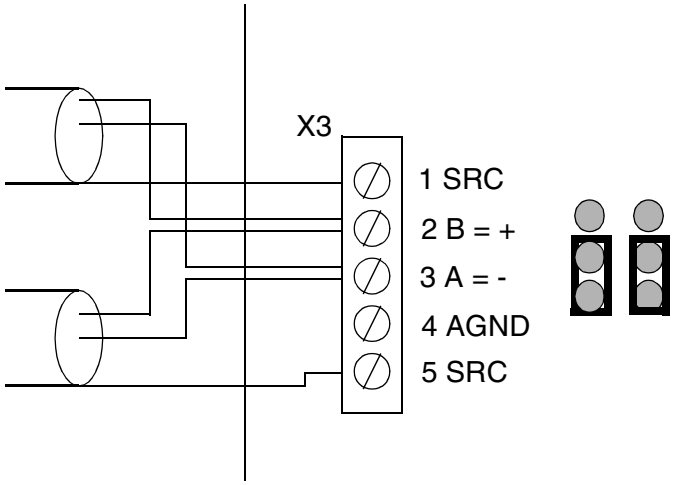
The FLN network should be wired using Belden 9841 or equivalent. Belden 9842 is a twisted, shielded pair cable with a wave impedance of 120 ohm. For details, see the diagram *Figure 3-1 "Communication wiring for ACS/H 400 Drives"*.

The RS-485 link is a daisy-chained bus, without dropout lines. The RS-485 link should also be terminated on both physical ends of the wire to reduce the noise on the network.

Connections

The network should be connected according to the following diagram. In *Figure 3-1 "Communication wiring for ACS/H 400 Drives"* the termination resistors are disconnected.

Figure:3-1Communication wiring for ACS/H 400 Drives



The RS-485 connection is made using one of the twisted pairs in the cable. The B+ terminals are all connected together, and the A- terminals are all connected together. The logical grounds for all of the drives are connected together using terminal 4.

The shields at both ends of the cable are connected to the drives. On one end, the shield should be connected to terminal one, and on the other end to terminal five. The shielding must not be made continuous by connecting the incoming and outgoing cable shields to the same terminals. The proper shield connection is shown in *Figure 3–1*.

The connections should be made only while the drive is disconnected from the power source.

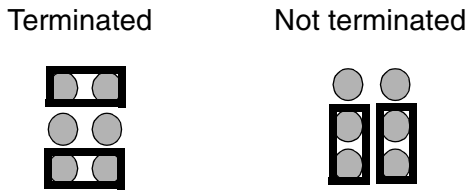
Grounding and Termination

The FLN network should not be directly grounded at any point. All the devices on the network should be well grounded using their corresponding grounding terminals.

As always, the grounding wires should not make any closed loops, and all the devices should be grounded into common ground.

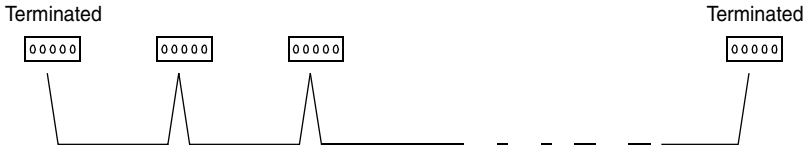
The FLN network must be terminated using 120 ohm resistors at both ends of the network. These resistors are already resident on the ACS/ACH 400 board. To connect the termination resistors, move jumpers on the jumber box J1 on the control interface board to the terminate position. *Figure 3-2 "RS-485 termination jumpers"* shows the position of the termination jumpers.

Figure:3-2 RS-485 termination jumpers



The termination should not be done on the intermediate stations on the network.

Figure:3-3 Termination for the link



Chapter 4 – Programming

This chapter describes the programming of the ACS/H 400 drives for communications on the FLN network. The reader should be familiar with the ACS/H 400 drive and the Siemens Building Technologies Landis Division's System.

Programming of the Drive

The ACS/H 400 drives are programmed through the local programming panel. The operation of the panel is described in detail in the ACS/H programming manual.

Siemens Building Technologies / ABB Coordination

Coordinate drive programming with the local Siemens Building Technologies representative so that the drive's RS485 bus address is setup correctly. The Siemens Building Technologies representative should communicate which drive control functionality will be required for each drive (control locations) so that ABB start-up personnel can setup the drives correctly for the installation.

Supported Features

To the field panel ACS/H 400 "looks" like a FLN LAN device. A complete list of the points inside the ACS/H 400 drive is located in *'Appendix A - FLN Points'*.

Communication Setup

To activate the direct FLN connection, set parameter 5005 PROTOCOL SEL to OEM APPLIC (4). If you can not see this selection on the panel and you have selected "Full Menu", your drive does not have FLN protocol software in the application memory.

For the direct FLN communication there are new setup parameters on the drive. These are located in the group 53 OEM APPLICATION. These parameters are shown in *Table 4-1 "Group 53 OEM APPLICATION"*.

Table 4-1 Group 53 OEM APPLICATION

Parameter	Panel Text	Range/ Unit	Description
1 OEM Application ID and Revision	5301 OEM APP PAR1	1110 - 1199	FLN Software ID and revision
2 Drive ID-number	5302 OEM APP PAR2	1 - 98	Drive's FLN address
3 Baud Rate	5303 OEM APP PAR3	0 - 4 (1,200 - 19,200 bit/s)	Communication speed
4 Communication time-out time	5304 OEM APP PAR4	1 – 600 (1.0 - 60.0 s)	Time limit for communication loss detection
5 Communication fault function	5305 OEM APP PAR5	0 – 3	Operation in case communication with master device is lost
6 Good Message Counter	5306 OEM APP PAR6	0 – 65535	Rolling counter for good messages
7 Bad Message Counter	5307 OEM APP PAR7	0 – 65535	Communication error counter
8 Framing Error Counter	5308 OEM APP PAR8	0 – 65535	Number of detected framing errors
9 Overrun Counter	5309 OEM APP PAR9	0 – 65535	Number of detected overrun errors
10 Protocol Software Error	53010 OEM APP PAR10	0 – 3	Protocol software error code

1 OEM Application ID and Revision

This parameter shows the application software ID and revision code. First two digits are the ID and next two are the revision code. The Application ID for FLN software is 11.

2 Drive ID-number

This parameter selects the node number for the ACS/H 400 drive on the FLN network. Default value is 0, which disables the communication.

3 Baud Rate

This parameter is used to define the baud rate for FLN communication.

The possible selections are:

0 = 1,200 bit/s

1 = 2,400 bit/s

2 = 4,800 bit/s

3 = 9,600 bit/s

4 = 19,200 bit/s

4 Communication time-out time

This parameter is used to define the time-out value for the communication loss function. If the field panel does not communicate with the drive for this period of time, a communication loss fault is generated.

5 Communication Fault Function

This parameter selects what is being done when there is a communication loss from the field panel down to the drive. The communication loss is defined so that if there are no messages to the drive within a time period defined in the parameter 4 Communication time-out time, a communication loss is generated.

The possible selections are:

0 = NOT SELECTED
Ignore
The communication loss is ignored.

1 = FAULT
Stop the Drive
The drive will show the OEM fault on the panel and will stop. To restart the drive, communication must be restored and the fault must be cleared.

2 = CONSTANT SPEED 7
Drive keeps on running
The drive will show the OEM fault on the panel and will continue running at the constant speed set by parameter 1208 CONST SPEED 7. To restart the drive, communication must be restored and the fault must be cleared.

3 = LAST SPEED
Drive keeps on running
The drive will show the OEM fault on the panel and will continue running at the last reference speed. To restart the drive, communication must be restored and the fault must be cleared.

WARNING! The changes to parameters 2 - 4 will take effect only when the drive is powered up. When these parameters are changed, the power must be disconnected from the drive until the drive panel is blank.

6 Good Message Counter

This counter calculates the received good messages from the field panel. If this counter is advancing, the ACS/H 400 is on-line on the FLN network and the field panel is communicating to the drive.

7 Bad Message Counter

This counter counts the communication errors on the FLN network. If there are no errors, no duplicate stations, and no noise on the link, this counter will not advance. This counter will also advance when the baud-rate is incorrect.

The Bad Message counter also counts all the replies with an error code. These errors could be caused by an incorrect message, by a command for a non-existing point, or by an incorrect command type for a point.

8 Framing Error Counter

This counter counts the framing errors on the FLN network. This counter will advance when the baud-rate is incorrect or there is noise on the line.

9 Overrun Counter

This counter counts the overrun errors on the FLN network.

10 Protocol Software Error

This parameter shows the protocol software error code.

The possible codes are:

0 = NO FAULT

1 = NO ADDRESS
FLN node address of the drive has to be set and the drive has to be powered down and back up for the setting to take effect.

2 = TIME-OUT FAULT
Communication time-out time has elapsed.

3 = LINE BREAK
This error may occur if the RS485 wires are swapped.

Output Point Configuration

The FLN implementation follows the normal control place logic configuration on the ACS/H 400 drive. This will mean that to use output points to control the drive, the drive must also be configured to receive commands from a Communication port.

Before any control commands can be given through the direct FLN connection, parameter 5006 COMM COMMANDS value must be set to OEM APPLIC (3).

Required setups for each individual point are listed below.

Outputs

Below is a list of all the output points for the FLN interface for the ACS/H 400 drive.

22 CMD FWD.REV

Set Parameter 1003 to REQUEST. Also, depending on the selected reference, setup the following Parameter:

- Set Parameter 1103 EXT REF1 SELECT to COMM, when using Reference R1.
- Set Parameter 1104 EXT REF2 SELECT to COMM, when using Reference R2.

24 CMD STP.STRT

Set Parameter 1001 EXT1 COMMANDS to COMM, when using Reference R1. Set Parameter 1002 EXT2 COMMANDS to COMM, when using Reference R2.
When this point is overridden to 0, the drive will ramp to stop. Use the Binary Output 4 RUN ENABLE for stopping the drive by coast.

30 CURRENT LIM

No setup is necessary.

31 ACCEL TIME 1

No setup is necessary.

32 DECEL TIME 1

No setup is necessary.

33 LOCK PANEL

No setup is necessary.

34 SEL HND.AUTO	Set Parameter 1102 EXT1/EXT2 SEL to COMM.
35 RUN ENABLE	No setup is necessary. Note that this point must always be set to 1 to start the drive. If Binary Output 1 STOP/START is kept high and this point is overridden to 0, the drive will coast to stop.
40 CMD DRV RO 1	Set Parameter 1401 RELAY OUTPUT 1 to 7 “SUPERV1 OVER”, SET Parameter 3201 SUPERV 1 PARAM to 131 “SERIAL LINK DATA 1” and set Parameter 3203 SUPERV 1 LIM HI to 1.
41 CMD DRV RO 2	Set Parameter 1402 RELAY OUTPUT 2 to 9 “SUPERV2 OVER”, set Parameter 3204 SUPERV 2PARAM to 132 “SERIAL LINK DATA 2” and set Parameter 3206 SUPERV 2 LIM HI to 1.
48 CMD DRV AO 1	Set the parameter 1501 AO CONTENT to 133 (SERIAL LINK DATA 3) and set the parameter 1503 AO CONTENT MAX to 255.
50 INPUT REF 1	Set the parameter 1103 EXT REF1 SELECT to COMM.
51 INPUT REF 2	Set the parameter 1104 EXT REF2 SELECT to COMM.
61 PID GAIN	No setup is necessary.
62 PID I TIME	No setup is necessary.
63 PID D TIME	No setup is necessary.
64 PID D FILTER	No setup is necessary.
94 RESET FAULT	Set Parameter 1604 FAULT RESET SEL to COMM.

Fault Queue

The ACS/H 400 has a fault queue which records the latest three faults. This queue can be read using the LAI points 90 - 92.

Faults

Faults are abnormal situations detected by the drive, which cause the drive to fault. The fault information is both displayed on the drive panel and is placed into the fault queue.

To get a more detailed description of the corresponding faults see the appropriate ACS/H 400 drive *User's Manual*.

Table 4-2 "Drive Faults" lists the fault code numbers which correspond to the faults in the fault queue parameters.

Table 4-2 Drive Faults

Code	Message	Description
FL 1	OVERCURRENT	Overcurrent: • Possible mechanical problem. • Acceleration and/or deceleration times may be too short. • Power supply disturbances.
FL 2	DC OVERVOLTAGE	DC overvoltage: • Input voltage too high. • Deceleration time may be too short.
FL 3	ACH400 OVERTEMP	ACH 400 overtemperature: • Ambient temperature too high. • Severe overload.
FL 4 *	SHORT CIRCUIT	Fault current: • Short circuit. • Power supply disturbances.
FL 5	OUTPUT OVERLOAD	Output overload.
FL 6	DC UNDERVOLTAGE	DC undervoltage.
FL 7	ANALOG INPUT 1	Analog input 1 fault. Analog input 1 value is less than MINIMUM AI1 (1301). See also parameter 3001 AI<MIN FUNCTION.
FL 8	ANALOG INPUT 2	Analog input 2 fault. Analog input 2 value is less than MINIMUM AI2 (1304). See also parameter 3001 AI<MIN FUNCTION.
FL 9	MOTOR OVERTEMP	Motor overtemperature. See parameters 3004-3008.

FL10	PANEL LOSS	Panel loss. Panel is disconnected when Start/Stop/Dir or reference is coming from panel. See parameter 3002 and APPENDIX. **Note!** If FL10 is active when the power is turned off, the ACH 400 will start in remote control (REM) when the power is turned back on.
FL11	PARAMETERING	Parameters inconsistent. Possible fault situations: • MINIMUM AI1 > MAXIMUM AI1 (parameters 1301 and 1302) • MINIMUM AI2 > MAXIMUM AI2 (parameters 1304 and 1305) • MINIMUM FREQ > MAXIMUM FREQ (parameters 2007 and 2008)
FL12	MOTOR STALL	Motor stall. See parameter 3009 STALL FUNCTION.
FL13	SERIAL COMM LOSS	Serial communication loss.
FL14	EXTERNAL FAULT SIGNAL	External fault is active. See parameter 3003 EXTERNAL FAULT.
FL15 *	OUTPUT EARTH FAULT	Output ground fault.
FL16 *	DC BUS RIPPLE	DC bus ripple too high. Check power supply for phase loss or imbalance.
FL17	UNDERLOAD	Underload.
FL18	OEM FAULT	FLN communication time-out.
FL19	DDCS LINK	DDCS link fault.
FL20 - FL28 *	HARDWARE ERROR	Hardware error. Contact the factory.
“COMM LOSS” (ACS-PAN) Serial link failure. Bad connection between the control panel and the ACH 400.		

Chapter 5 – Fault Tracing

This chapter describes troubleshooting procedures for the FLN network installation using diagnostics counters, fault queues, and drive status displays. Possible fault origins are also addressed.

Fault Diagnostics

This chapter concentrates on the problems and possible remedies for the serial communication connection for the ACS/H 400 Direct FLN Interface. For other general fault diagnostics with the ACS/H 400 drives, please consult the drive's User's Manual.

Network problems can be caused by multiple sources. Some of these include:

- Loose connections
- Incorrect wiring, including swapped wires
- Bad grounding
- Duplicate station numbers
- Incorrect programming and setup for drives or other devices on the network

The major diagnostic features for fault tracing on the network include Group 53 OEM APPLICATION parameters 6 GOOD MESSAGE COUNTER and 7 BAD MESSAGE COUNTER.

This chapter will list some possible communication problems, how to identify them, and will list some possible corrections.

Normal operation

During normal operation of the network, the GOOD MESSAGE COUNTER should constantly advance on all the stations, and the BAD MESSAGE COUNTER should not advance at all.

If problems exist, the BAD MESSAGE COUNTER will advance whenever a bad message packet is received, and the GOOD MESSAGE COUNTER will advance for each good message packet received.

No station on line

How to diagnose: Neither the GOOD MESSAGE COUNTER nor the BAD MESSAGE COUNTER increases on any of the stations.

How to correct: Check that the field panel and drive are connected and are properly programmed on the network. Verify that the network cable is not cut or short circuited. If parameter 5310 is showing 1, set the drive's node address with parameter 5302 and cycle the drive's input power.

Duplicate station

How to diagnose: Two or more drives cannot be addressed. Every time there is a read or write to one given station, the BAD MESSAGE COUNTER advances.

How to correct: Verify the station numbers of all stations. Change conflicting station numbers.

Swapped wires

How to diagnose: The GOOD MESSAGE COUNTER is not advancing. The BAD MESSAGE COUNTER is advancing. Protocol Error Code is 3 = Line Break.

How to correct: Check that the RS-485 lines are not swapped.

Oem Application Fault

The OEM APPLICATION fault text is displayed on the drive's local panel. The drive also might not start.

This is an indication, that by the drive setup, there has been a communication loss to the FLN system. This is either caused by the fact that the field panel is down or the communication connection is bad.

It is also possible that the time-out selection for the drive is too short for the given installation. The field panel is not polling the drive within the time-out delay time given in the parameter 5304 TIME-OUT TIME. If this is the case, increase the time-out.

Intermittent off-line occurrences

If drive parameters are changed from the operator panel while the Direct FLN Interface is communicating, the communication from the drive may halt for short periods.

How to correct: If parameters need to be adjusted while communication is operational, set parameter 1602 PARAMETER LOCK to NO SAVE position. When you have adjusted all needed parameters, save your changes with parameter 1607 PARAM. SAVE. Note that, while saving, you may loose communication from drive for a short period.

Summary

The problems described here cover the most usual problems encountered when starting up the ACS/H 400 Direct FLN Interface. Intermittent problems might well be caused by marginally loose connections, wear on wires caused by equipment vibrations, or especially through insufficient grounding and shielding on both the devices and on the communication cables.

Appendix A – FLN Points

Table A-1 FLN LAN points for ACS/H400, application 2719

Pnt	Descriptor	Type	Engr. Units (SI Units)	Slope (SI Units) On Text	Intercept (SI Units) Off Text	In EE-prom	Range
1	CTRL ADDRESS	LAO	--	1	0	Yes	0-98
2	APPLICATION	LAO	--	1	0	--	2719
{3}	FREQ OUTPUT	LAI	HZ	0.1	0	--	0-250
{4}	PCT OUTPUT	LAI	PCT	0.01	0	--	0-100
{5}	SPEED	LAI	RPM	1	0	--	0-9999
{6}	CURRENT	LAI	A	0.1	0	--	0-9999
{7}	TORQUE	LAI	PCT	0.1	-300	--	0-300
{8}	POWER	LAI	KW	0.1	0	--	0-9999
{9}	DRIVE TEMP	LAI	DEG F (DEG C)	0.18 (0.1)	32 (0)	--	0-302 (0-150)
{10}	KWH	LAI	KWH	1	0	--	0-9999
{11}	MWH	LAI	MWH	1	0	--	0-9999
{12}	RUN TIME	LAI	HRS	1	0	--	0-9999
{13}	DC BUS VOLT	LAI	V	0.1	0	--	0-999
20	OVRD TIME	LAO	HRS	1	0	--	0-255
{21}	FWD.REV	LDI	--	REV	FWD	--	0-1
{22}	CMD FWD.REV	LDO	--	REV	FWD	--	0-1
{23}	STOP.RUN	LDI	--	RUN	STOP	--	0-1
{24}	CMD STP.STRT	LDO	--	START	STOP	--	0-1
29	DAY.NIGHT	LDO	--	NIGHT	DAY	--	0-1
30	CURRENT LIM	LAO	A	0.1	0	Yes	0.5*In-1.66*In
31	ACCEL TIME 1	LAO	SEC	0.1	0.1	Yes	0.1-1800
32	DECEL TIME 1	LAO	SEC	0.1	0.1	Yes	0.1-1800
33	LOCK PANEL	LDO	--	LOCK	OPEN	Yes	0-1
{34}	SEL HND.AUTO	LDO	--	AUTO	HAND	--	0-1
{35}	RUN ENABLE	LDO	--	ON	OFF	--	0-1

Pnt	Descriptor	Type	Engr. Units (SI Units)	Slope (SI Units) On Text	Intercept (SI Units) Off Text	In EE-prom	Range
{40}	CMD DRV RO 1	LDO	--	ON	OFF	--	0-1
{41}	CMD DRV RO 2	LDO	--	ON	OFF	--	0-1
{43}	DRV ACT AO 1	LAI	MA	0.1	0	--	0-20
{45}	DRV ACT AI 1	LAI	PCT	0.1	0	--	0-100
{46}	DRV ACT AI 2	LAI	PCT	0.1	0	--	0-100
{48}	CMD DRV AO 1	LAO	PCT	0.5	0	--	0-100
{50}	INPUT REF 1	LAO	PCT	0.005	0	--	0-100
{51}	INPUT REF 2	LAO	PCT	0.01	0	--	0-100
{60}	PID FEED-BACK	LAI	PCT	0.1	0	--	0-100
61	PID GAIN	LAO	PCT	0.1	0.1	Yes	0.1-100
62	PID I TIME	LAO	SEC	0.1	0.1	Yes	0.1-320
63	PID D TIME	LAO	SEC	0.1	0	Yes	0-10
64	PID D FILTER	LAO	SEC	0.1	0	Yes	0-10
{70}	DRV ACT DI 1	LDI	--	ON	OFF	--	0-1
{71}	DRV ACT DI 2	LDI	--	ON	OFF	--	0-1
{72}	DRV ACT DI 3	LDI	--	ON	OFF	--	0-1
{73}	DRV ACT DI 4	LDI	--	ON	OFF	--	0-1
{74}	DRV ACT DI 5	LDI	--	ON	OFF	--	0-1
{76}	DRV ACT RO 1	LDI	--	ON	OFF	--	0-1
{77}	DRV ACT RO 2	LDI	--	ON	OFF	--	0-1
{90}	LAST FAULT	LAI	--	1	0	--	0-255
{91}	PREV FAULT	LAI	--	1	0	--	0-255
{92}	OLDEST FAULT	LAI	--	1	0	--	0-255
{93}	OK.FAULT	LDI	--	FAULT	OK	--	0-1
{94}	RESET FAULT	LDO	--	RESET	NO	--	0-1
99	ERROR STA-TUS	LAI	--	1	0	--	0-255

NOTE: To command ACS/H400 Analogue and Relay Outputs via FLN following settings are required:

- Relay Output 1: Set parameter 1401 to 7 “SUPERV1 OVER”,
  set parameter 3201 to 131 (SERIAL LINK DATA1) and set parameter 3203 to 1.
- Relay Output 2: Set parameter 1402 to 7 “SUPERV2 OVER”,
  set parameter 3204 to 132 (SERIAL LINK DATA 2) and set parameter 3206 to 1.
- Analogue Output: Set parameter 1501 to 133 (SERIAL LINK DATA 3)
  and set parameter 1503 to 255.

ACH400-FLN-US-04
3AUA489002B6073 R0101
Effective: 4/1/01
Supersedes: None

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