ABB Drives

User's Guide

N2 Protocol
ACS/ACH 400 AC Drives

ABB

Direct N2 Bus Interface
For ACS/ACH 400 AC Drives

User's Guide

Safety Instructions

Overview
This chapter states the safety instructions that must be followed when installing into a network and operating the direct N2 Bus 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/ACH 400 Adjustable Frequency AC Drive for the direct Johnson Controls N2 Bus 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/ ACH 400 N2 Bus Installation & Start-up Manual* and conventions used throughout the manual.

Chapter 2 - Overview of the N2 Bus connection gives an overview of the direct N2 serial communication implementation for the ACS/ ACH 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/ACH 400 drives for the N2 Bus. 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 N2 points from the ACS/ACH 400 drive with the units and scaling.

Appendix B – DDL File for NCU lists the Data Definition Language file for the ACS/ACH 400 drive that can be used with the Network Controller Unit.

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 N2 Bus installation. The audience will also program and setup the ACS/ACH 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.

Analog Inputs

Analog Input points are real number values which are inputs to the Metasys. In the ACS/ACH 400 drive, the analog input values include the actual values, and the fault queue entries.

Analog Outputs

Analog Output points are real number values which are outputs from the Metasys. In the ACS/ACH 400 drive, the analog output values include the set point values.

Binary Inputs

Binary Input points are boolean values which are inputs to the Metasys. In the ACS/ACH 400 drive, the binary inputs include the drive status information.

Binary Outputs Binary Output points are boolean values which are outputs from the Metasys. In the ACH 400 drive, the binary outputs include the drive control for start and stop, direction, and fault reset.

Change of State (COS) On the N2 Bus it is possible to define High and Low Warning and Alarm limits to analog input points, and alarm states for binary Inputs.

When a point goes to a Warning or Alarm state, or returns back from it, the drive will report this change of state back to the Metasys. This Change of State (COS) is reported only if this function is required by the Metasys. This feature allows fast recognition of changes to non-normal states, and the subsequent returns back to normal.

N1LAN N1LAN is the communications backbone for Metasys. It allows the functions of multiple Network Control Units and Operator Workstations to be integrated into a facility-wide control and information network.

N2Bus The N2 Bus connects point interfaces and remote controllers within an equipment room, or within occupied spaces of your facility, to Network Control Units (NCUs).

On-Line / Off-Line On the N2 Bus, a node can be either On-Line or Off-Line. Immediately after the power-up, every station is in the Off-Line state. The Metasys system will then poll all the Off-Line stations. Once the ACS/ACH 400 has properly responded to this poll, it is placed into the On-Line state. In this state the Analog and Binary points can be read and modified.

When the drive does not respond to the Metasys for three polls in a row, the drive is placed into the Off-Line state by the Metasys.

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 *User's Manual for type ACS400 Frequency Cornverter from 2,2 to 37 kW* or *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 N2 Connection

This chapter describes the general features of the N2 Bus. For more detailed information on the use of the N2 Bus, please consult the appropriate Johnson Controls documentation.

Introduction

The N2 Bus protocol is a master - slave type serial communication protocol, used by the Johnson Controls Metasys system. In the Metasys architecture the N2 Bus connects point interfaces and remote controllers to Network Control Units (NCUs).

Also the N2 Bus can be used to connect ACS/ACH 400 drives to the Johnson Controls Companion product line.

This chapter is not intended to describe the protocol in detail, it is intended to describe the use of the N2 Bus with the ACS/ACH 400 drives' connection.

Metasys Integration   *Figure 2-1 "ABB and Metasys Integration"*
                           shows the drives' integration to the Johnson
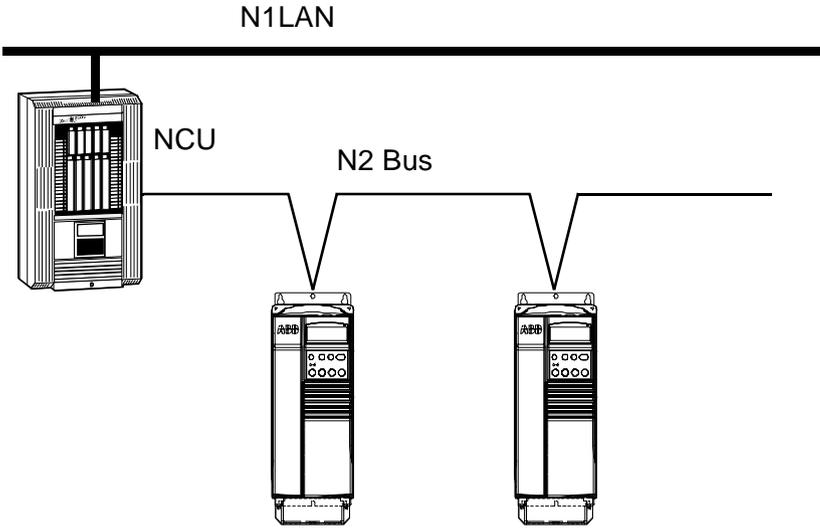   Controls Metasys system.

N1LAN

NCU

N2 Bus

Figure 2-1 ABB and Metasys Integration

Figure 2-2 "ABB and Metasys Companion Integration" shows the drives' integration to the Johnson Controls Metasys Companion system.
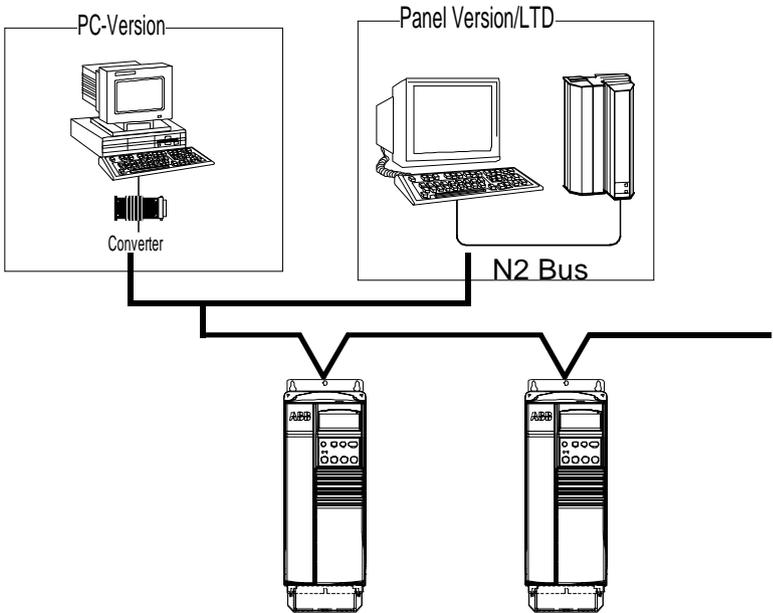
Figure 2-2 ABB and Metasys Companion Integration

On the N2 Bus each ACS/ACH 400 drive can be accessed by the full complement of Metasys FMS features, including Change-of-State (COS) monitoring, alarm notification, scheduling, trend, and totalization.

The ACS/ACH 400 drive has a pre-defined set of Analog and Binary I/O points. A complete list of these points is in *Appendix A* of this manual.

On one N2 Bus segment there can be up to 32 nodes while integrating ACS/ACH 400 drives with Johnson Controls Metasys. This is less than the 50 nodes which is the recommended maximum by Johnson Controls.

Device Type

For the Metasys and Metasys Companion products, the device type for the ACS/ACH 400 drive is VND.

DDL File   To simplify the definition of points for the NCU
                                unit, the ACH400.DDL file is listed in
                                Appendix B.

Chapter 3 – Installation

This chapter describes the installation of the N2 network for the ACS/ACH 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 N2 Bus connection to the ACS/ACH 400 drives is based on an industry standard RS-485 physical interface. This chapter will not deal with Johnson Controls N2 Bus 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 N2 Bus connection by having the Metasys 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 Metasys.

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

Feedback from the drive

The Metasys 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 N2 Bus network is based upon the industrial RS-485 standard. The RS-485 connection is made using a shielded, twisted pair cable.

On the N2 Bus for the ACS/ACH 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 N2 Bus should be wired using Belden 9842 or equivalent. Belden 9842 is a dual twisted, shielded pair cable with a wave impedance of 120 W. One of these twisted shielded pairs is used for the RS-485 link. One of the wires in the other pair is used for the logical ground, leaving one wire unused. 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/ACH 400 Drives
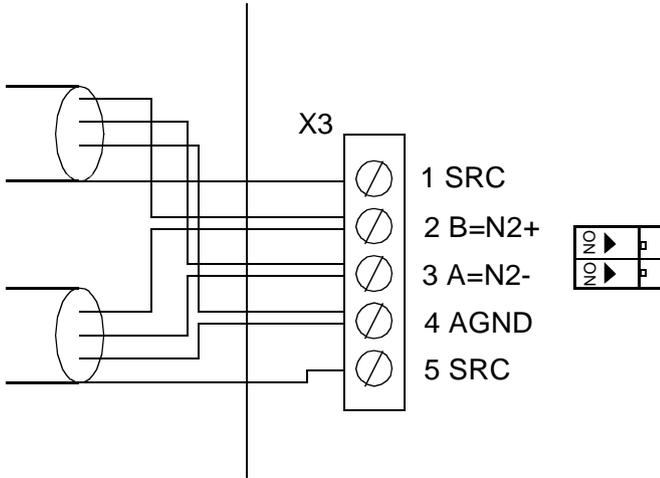
The RS-485 connection is made using one of the twisted pairs in the cable. The B terminals are all connected together, and the A terminals are all connected together. The logical grounds for all of the drives are connected together using terminal 4.

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 N2 Bus 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 N2 Bus must be terminated using 120 W 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 switch box J1 on the control interface board to the terminate position. *Figure 3-2 "RS-485 termination switches"* shows the position of the termination switches.

Figure:3-2 RS-485 termination switches

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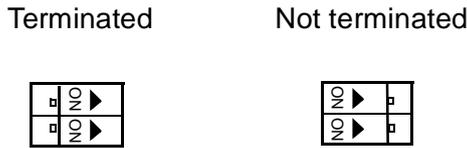
The termination should not be done on the intermediate stations on the network.

Figure:3-3 Termination for the link

Terminated   Terminated
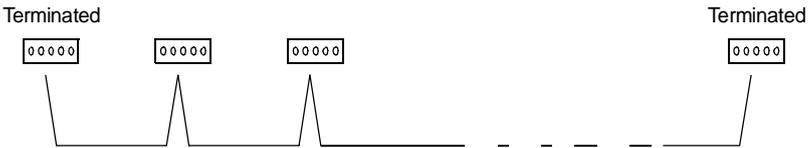
Chapter 4 – Programming

This chapter describes the programming of the ACS/ACH 400 drives for communications on the N2 Bus. The reader should be familiar with the ACS/ACH 400 drive and the Johnson Controls Metasys system.

Programming of the Drive

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

Supported Features

An ACS/ACH 400 drive looks for the N2 Bus protocol as a "virtual object" shown in *Figure:4-1 "ACS/ACH 400 Virtual Object"*. A virtual object is made up of:

- Analog Inputs
- Binary Inputs
- Analog Outputs
- Binary Outputs
- Internal values for Floating point, Integer, and Byte values.

Analog Inputs

Binary Inputs

Virtual Object

Analog Outputs

Binary Outputs

Internal values, Float, Integer, Byte
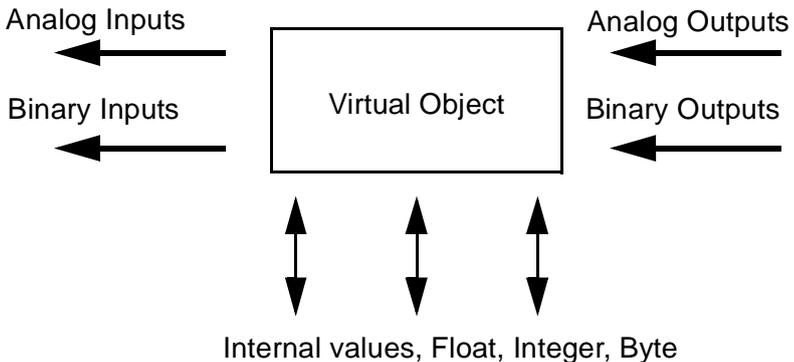
Figure:4-1 ACS/ACH 400 Virtual Object

The ACS/ACH 400 drive does not have any internal values for the N2 Bus communication. A complete list of the Analog and Binary I/O points is shown in the *Appendix A*.

Analog Input

The analog input points support the following features:

- Analog Input actual value in engineering units
- Low Alarm limit
- Low Warning limit
- High Warning limit
- High Alarm limit
- Differential value for the hysteresis of the Alarms and Warnings
- Change of State (COS) enabled
- Alarm Enabled
- Warning Enabled
- Override value is received, but there is no action taken.

Binary Input

The binary input points support the following features:

- Binary Input actual value
- Normal / Alarm state specification
- Alarm Enabled
- Change of State (COS) enabled
- Override value is received, but there is no action taken.

Analog Output

The analog output points support the following features:

- Analog Output value in engineering units
- Override value is used to change the Analog Output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

Binary Output

The binary output points support the following features:

- Binary Output value
- Override value is used to change the Binary Output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

Communication Setup

To activate the direct N2 Bus connection, set parameter 5005 PROTOCOL SEL to OEM APPLIC (4). If you can not see this selection on the panel, your drive does not have N2 protocol software in the application memory.

For the direct N2 Bus 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	1010 - 1099	N2 Software ID and revision
2 Drive ID-number	5302 OEM APP PAR2	1 - 255	Drive N2 address
3 Communication time-out time	5303 OEM APP PAR3	1 – 600 (1.0 - 60.0 s)	Time limit for communication loss detection
4 Communication fault function	5304 OEM APP PAR4	0 – 3	Operation in case communication with master device is lost
5 Good Message Counter	5305 OEM APP PAR5	0 – 65535	Rolling counter for good messages
6 Bad Message Counter	5306 OEM APP PAR6	0 – 65535	Communication error counter

Parameter	Panel Text	Range/ Unit	Description
7 Framing Error Counter	5307 OEM APP PAR7	0 – 65535	Number of detected framing errors
8 Overrun Counter	5308 OEM APP PAR8	0 – 65535	Number of detected overrun errors
9 Protocol Soft-ware Error	5309 OEM APP PAR9	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 N2 software is 10.

2 Drive ID-number

This parameter selects the node number for the ACS/ACH 400 drive on the N2 Bus. Default value is 0, which disables the communication.

3 Communication time-out time

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

4 Communication Fault Function

This parameter selects what is being done when there is a communication loss from the Metasys system 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 8 TIME-OUT SELECT, 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. The drive will also go to the Off-Line state on the N2 Bus. 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. The
drive will also go to the Off-Line state on the
N2 Bus. 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. The drive will also go to the Off-Line
state on the N2 Bus. 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.

5 Good Message Counter   This counter calculates the received good
messages from the Metasys system. If this
counter is advancing, the ACS/ACH 400 is on-
line on the N2 Bus and the Metasys is
communicating to the drive.

6 Bad Message Counter   This counter counts the communication errors
on the N2 Bus. 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.

7 Framing Error Counter   This counter counts the framing errors on the
N2 Bus. This counter will advance when the
baud-rate is incorrect or there is noise on the
line.

8 Overrun Counter   This counter counts the overrun errors on the
N2 Bus.

---

9 Protocol Software Error

This parameter shows the protocol software error code.

The possible codes are:

0 = NO FAULT

1 = NO ADDRESS
N2 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 N2 Bus implementation follows the normal control place logic configuration on the ACS/ACH 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 N2 connection, parameter 5006 COMM COMMANDS value must be set to OEM APPLIC (3).

Required setups for each individual point are listed below.

Analog Outputs

Below is a list of all the analog output points for the N2 Bus interface for the ACS/ACH 400 drive.

1 REFERENCE 1

Set the parameter 1103 EXT REF1 SELECT to COMM.

2 REFERENCE 2

Set the parameter 1104 EXT REF2 SELECT to COMM.

3 CURRENT LIMIT

No setup is necessary.

4 ACCEL TIME 1

No setup is necessary.

5 DECEL TIME 1

No setup is necessary.

6 PID-CONT GAIN

No setup is necessary.

7 PID-CONT I-TIME

No setup is necessary.

8 PID-CONT D-TIME	No setup is necessary.
9 PID-CONT D-FILTER	No setup is necessary.
10 COMMAND AO 1	Set the parameter 1501 AO CONTENT to 133 (SERIAL LINK DATA 3) and set the parameter 1503 AO CONTENT MAX to 255.

Binary Outputs

Below is a list of all the analog output points for the N2 Bus interface for the ACS/ACH 400 drive.

1 STOP/START

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.

2 FORWARD/REVERSE

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.

3 PANEL LOCK

No setup is necessary.

4 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.

5 REF1/REF2

Set Parameter 1102 EXT1/EXT2 SEL to COMM.

6 FAULT RESET

Set Parameter 1604 FAULT RESET SEL to COMM.

7 COMMAND 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.

8 COMMAND 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.

Fault Queue   The ACS/ACH 400 has a fault queue which records the latest three faults. This queue can be read using the Analog Input points 13 - 15.

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/ACH 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	ACS400 or ACH400 OVERTEMP	ACS/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 ACS/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		Reserved.
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 ACS/ACH 400.		

Chapter 5 – Fault Tracing

This chapter describes troubleshooting procedures for the N2 Bus 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/ACH 400 N2 Bus. For other general fault diagnostics with the ACS/ACH 400 drives, please consult the appropriate product 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 Metasys 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 Metasys is connected and properly programmed on the network. Verify that the cable is connected, and is not cut or short circuited. If parameter 5309 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 Metasys system. This is either caused by the fact that the Metasys system 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 Metasys is not polling the drive within the time-out delay time given in the parameter 5303 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 N2 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.

Metasys Commissioning

Verify that the N2 Bus has been installed as described in the *"N2 Communications Bus Manual"* from Johnson Controls. Also verify that all the commissioning steps are completed according to this documentation. Go through the Troubleshooting Procedures described in the manual.

Summary

The problems described here cover the most usual problems encountered when starting up the N2 Bus. 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 – I/O Point List

This chapter lists all the I/O points defined for the ACS/ACH 400 drive. This chapter is intended for reference purposes.

All the numbers read and written to the drive are in engineering units.

Parameters

The following table lists all of the I/O points. For each point, the following information is provided:

- The Point type
- The Point number
- Engineering units
- Allowable range of values

Parameters

Table A-1 I/O point list

Numb	Point	Units	Range
Analog Inputs:			
1	OUTPUT FRE-	Hz	0 - 250
2	RATED SPEED	%	0 – 100
3	SPEED	rpm	0 – 9999
4	CURRENT	A	0 – 9999
5	RATED TORQUE	%	-300 – 300
6	RATED POWER	kW	0 -9999
7	DRIVE TEMPERA-	°C	0 – 125
8	KILOWATT	kWh	0 – 9999
9	MEGAWATT	MWh	0 – 999
10	RUN TIME	h	0 – 9999
11	DC BUS VOLT-	V	0 – 999
12	PID-CTRL ACT	%	0 – 100
13	LAST FAULT		fault code
14	PREV FAULT		fault code
15	OLDEST FAULT		fault code
16	AI 1 ACTUAL	%	0 - 100
17	AI 2 ACTUAL	%	0 - 100
18	AO 1 ACTUAL	mA	0 - 20
Binary Inputs:			
1	STOP/RUN		0 = Stop, 1 = Drive Run-
2	FORWARD/		0 = Forward, 1 = Reverse
3	OK/FAULT		0 = OK, 1 = Drive Faulted
4	RELAY OUTPUT 1		0 = off, 1 = on
5	RELAY OUTPUT 2		0 = off, 1 = on
6	DIGITAL INPUT 1		0 = off, 1 = on
7	DIGITAL INPUT 2		0 = off, 1 = on

Numb	Point	Units	Range
8	**DIGITAL INPUT 3**		**0 = off, 1 = on**
9	**DIGITAL INPUT 4**		**0 = off, 1 = on**
10	**DIGITAL INPUT 5**		**0 = off, 1 = on**

Numb	Point	Units	Range
Analog Outputs:			
1	REFERENCE 1	%	0 - 100
2	REFERENCE 2	%	0 – 100
3	CURRENT LIMIT	A	0.5*In - 1.66*In
4	ACCEL TIME 1	s	0.1 – 1800
5	DECEL TIME 1	s	0.1 – 1800
6	PID-CONT GAIN	%	0.1 – 100
7	PID-CONT I-TIME	s	0.1 – 320
8	PID-CONT D-TIME	s	0 - 10
9	PID-CONT D FIL-	s	0 - 10
10	COMMAND AO 1	%	0 – 100
Binary Outputs:			
1	STOP/START		0 = Stop, 1 = Start to
2	FORWARD/		0 = Forward, 1 = Reverse
3	PANEL LOCK		0 = Open, 1 = Locked
4	RUN ENABLE		0 = Off, 1 = On
5	REF1/REF2		0 = Ref1, 1 = Ref2
6	FAULT RESET		Change 0 -> 1 Resets
7	COMMAND RO 1		0 = Off, 1 = On
8	COMMAND RO 2		0 = Off, 1 = On

NOTE: To command ACS/ACH400 Analog and Relay Outputs via N2, the 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.
- Analog Output: Set parameter 1501 to 133 (SERIAL LINK DATA 3) and set parameter 1503 to 255.

Appendix B – DDL File for NCU

This chapter lists the Data Definition Language file for ACS/ACH 400 drives to be used with the NCU units.

This chapter is intended for people who are defining the I/O points of the ACS/ACH 400 drive to the Network Controller Units.

ACH_400.DDL   Below is the listing of the ACH_400.DDL file.

```
********************************************
ABB Drives, ACH 400 Variable Frequency Drive
********************************************
CSMODEL "ACH_400","VND"
AITITLE "Analog Inputs"
BITITLE "Binary Inputs"
AOTITLE "Analog Outputs"
BOTITLE "Binary Outputs"

CSAI "AI1",N,N,"FREQ ACT","Hz"
CSAI "AI2",N,N,"PCT ACT","%"
CSAI "AI3",N,N,"SPEED","RPM"
CSAI "AI4",N,N,"CURRENT","A"
CSAI "AI5",N,N,"TORQUE","%"
CSAI "AI6",N,N,"POWER","kW"
CSAI "AI7",N,N,"DRV TEMP","C"
CSAI "AI8",N,N,"ENERGY k","kWh"
CSAI "AI9",N,N,"ENERGY M","Mwh"
CSAI "AI10",N,N,"HOURS","h"
CSAI "AI11",N,N,"DC VOLT","V"
CSAI "AI12",N,N,"PID ACT","%"
CSAI "AI13",N,N,"LAST FLT","Code"
CSAI "AI14",N,N,"2ND FLT","Code"
```

```
CSAI "AI15",N,N,"1ST FLT","Code"
CSAI "AI16",N,N,"AI 1","%"
CSAI "AI17",N,N,"AI 2","%"
CSAI "AI18",N,N,"AO 1","mA"

CSBI "BI1",N,N,"STATUS","STOP","RUN"
CSBI "BI2",N,N,"DIRECT.","FWD","REV"
CSBI "BI3",N,N,"FAULT","OK","FLT"
CSBI "BI4",N,N,"RO 1","OFF","ON"
CSBI "BI5",N,N,"RO 2","OFF","ON"
CSBI "BI6",N,N,"DI 1","OFF","ON"
CSBI "BI7",N,N,"DI 2","OFF","ON"
CSBI "BI8",N,N,"DI 3","OFF","ON"
CSBI "BI9",N,N,"DI 4","OFF","ON"
CSBI "BI10",N,N,"DI 5","OFF","ON"

CSAO "AO1",Y,Y,"REF 1","%"
CSAO "AO2",Y,Y,"REF 2","%"
CSAO "AO3",Y,Y,"CURR LIM","A"
CSAO "AO4",Y,Y,"ACCEL 1","s"
CSAO "AO5",Y,Y,"DECEL 1","s"
CSAO "AO6",Y,Y,"PID GAIN","%"
CSAO "AO7",Y,Y,"PID ITIM","s"
CSAO "AO8",Y,Y,"PID DTIM","s"
CSAO "AO9",Y,Y,"PID DFIL","s"
CSAO "AO10",Y,Y,"CMD AO 1","%"

CSBO "BO1",Y,Y,"START","STOP","START"
CSBO "BO2",Y,Y,"REVERSE","FWD","REV"
CSBO "BO3",Y,Y,"PAN LOCK","OPEN","LOCKED"
CSBO "BO4",Y,Y,"RUN ENAB","DISABLE","ENABLE"
CSBO "BO5",Y,Y,"R1/2 SEL","EXT 1","EXT 2"
CSBO "BO6",Y,Y,"FLT RSET","-","RESET"
CSBO "BO7",Y,Y,"CMD DO 1","OFF","ON"
CSBO "BO8",Y,Y,"CMD DO 2","OFF",'ON"
```

ABB

ABB Inc.
Drives
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone: 262 785-3416
              800 243-4384
Fax: 262 785-8525
Internet: www.abb-drives.com

ABB Oy
AC Drives
P.O.Box 184
FIN-00381 Helsinki
FINLAND
Telephone: +358 10 2211
Fax: +358 10 222 2681
Internet: www.abb.com/motors&drives