CDI 300

Installation & Start-up Manual

CDI 300 Common Drives Interface
For ACS 500, ACH 500, Series B

CDI300-04
EFFECTIVE 9/23/93

ABB Drives

ABB

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General Safety Instructions

Warnings in this manual appear in either of two ways:

- *Dangerous voltage warnings*, preceded by a Dangerous Voltage symbol, indicate the presence of voltages which may cause death or serious injury. These warnings describe procedures to avoid death or serious injury.
- *General warnings*, preceded by a General Warning symbol, indicate situations or conditions which may cause death or serious injury. These warnings describe procedures to avoid death or serious injury.

CAUTIONS inform you of situations or conditions which will damage machinery or cause additional motor-operation down-time if you do not take suggested steps to correct or address such situations or conditions.

Note: *Notes provide you with additional and useful information. Although less urgent than cautions and warnings, notes are important and should not be ignored.*

Warning Symbols

For your own safety please pay special attention to instructions containing these symbols:

This warning symbol indicates the presence of dangerous voltage. This symbol informs you of high voltage conditions, situations, and locations that may cause death or serious injury if you do not follow precautions and proper steps.

This warning symbol indicates a general warning.

This warning symbol indicates an electrostatic discharge hazard.

Warnings, Cautions, and Notes

WARNING! Your drive contains dangerous voltages when connected to the line power. Always check that the ACS 501 is safe, after disconnecting the power, by measuring the DC bus voltage and line input voltage. Failure to check voltages could cause death or serious injury. Only a qualified electrician should carry out the electrical installation.

Note that the Motor Control Card of the ACS 501 is at DC bus voltage potential.

The DC bus capacitors contain dangerous DC voltage levels (1.35 x V_{IN}). After disconnecting the supply, wait at least five minutes after the display readout on the control panel has disappeared before taking any measurements.

Dangerous external control voltages may be present on the relay outputs of the Control Interface Card and Option Cards.

CAUTION: Electrostatic Discharge (ESD) can damage electronic circuits. Do not handle any components without following the proper ESD precautions.

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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 500 or ACH 500 Adjustable Frequency AC Drive for the Common Drives Interface (CDI 300) serial communication. This manual also describes features and functions which have been added to the drive to support the serial multidrop communication, and gives recommendations for external connections, wiring, routing, and cable sizes.

Chapter 1 - Introduction, the chapter you are reading now, introduces you to the *CDI 300 Installation & Start-up manual* and conventions used throughout the manual.

Chapter 2 - Overview of the CDI 300 gives an overview of the CDI 300 serial communication network for the ACS 500 and ACH 500 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 500 and ACH 500 drives for the CDI 300 network. 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 – Parameter List lists all the parameters from the ACS 500 drive with the units.

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 500 or ACH 500 drives.

The audience for this manual will install, start-up, and diagnose the CDI 300 network. The audience will also program the ACS 500 drives for the serial 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.

Control Panel Display

The Control Panel display is an LCD readout of drive functions, drive parameter selections, and other drive information. Letters or numbers appear in the display according to which Control Panel keys you press.

Control Panel Keys

Control Panel keys are flat, labeled, push-button-type devices that allow you to monitor drive functions, select drive parameters, and change drive macros and settings.

Main

A main is the first level of programming. The Mains organize the Parameters into four main functional groups. A Main in this manual is the number corresponding to Group access. All Groups in the 10s range are accessed on the Control Panel through `CONTROL CONNECTIONS/MAIN 10`. Access Groups in the 20s range through `DRIVE PARAMETERS/MAIN 20`. Access Groups in the 30s range through `PROTECTION PARAMETER/MAIN 30`, and access Groups in the 40's range through `APPLIC PARAMETERS/MAIN 40`.

Group

A Group is a sub-set of a Main. Groups are grouped within Mains according to their 10s, 20s, 30s, or 40s range. For example, Groups numbered 30.1, 30.2, 30.3, and 30.4 are found in `PROTECTION PARAMETER/MAIN 30`. Parameters are accessed through Groups.

Parameter

A parameter is a sub-set of a Group, selected through the Control Panel keys. Parameters in this manual often are expressed as a number, a decimal (.), another number, a decimal, and another number. The first number at the left represents the Main. The number between the decimals represents the Group, for example, 20.2 (Start/Stop). The number at the right represents a Parameter within that group, for example, 4 (Brake Chopper). In this manual, Parameter 4 in Group 20.2 is expressed as Parameter 20.2.4.

Press Press a key on the Control Panel to achieve a desired result. In this manual, individual Control Panel keys are enclosed in square brackets. For example, the Setting mode key is expressed as [*]. Refer to *Chapter 2 – Overview of the ACS 501, Control Panel Operation*, for details.

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, X25. The number to the right of the colon represents the terminal connection, for example 16, on the terminal block. In this manual, a terminal connection numbered 16, located on a terminal block named X25, is expressed as X25:16.

Dataset A dataset is one group of data transmitted using the CDI 300 network. One dataset can contain one or multiple datawords, which are sent from one station to others. The dataset communication is always cyclical, with an user defined cycle time. Dataset communication is the main control and feedback data transfer provided by the CDI 300 network.

Warranty and Liability Information

The warranty for your ABB drive 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.

Related Publications

For related information about the drive, refer to the ABB *ACS 500 Adjustable Frequency AC Drives 2 to 350 HP Programming Manual Including Application Macros (ACS 500-05)* and the *ACS 501 with Option Pack Users Manual (ACS 500-08)*.

For related information about the ModBus+ connection, refer to the ABB *CDI 310 Modbus Plus ™ Gateway Installation & Start-up Manual.* For information about the Allen-Bradley connection, refer to the ABB *CDI 320 coprocessor Programming Manual.*

Chapter 2 – Overview of the CDI 300

This chapter describes the general features of the CDI 300 Multi Master serial communication protocol. The overview is a functional description of the CDI 300 network, and the overview will also clarify how the CDI 300 network communication has been implemented to the ACS 500 and ACH 500 drives.

Introduction

The CDI 300 Multi Master communication network is a serial communication interface especially designed for the ABB variable frequency drives. The protocol has two distinctive types of data transfer services, which have been designed to cover different needs for both programming and controlling variable frequency drives. These services are described in the following chapters.

Dataset communication is a cyclical, broadcasted transmission from one station to any number of receiving stations. The information contained in a data-set is in binary format, and is freely user configurable. For detailed information of how to program and configure the dataset contents, see *Chapter – 4, Programming*.

The dataset communication is optimized for drive control, and continuous drive feedback data transfer. Key features for the dataset communication are:

- The data transfer is cyclical, where the cycle time is user configurable.
- The data is broadcasted, and can be received by multiple stations at the same time.
- The dataset contents are user configurable during the programming time, and fixed during the normal operation.
- The data is sent in a binary format.

Message communication is exception driven, command response type data transfer from one station on the network to any other station. The information contained in a message depends on the target device, and on the message command number being sent.

The message communication is optimized for the programming and diagnostics need of the drives. Key features for the message communication are:

- The communication is command-response type. For each of the commands sent from a station A to a station B, there is a reply back from B to A.
- The data transfer is verified by acknowledgment packets, and when necessary by re-transmission.
- The data being transferred can vary from one message to another during system operation, and the data length is not limited by the protocol.
- The message transmission does not interfere with the process control, which uses the dataset services.
- The services depend on the target device type.

The message communication is not intended to do continuous process control, or monitoring. It is especially suited for making diagnostic information reads after an exception. An example of this could include the reading of the fault queue, after there has been a fault in the drive.

Dataset services

The dataset communication is unique communication for the CDI 300 network. A dataset is a collection of binary data, with an unique number identifier, and programmable data contents.

The CDI 300 network has been designed to support datasets with identification numbers in the range of 1 - 128. Each one of the datasets has a configurable length, which can be from 1 byte up to 32 bytes. The ACS 500 and ACH 500 drives have additional restrictions for the number and extent of the datasets to be used in the drive.

The ACS 500 and ACH 500 drives support the dataset communication. These drives have been designed to be able to receive and send datasets with the id numbers of 1 through 64. Also the maximum length of the dataset in the ACS 500 and ACH 500 drives is limited to the range from 2 bytes up to 16 bytes (1 to 8 integer words).

Even if the ACS 500 drive cannot use the dataset information beyond the drive limits defined above, the drive can be in a network with any legal dataset communication without problems. The information beyond the drive limits is not accessible for the drives.

Our gateways and connection modules have been designed to support the full dataset access in the CDI 300 network.

Control

The datasets are an excellent method for controlling a drive from a device like a PLC or a drive panel. There are examples later in this manual showing the parameter setups for the dataset configuration.

One control dataset can be used for controlling one, or multiple devices. A typical application for using the same dataset for multiple drives, is a situation where multiple drives should follow the same frequency target. This target could be sent in one dataset, and be simultaneously received by many drives.

Typical control information to the drive can include the following data:

- Bit packed control word. This control word contains 16 bits, each having its own unique action, like start, stop, direction control, and fault reset.
- Speed reference, and
- Current limit, to mention a few.

For a complete listing see *Chapter – 4 Programming*. To use the datasets for controlling, the drive must be programmed to receive the intended dataset, and the control place for the action (start, stop, direction) must be set for `STD COMM`.

Monitoring

The datasets can be used for sending actual values, or setup parameter values from the drive back to the monitoring station. The feedback would typically be sent to a PLC, drive panel, or to a PC station doing monitoring of the drive network.

The drive can be programmed to send up any operational data, or setup parameter using the dataset services up. What is sent is fully user configurable. All the information is sent as a 16 bit integer, most of which are unsigned. For details of how to program the dataset communication, and for the scaling of the data see *Chapter – 4 Programming*.

Typical feedback information from the drive can include the following data:

- Bit packed status word. This status word contains 16 bits, each having its own unique information, like drive running, drive faulted, and drive direction.
- Frequency actual value,
- Current actual,
- Cumulative kilowatt hours (kWh) to mention a few.

Cycle time

Each dataset is being broadcasted cyclically, with a user definable cycle time. This cycle time will determine how often the data is being transmitted from one station to another. The shorter the cycle time, the faster the communication. Too many fast datasets might well overload the network; therefore, a load calculation for the dataset communication is required during the start-up time.

The cycle time is configurable in multiples of 100ms. The minimum cycle time is 100ms, and the maximum for ACS/ACH 500 drives is 25 seconds.

Dataset contents

The datasets for the CDI 300 network contain binary information.

On the ACS 500 and ACH 500 drives, each dataset can contain from 1 up to 8 separate parameters. Each one of the parameters has a scaling which is described in *Chapter - 4 Programming*. Most of the parameters are sent as unsigned integers. In addition to the unsigned integer information, the drive has command and status words, each of which are 16 bit packed logical words, and some signed, 2's complement integers.

Message services

The message services have been designed mainly for programming and diagnosing the drives. Typically no continuous control, or feedback information transfers would be done using message transactions.

The message services described below are not intended to be used in the first release of the CDI 300 firmware. The descriptions for the message services below are intended to be informational.

On the ACS 500 and ACH 500 drives, it is possible to access freely any parameter value for both reading and for modifying its value. For a system, this read access might be useful for accessing more detailed information from the drive upon exception conditions. An example of this could be the reading of the fault queue, after a drive fault.

Not all the gateways support the message services. For a specific installation, consult the corresponding Installation Guide for the connection.

Read

With one read message command it is possible to read one or multiple parameter values from the ACS 500 drive. Every parameter can be read, including the operational data, and the start-up data. The data is returned always as a 16-bit integer, and the data is sent on the network low data byte first.

It is possible to read multiple parameters with one read instruction. The order of the parameters is the same as the parameter list order defined later. The range of parameters for reading is limited by the grouping of the parameters.

In addition to the information visible from the panel, there are additional parameters added to the drive, which are accessible only through the serial communication. These include the 16-bit packed logical status and command words.

Write

The ACS 500 drive supports message based writes for one parameter at a time. With this write access, it is possible to modify all the parameters on the drive, with an exception of some operational data parameters.

The control location parameter can be used to 'lock out' the write access from the CDI 300 network on ACS 500 drives. If the control location is not EXTERNAL, the CDI 300 network can only do message reads. Message writes, downloads, and backups are disabled.

This feature can be used for preventing accidental, remote starts when the drive is connected to the CDI 300 network.

Upload

The Upload service can be used for making a complete backup of all the parameter setups within the ACS 500 or ACH 500 drive.

The Upload/Download functions present in the CDI 300 network make a copy of all the setup parameters in the drive. This information includes also the motor data.

The uploaded data is in binary format, and is not intended to be modified in any way.

Download

Download is the matching service to the upload function. A parameter setup read using the Upload message, can be returned to the same, or similar drive using the Download function.

The Upload / Download is designed for software backup purposes.

Downloaded parameters are not stored into the EEPROM, unless they are especially written after the Download operation using the Backup command. This operation is different from changing the parameters from the panel.

Backup

The backup command is used to write the present parameter values to the non-volatile EEPROM memory in the drive. When modifying the parameter table using the message write or message download commands, the changes are stored to the drive in a volatile memory.

The changes become permanent only after issuing the Backup command, which will then write all the presently active parameter values to the EEPROM memory. After this, the values are saved, and retained even if the power is disconnected from the drive.

This action is different from the panel operation, where all the changes to the parameter table are immediately written to the EEPROM. The difference is made to protect the EEPROM memory from excessive write operation.

Chapter 3 – Installation

This chapter describes the installation of the CDI 300 network for the ACS/ACH 500 drives. It describes the planning of the network installation, required hardware wirings, and programming considerations for the drive.

Introduction

The CDI 300 network for the ACS/ACH 500 series of drives is a Multi Master protocol, which is very flexible, and is suitable for all the communication needs for standard electrical drives.

The flexibility gives a great degree of freedom for using the network; therefore, it is important to do the planning for the functionality of the network before doing the actual implementation on site.

Network planning should include the following topics:

- Define what devices, and in what quantities is connected to the network.
- Define what control information is needed to be sent down to the drives.
- Define what feedback information is needed to be sent from the drives to the controlling system.
- Define the data transmission intervals.
- Calculate the average network load, and adjust the communication intervals or divide the network in two, if required.

Controlling the drive

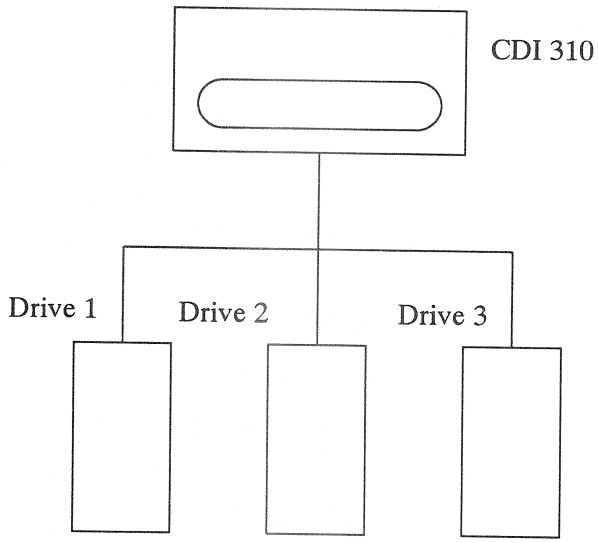
The drive can receive control using the CDI 300 network from one or two independent sources, or stations on the CDI 300 network. Typically all the control is done using the dataset services, while the message service is left for changing the programming of the drive; therefore, this chapter concentrates solely on dataset transmission planning.

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

The control information is sent to the drive (or drives) using dataset transmissions. Since the dataset is a broadcast type of transmission, it is possible to send control information using one dataset to multiple drives at the same time. This practice is recommended, for it typically reduces the network communication load.

Example In this example there is one CDI 310 ModBus+ gateway controlling 3 drives. All the drives receive their start and stop control and the frequency reference from the gateway. In addition to this, drives 1 and 2 both start and stop at the same time, while drive 3 is independently controlled.

Figure 3-1 Network Diagram



In this case, the following configurations for the gateway are possible:

- Dataset one sends out the following information from the gateway:
  - Word one, control word for both drives one and two
  - Word two, frequency reference for both drives one and two.
- Dataset two sends out the following information from the gateway
  - Word one, control word for drive 3
  - Word two, frequency reference for drive 3

In this case, the following configuration would also been possible, and actually has less network communication load:

- Dataset one sends out the following information from the gateway
  - Word one, control word for both drives 1 and 2
  - Word two, frequency reference for both drives 1 and 2.
  - Word three, control word for drive 3
  - Word four, frequency reference for drive 3

Another difference is that in case one, the update intervals for the drives 1&2 and 3 could be separate, while in the second case, all the data is transmitted using the same interval. This case is just an example, in real installations the grouping of the data, and the selection for the control information could well be different.

Feedback from the drive

The drive feedback information has more choices available, than the drive control using the datasets. Basically, any information available on the drive panel can be sent out using the CDI 300 network. The data transfer is done using the dataset services, which allows multiple stations to receive the same physical data, without repeating the transmission. This unique feature of the CDI 300 network can be used to optimize the network loading.

For planning drive feedback information, the following items should be considered:

- What information is required from each one of the drives
- What is the required data-transmission interval for the data.

The drive is able to send out one or two datasets. Each one of these can contain up to 8 individual parameters. The capability of sending two datasets allows the drive to send two different groups of information with different intervals.

Using two datasets, critical information can be prioritized, and non-critical information can be sent out on a longer interval.

Example

As in the previous example with three drives, the following scenario could be implemented:

- Each one of the drives sends out its status, frequency actual, drive current, and all three entries of the fault queue.
- The status word is sent out on one dataset with the transmission interval of 500ms, while the rest of the information is sent out on another dataset with the transmission interval of 1000ms.

For dataset numbering, the following allocation can be used:

- Drive one sends datasets 10 and 11
- Drive two sends datasets 12 and 13
- Drive three sends datasets 14 and 15.

Network load calculation

The CDI 300 network is implemented using asynchronous RS-485 connection. The communication speed is fixed to 9600 baud. This communication speed is giving the maximum amount of information, that can be transmitted on the physical connection.

For ensuring that the network will operate properly, the total load from the dataset transmissions should be calculated before the final installation. If the load from the datasets exceed on an average 67%, there is a need to do one of the following actions:

- Reduce the amount of data being transmitted,
- Increase the data transmission intervals,
- Pack more data into the existing datasets, thus eliminating some of the datasets from the network, or
- Divide the network into multiple, independent, segments.

The proper action depends on the actual installation in case.

The average network load caused by one dataset can be calculated using the following formula. The total load on the network is the sum of the individual loads caused by all the datasets on the network.

$$Load = (1 / T) * [(2*n_{words} + 7)*1.15 + 5] / 10\%$$

In this formula, the following symbols are used:

Load	This is the calculated load in%
T	This is the cycle time in seconds. 100ms = 0.1s
n_{words}	This is the number of words in one dataset

Example

This example calculates the load for the drive feedback configuration described in the section above:

Drive status dataset load. One word sent on the interval of 500ms.

$$Load = (1/0.5) * [(2*1 + 7)*1.15 + 5] / 10 = 3.07\%$$

Drive feedback dataset load. Five words (frequency, current, and fault queue) sent on the interval of 1s

$$Load = (1/1.0)*[(2*5 + 7) * 1.15 + 5] / 10 = 2.455\%$$

The total load on the network from all of the three drives is:

$$Load_{Total} = 3* (3.07\% + 2.455\%) = 16.5\%$$

Hardware installation

The CDI 300 network is based upon the industrial RS-485 standard. The RS-485 connection is done using a shielded twisted pair cable.

On the CDI 300 network the wiring connections described below are recommended. This connection method ensures minimal noise on the network, while keeping the connections simple, and affordable.

The control board, which has both the analog and digital IO terminals, and the RS-485 port must be grounded by using the on-board resistor/capacitor circuit. Any possible additional grounding wires (like the one connected to X50:8) must be removed before installing the CDI 300 network.

The digital and analog inputs come directly to this floating control board. Any dangerous voltages connected through these terminals will go directly to the control board, panel, and through the CDI 300 network to other drives, and to the backside of the panels. Equipment damage or personal injury could be caused by inappropriate connections.

Wiring

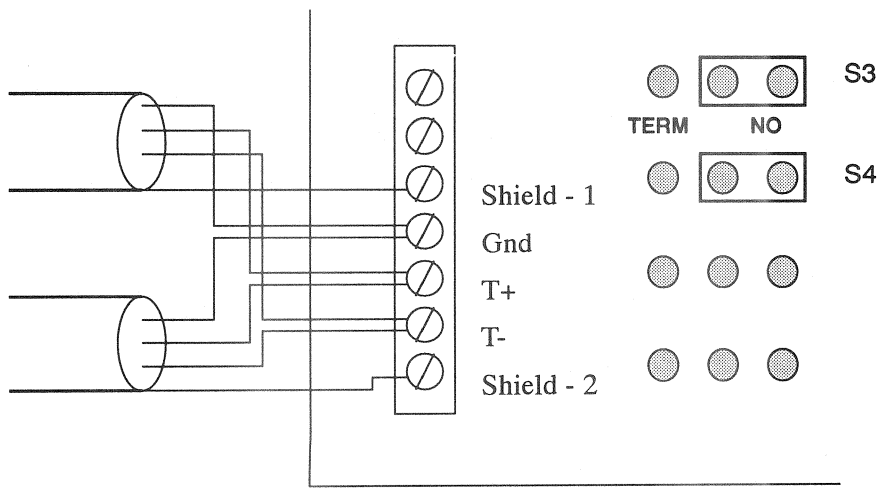
The CDI 300 network should be wired using Belden 9844 or equivalent. The Belden 9844 is dual twisted shielded pair cable with a wave impedance of 120 Ω. One of these twisted shielded pairs is used for the RS-485 link. One of the wires in the other pair is used for the logical ground, leaving one wire unused. For details, see the diagrams below.

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 the Figure 3 – 2 the termination resistors are disconnected.

Figure 3-2 Communication wiring for ACS/ACH 500 Drives



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

The shields at both ends of the cable are connected to the drives. On one end, the shield should be connected to terminal three, and on the other end to terminal seven. 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 the Figure 3 – 2.

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

The drive should be checked visually to verify that no loose metal pieces from the wire or the shield are left either over the circuit board or over the power components

ESD procedures should be followed.

Grounding and termination

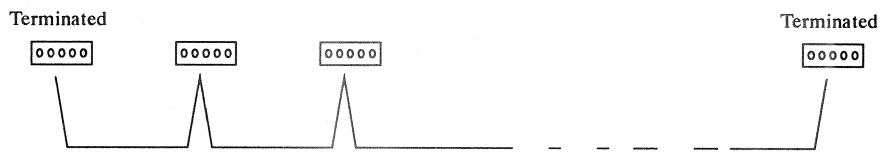
The CDI 300 network should not be directly grounded at any point. All the devices on the network should be well grounded using their corresponding grounding terminals.

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

The CDI 300 network must be terminated using 120 Ω resistors at both ends of the network. These resistors are already resident on the ACS/ACH 500 board. To connect the termination resistors, move jumpers S3 and S4 on the control interface board to the terminate position. Figure 3–2 shows the termination resistors disconnected.

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 500 and ACH 500 drives for the CDI 300 network. Required information for this chapter was provided in *Chapter 2 - Overview of the CDI 300.*

Programming of the Drive

The ACS 500 and ACH 500 drives are programmed through the local programming panel. The operation of the panel is described in detail in the ACS programming manual.

For the CDI 300 network, there are a group of new parameters. In addition to adding new parameters to the drive, some existing parameters have been modified to support additional functions. All of these parameters are described in detail in this chapter.

Unlike the local panel, all the data being transported through the CDI 300 network is in binary format. To use the data correctly, the units, and scaling of the parameters and operating data should be verified using the parameter table within this chapter.

Modified parameters

The CDI 300 network interface follows the control location logic, which was introduced with the ACS/ACH 500 drive. With the introduction of the serial communication, the drive now has new control locations to support control from the serial communication link.

In addition to the control locations, the operating data `9 CONTROL LOCATION` is used now to also lock out the serial communication link from doing accidental writes to the drive. The dataset setpoint changes are still updated, even if the `9 CONTROL LOCATION` is not in `EXTERNAL` mode.

Control locations

Using the data-set services, it is possible to:

- Start and stop the drive,
- Change the direction of the drive,
- Receive external reference 1 and/or 2,
- Select the source for both the external references 1 and/or 2,
- External control for Start, Stop, and change Direction,
- Change the reference scaling using offset and gain variables,
- Setup the current limit for the drive,
- Setup the acceleration and deceleration time 1,
- Setup the PI controller gain and integration time.

To use these options, it is necessary to program a data-set to receive the information, and also to specify the control location for the operation to be `STD COMM` in the control location parameters.

Main 10 Control Connections

Group 10.1 Start/Stop/Direction

These parameter values can only be altered with the ACS/ACH 500 stopped. The Range/Unit column in Table 4-1 shows parameter values. The text following the table explains parameter values in detail.

Table 4-1 Group 10.1

Parameter	Range/Unit	Description
1 EXT 1 STRT/ STP/DIR	Not Sel / Digital Inputs / Keypad / Standard communication	External control reference R1 start/stop and direction input.
2 EXT 2 STRT/ STP/DIR	Not Sel / Digital Inputs / Keypad / Standard communication	External control reference R2 start/stop and direction input

1 EXT 1 STRT/STP/DIR

This parameter selects the Digital Inputs used for Start/Stop and Reverse commands.

NOT SEL

No Digital Input selected.

DI1

Two-wire start/stop

0 V DC = Stop and 24 V DC = Start. Rotation direction is fixed.

DI1,2

Two-wire start/stop and direction

Start/Stop is connected to DI1 and Reverse to DI2. 0 V DC on DI2 = Forward and 24 V DC = Reverse.

DI1P,2P

Three-wire start/stop

Start/Stop commands are from momentary push-buttons. The stop push-button is normally closed, and connected to DI2. The start push-button is normally open, and connected to DI1. Multiple start push-buttons are connected in parallel, and stop push-buttons in series.

DI1P,2P,3

Three-wire start/stop and direction

Refer to DI1,2. Reverse is connected to DI3. 0 V DC = Forward, 24 V DC = Reverse.

DI1P,2P,3P

Start forward, start reverse, and stop.

Start and direction commands are given simultaneously with two separate momentary push-buttons. The stop push-button is normally closed, and connected to DI3. The start forward push-button is normally open, and connected to DI1. The start reverse push-button is normally open, and connected to DI2. Multiple start push-buttons are connected in parallel, and stop push-buttons in series.

DI6

Two-wire start/stop

0 V DC = Stop and 24 V DC = Start. Rotation direction is fixed.

DI6,5

Two-wire start/stop and direction.

Start/Stop is connected to DI6 and Reverse is connected to DI5. 0 V DC on DI5 = Forward.

KEYPAD

Start/Stop command and Direction command are from the Keypad for Ext 1.

STD. COMM.

Start/Stop and direction command is received from the serial communication. To use this option, a command word must be programmed to be received using a data-set.

2 EXT 2 STRT/STP/DIR

This parameter selects the Digital Inputs used for Start/Stop and Reverse commands. The choices are the same as Parameter 10.1.1 (Ext 1 Strt/Stp/Dir)

3 LOC/EXT DIRECTION

This parameter allows you to fix rotation direction to FORWARD or REVERSE. If you select REQUEST, the rotation direction is selected by the source defined in parameters 10.1.1 (Ext 1 Strt/Stp/Dir) and 10.1.2 (Ext 2 Strt/Stp/Dir). These selections include digital inputs, keypad, and standard communication. If FAST REV is selected, and Parameter 20.2.3 (Stop function) is set to COAST, the modulator starts to operate in a reverse direction immediately when REVERSE is requested. This procedure results in fast reversing.

Group 10.2 External Reference Select

These parameter values can be altered with the ACS 500 running, except those marked with (O). The Range/Unit column in Table 6-2 shows parameter values. The text following the table explains parameter values in detail.

Table 4-2 Group 10.2

Parameter	Range/Unit	Description
1 EXT 1/EXT 2 SELECT (O)	OP DATA 12/ DI1–DI6/ STD COMM.	External control location selection input.
2 EXTERNAL REF1 SEL (O)	OP DATA 13/Analog and Digital Inputs/ STD COMM.	External reference 1 input.
3 EXT REF1 MINIMUM	0 – 500 Hz (ACS 501) 0 – 120 Hz (ACS 502)	External reference 1 minimum value.
4 EXT REF1 MAXIMUM	0 – 500 Hz (ACS 501) 0 – 120 Hz (ACS 502)	External reference 1 maximum value.
5 EXT REF1 OFFSET	-30 - 30 Hz	Offset for scaling external reference 1
6 EXT REF1 GAIN	-100 - 100%	Gain for scaling external reference 1
7 EXTERNAL REF2 SEL (O)	OP DATA 14/Analog and Digital Inputs/ STD COMM	External reference 2 input.
8 EXT REF2 MINIMUM	0 – 500 Hz (ACS 501) 0 – 120 Hz (ACS 502)	External reference 2 minimum value.
9 EXT REF2 MAXIMUM	0 – 500 Hz (ACS 501) 0 – 120 Hz (ACS 502)	External reference 2 maximum value.
10 EXT REF2 OFFSET	-30 - 30 Hz	Offset for scaling external reference 2
11 EXT REF2 GAIN	-100 - 100%	Gain for scaling external reference 2

1 EXT 1/EXT 2 SELECT

This parameter defines how to select the external control location (Ext Ref 1/ Ext Ref 2). If you choose `OP DATA 12`, the selection is made with Operating Data Parameter 12 (Ext Ref 1 or 2). If you choose a Digital Input (DI1 – DI6), 0 V DC = Ext Ref 1 and 24 V DC = Ext Ref 2.

If the standard communication is selected, the selection between External reference 1 and 2 is received using the serial communication. The command word is telling the drive which one of the references to use. To use this option, the command word must be programmed to be received by one of the datasets.

2 EXTERNAL REF1 SEL

This parameter selects the signal source of External Reference 1.

OP DATA 13

Reference is given from the Keypad, Operating Data Parameter 13.

AI1

Reference from analog input 1.

AI2

Reference from analog input 2.

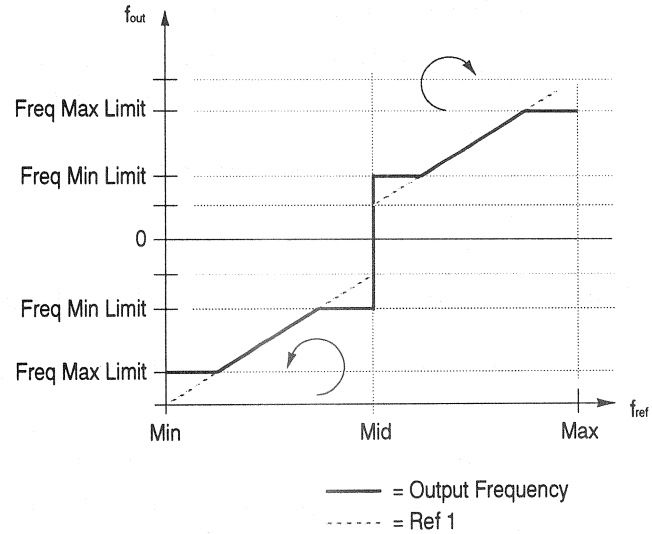
AI1/JOYST

Reference from analog input 1 configured for a joystick. Analog input minimum signal is full speed reverse, and analog input maximum signal is full speed forward. The mid point between minimum and maximum is zero speed.

CAUTION: Minimum reference for joystick must be 0.3 V/0.6 mA or greater. If a 0 – 10 V or 0 – 20 mA signal is used, the drive will run at fmax to Reverse if the control signal is lost. Set Parameter 10.5.1 (Minimum AI1) to 2 V/4 mA or to a value 0.3 V/0.6 mA or greater, and Parameter 30.1.2 (AI < Min Function) to Fault, and the drive will stop in case of lost control signal.

Figure 4-1 shows Joystick control.

Figure 4-1 Joystick Control



DI3U,4D(R)

Speed reference via digital inputs as Floating Point Control, or Motor Operated Potentiometer Control. DI3 increases speed, and DI4 decreases speed. (R) indicates that the reference will reset to minimum frequency when stop command is given. The rate of change of the reference signal is controlled by parameter 20.3.5, ACCEL TIME 2.

DI3U,4D

Same as above except speed reference does not reset to zero on stop command.

DI5U,6D

Same as above.

STD COMM.

This choice selects the standard communication for the source of the external reference one. In addition to this selection, a data-set must also be setup to receive the EXT REF1 selection.

3 EXT REF1 MINIMUM

0 Hz – 500 Hz (ACS 501)

0 Hz – 120 Hz (ACS 502)

This parameter sets the frequency corresponding to the minimum reference. When Parameter 20.1.1 (Minimum Frequency) is changed, this parameter is automatically set to the same value.

4 EXT REF1 MAXIMUM

0 Hz – 500 Hz (ACS 501)

0 Hz – 120 Hz (ACS 502)

This parameter sets the frequency corresponding to the maximum reference. When Parameter 20.1.2 (Maximum Frequency) is changed, this parameter is automatically set to the same value.

5 EXT REF1 OFFSET

This parameter with the **EXT REF1 GAIN** are used for scaling the incoming serial reference. The **EXT REF1 OFFSET** is added to the received serial reference.

6 EXT REF1 GAIN

This parameter with the **EXT REF1 OFFSET** are used for scaling the incoming serial reference. The EXT REF1 GAIN specifies what percentage of the received serial reference is added to the received serial reference.

The External Reference Offset and Gain are used to scale also the reference sources `AI1`, `AI2`, and `AI1/JOYST`.

Example: The reference is 20 Hz, EXT REF1 OFFSET is 5Hz, and EXT REF1 GAIN is 10%. The drive reference is now 20Hz + 5Hz + 0.1* 20Hz = 27Hz.

7 EXTERNAL REF2 SEL

OP DATA 14

This parameter selects the signal source for External Reference 2.

Reference is given from the Keypad, Operating Data Parameter 14.

AI1

Reference from analog input 1.

AI2

Reference from analog input 2

DI3U,4D(R)

Speed reference via digital inputs as Floating Point Control, or Motor Operated Potentiometer Control. DI3 increases speed, and DI4 decreases speed. (R) indicates that the reference will reset to zero when stop command is given.

DI3U,4D

Same as above except speed reference does not reset to zero on stop command.

DI5U,6D

Same as above.

STD COMM.

This selection selects the standard communication for the source of the external reference two. In addition to this selection, a data-set must also be setup to receive the EXT REF2 selection.

8 EXT REF2 MINIMUM

0 Hz – 500 Hz (ACS 501)

0 Hz – 120 Hz (ACS 502)

This parameter sets the frequency corresponding to the minimum reference. When Parameter 20.1.1 (Minimum Frequency) is changed, this parameter is automatically set to the same value.

9 EXT REF2 MAXIMUM

0 Hz – 500 Hz (ACS 501)

0 Hz – 120 Hz (ACS 502)

This parameter sets the frequency corresponding to the maximum reference. When Parameter 20.1.2 (Maximum Frequency) is changed, this parameter is automatically set to the same value.

10 EXT REF2 OFFSET

Same as above.

11 EXT REF2 GAIN

Same as above.

The External Reference Offset and Gain are used to scale also the reference sources `AI1`, and `AI2`.

Group 10.4 System Control Inputs

These parameter values can only be altered with the ACS 500 stopped. The Range/Unit column in Table 4 – 3 shows parameter values. The text following the table explains parameter values in detail.

Table 4-3 Group 10.4

Parameter	Range/Unit	Description
1 RUN ENABLE	Yes/DI1–DI6	Run enable input.
2 FAULT RESET SELECT	Not Sel/DI1–DI6/ On Stop/ Std Comm.	Fault/Warning/Supervision reset input.
3 PARAM LOCK SEL	Op Data 20/ DI1–DI6/ Std. Comm	Parameter lock input.
4 EXTERNAL FAULT	Not Sel/DI1–DI6	External fault input.

1 RUN ENABLE

This parameter selects the source of the Run Enable signal.

YES

Run Enable signal active. Drive is ready to start without an external Run Enable signal.

DI1 – DI6

To activate the Run Enable signal, the selected Digital Input must be connected to +24 V DC. If the Digital Input goes to 0 V DC, the drive will coast to stop.

2 FAULT RESET SELECT

NOT SEL/DI1 – DI6/ON STOP/STD COMM

If you select `NOT SEL`, fault reset is done from the Keypad. If a digital input is selected, fault reset is done from an external switch or from the keypad. Reset is activated by opening a normally closed contact (negative edge on digital input). If `ON STOP` is selected, a fault is reset by giving a stop command from the active STOP signal, or from the Keypad. A stop received using the serial communication will also reset the fault.

If the `STD COMM` is selected, the fault reset can be done using the serial communication. To use this function, a control word must be programmed to be received. The faults are cleared on the rising edge of the fault reset bit on the control word.

3 PARAM. LOCK SEL

This parameter selects the control location for Parameter Lock.

If you select `OP DATA 20`, Parameter Lock is controlled with Operating Data Parameter 20 (Parameter Lock). If you select a Digital Input (1 – 6), 0 V DC equals Open and 24 V DC equals Locked.

If the `STD COMM` is selected, the Parameter Lock is controlled with the parameter lock bit from the control word. A control word must be programmed to be received using the incoming datasets in this case.

4 EXTERNAL FAULT

NOT SEL

DI1 – DI6

Input for external fault device such as a motor overload relay or fire alarm. The device should have a normally closed contact. The digital input must be connected to +24 VDC. If the digital input goes to 0 VDC, the drive will coast to stop and a fault message will display.

Group 10.8 External Communication

The external communication group has parameters for diagnosing the serial communication link, plus parameters to program the dataset communication. The dataset communication is the communication method to be used for both the drive control, and feedback information.

Table 4-4 Group 10.8

Parameter	Range/Unit	Description
1 DRIVE ID-NUMBER	0-31	Network station number
2 DEVICE NAME	String, Constant	Drive identification
3 CONTROL SOURCE	0-32	Main controlling station number
4 COMMS FAULT FUNCT	None/Fault/ Fault+Stop	Communication fault action
5 BAD MESSAG COUNTER	0 - 255	Count of received bad characters
6 GOOD MESS COUNTER	0 - 255	Count of received good characters
7 DATASET 1 WRIT ID	0-64	Outgoing dataset one id number
8 DATASET 1 W CYCLE	100ms - 25.5s	Outgoing dataset one transmission cycle
9 DATASET 1.1 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
10 DATASET 1.2 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
11 DATASET 1.3 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
12 DATASET 1.4 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
13 DATASET 1.5 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
14 DATASET 1.6 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
15 DATASET 1.7 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
16 DATASET 1.8 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
17 DATASET 2 WRIT ID	0-64	Outgoing dataset one id number
18 DATASET 2 W CYCLE	100ms - 25.5s	Outgoing dataset one transmission cycle
19 DATASET 2.1 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
20 DATASET 2.2 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
21 DATASET 2.3 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
22 DATASET 2.4 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
23 DATASET 2.5 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
24 DATASET 2.6 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
25 DATASET 2.7 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out

Parameter	Range/Unit	Description
26 DATASET 2.8 WRITE	0/00/00 - 5/01/01	Parameter number to be sent out
27 DATASET 1 READ ID	0-64	Incoming Dataset id
28 DATASET 1.1 READ	Table 4-2	Received data
29 DATASET 1.2 READ	Table 4-2	Received data
30 DATASET 1.3 READ	Table 4-2	Received data
31 DATASET 1.4 READ	Table 4-2	Received data
32 DATASET 1.5 READ	Table 4-2	Received data
33 DATASET 1.6 READ	Table 4-2	Received data
34 DATASET 1.7 READ	Table 4-2	Received data
35 DATASET 1.8 READ	Table 4-2	Received data
36 DATASET 2 READ ID	0-64	Incoming Dataset id
37 DATASET 2.1 READ	Table 4-2	Received data
38 DATASET 2.2 READ	Table 4-2	Received data
39 DATASET 2.3 READ	Table 4-2	Received data
40 DATASET 2.4 READ	Table 4-2	Received data
41 DATASET 2.5 READ	Table 4-2	Received data
42 DATASET 2.6 READ	Table 4-2	Received data
43 DATASET 2.7 READ	Table 4-2	Received data
44 DATASET 2.8 READ	Table 4-2	Received data

1 DRIVE ID-NUMBER

This parameter identifies the drive on the network. Every station on the CDI-300 network has to have a unique station number.

Station number 0 is required on one station on the network. This station is the Bus Administrator, which is keeping track of all the active and inactive stations on the bus.

2 DEVICE NAME

This is a 8-character drive identifier. This parameter is not changeable using the drive panel.

3 CONTROL SOURCE

The CONTROL SOURCE and COMMS FAULT FUNCT parameters are used together to specify the communication fault function.

The CONTROL SOURCE is the station where the drive is receiving its control information from. If this station goes off-line from the network, a communication fault is generated. The action taken on the communication fault is defined in the parameter COMMS FAULT FUNCT.

The value of 32 for the 3 CONTROL SOURCE has a special meaning on the communication fault processing. If this parameter is set to 32, the communication fault is detected using the bit number 12 from the control word. If this bit does not change its value for 10 seconds, a communication fault is generated. This option is especially useful for PLC control, where the PLC can generate a periodically toggling bit. In this case the toggling will stop if the PLC is not running, a communication cable is defective, or if there is a power loss.

4 COMMS FAULT FUNCT

This parameter defines the action to be taken when the station defined in the CONTROL SOURCE parameter goes off-line.

The following actions are available:

- NONE - The communication fault is ignored
- FAULT - The communication fault generates a warning on the panel
- FAULT+STOP - The communication fault generates a warning on the panel, and stops the drive. In this case, the drive can not be re-started before the communication is restored

On start-up, the communication errors are disabled for the first 40 seconds. This will allow time for all the devices on the network to initialize and to come on-line.

There is 10 second time-out timer for the 'toggling-bit' communication loss detection. If the bit changes its value during the 10 seconds, there will be no communication losses generated. Only if the bit is stable, either 1 or 0, for more than 10 seconds, the communication loss is generated.

5 BAD MESSAGE COUNTER

This counter shows the received bad characters from the network. This counter is a cyclical counter. Whenever the counter reaches 255, the next value is 0.

This counter can be used to diagnose the noise level on the network. This parameter can be cleared using the keypad.

6 GOOD MESS COUNTER

This counter shows the received good characters from the network. This counter is a cyclical counter. Whenever the counter reaches 255, the next value is 0.

This counter can be used to verify that the Bus Administrator is on-line.

7 DATASET 1 WRIT ID

This parameter identifies the first data-set to be transmitted on the network. Legal values are from 1 through 64, while the value of zero disables the dataset from transmission.

Every dataset on the network must have a unique identification number. This number is in no way connected to the actual station number, and is freely user definable.

8 DATASET 1 W CYCLE

This parameter defines the transmission cycle time for the dataset defined in the parameter 7 DATASET 1 WRIT ID. The setup for this parameter depends on the system requirements and the extent of the system.

The cycle time is in milliseconds. The longer the cycle time, the less load it generates to the network, but the transmission times for the data also extends.

It is possible to overload the network by having too many datasets with too short update interval cycle times. The load on the network should be calculated before programming the drives. The formulas for the network load estimation are included in *Chapter 3 – Installation.*

9 DATASET 1.1 WRITE

This parameter defines what is sent on the first dataset on the first word of the dataset. The legal values for this are 0/00/00 – 5/01/01. Any parameter from the panel, including the start-up and operating data can be sent out using this selection.

The value of 0/00/00 is reserved for undefined. The last non-zero value also defines the dataset transmission length. It is highly recommended that the values are used starting from the beginning of the dataset (1.1), and if all the eight values are not used, the rest of the parameters are left to 0/00/00.

The numbers are coded in the following manner [M/GG/PP]:

- M is the main number. Zero is for the operating data, 5 is for the start-up data, plus the additional control and status words.
- GG is the group number within the main.
- PP is the parameter number within the group.

There have been two additional parameters, which are not visible from the drive local panel. These parameters are described in detail later. These parameters include:

- 5/01/01 is the status word of the drive,
- 5/01/02 is the command word for the drive.

10 DATASET 1.2 WRITE

As parameter 9 DATASET 1.1 WRITE. This parameter defines the second word of the outgoing dataset.

11 DATASET 1.3 WRITE
16 DATASET 1.8 WRITE

As parameters 9 DATASET 1.1 WRITE and 10 DATASET 1.2 WRITE.

17 DATASET 2 WRIT ID
26 DATASET 2.8 WRITE

As the parameters 7 DATASET W CYCLE – 16 DATASET 1.8 WRITE. These parameters define the information for the second outgoing dataset, if it is in use.

27 DATASET 1 READ ID

This parameter specifies the dataset identification number for the first dataset to be received from the wire.

If there is no need to receive the first data-set, this value can be set to zero.

The drive has no way of verifying that the information received is actually the information which was intended for. The programmer and designer of the system, should verify the program before starting up the drives.

28 DATASET 1.1 READ
35 DATASET 1.8 READ

These parameters specify word for word the use for the received word from the dataset. Any word can be either ignored, or it can be used for the purposes described in the table below.

Table 4-5 Incoming dataset use

Selection	Purpose for the received word
NOT SEL	Ignore
CMD WORD	ACS Command Word
ACS CMD WD	ACS Command Word sent by another drive Can be used to start and stop another ACS drive in the network.
EXT REF1	External reference 1
E REF1offs	External reference 1 offset
E REF1gain	External reference 1 gain
EXT REF2	External reference 2
E REF2offs	External reference 2 offset
E REF2gain	External reference 2 gain
E REF1 SEL	External reference 1 selection
E REF2 SEL	External reference 2 selection
EXT1 1/0	External reference 1 Start/Stop/Direction selection
EXT2 1/0	External reference 2 Start/Stop/Direction selection
CURR LIMIT	Drive Current Limit
ACC TIME1	Acceleration time 1
DEC TIME1	Deceleration time 1
PI GAIN	PI controller gain
PI I-TIME	PI controller integration time.

Invisible parameters

The addition of serial communication to the ACS drive has added a need for packed boolean word for both controlling and monitoring of drive.

To this purpose, we have added to the drive two parameters, which are invisible to the panel. They can only be accessed for both reading and modification using the serial communication protocol.

Drive status word

The drive status word is a 16-bit packed logical word. Each one of the bits in the word has a separate purpose, or is unused for the ACS 500 drive. The bits have the following meanings:

Table 4-6 Status word bits

Bit number	Description
0	0 = Drive stopped 1 = Drive running
1	0 = Drive running or faulted 1 = Drive stopped and ready to start (no faults)
2	0 = Drive not faulted 1 = Drive faulted
3	0 = Drive in keypad control 1 = Drive in external control
4	0 = DC Voltage normal 1 = DC Undervoltage or DC Overvoltage
5	As bit 4
6	Not in use
7	1 = Flying start
8	1 = Drive running at speed
9	1 = Drive Overtemperature Warning
10	1 = Motor Overtemperature Warning
11	Digital input 1
12	Digital input 2
13	Digital input 3
14	Digital input 4
15	0 = Drive running at forward direction 1 = Drive running at reverse direction

Drive control word

The drive control word is a 16-bit packed logical word, which is used to control the drive with the minimum amount of communication network load. Each one of the bits on the control word has a unique meaning and purpose.

Table 4-7 Control word bits

Bit number	Description
0	1 = Stop by ramp
1	Not used
2	1 = Stop by coast
3	Not used
4	0 -> 1 Start to speed. Rising edge of the bit will start.
5	1 = Select ext ref 2 Takes effect only if activated from 10.02.01
6	1 = Select ext ref 1 Takes effect only if activated from 10.02.01
7	1 = Select ext ref 2 Takes effect only if activated from 10.02.01
8	Not used
9	Not used
10	Not used
11	Not used
12	Communication loss detection
13	1 = Panel lock Takes effect only if activated from 10.04.03
14	1 = Reset fault Takes effect only if activated from 10.04.02
15	0 = Forward 1 = Reverse

Bit 12 has a special purpose. If the control source is selected to be 32, the ACS/ACH 500 will follow bit 12. If bit 12 does not change its value for 10 seconds, a communication loss fault is generated.

This bit is used typically on PLC controlled applications. The PLC should generate a toggling bit, which is then sent to the control word bit 12. If either there is a communication loss, or the PLC is set to program mode, this bit will stop toggling. This will then cause a communication loss fault to the drive.

Fault queue

The ACS/ACH 500 has a fault queue, which records the latest three faults. The queue can be sent out using the serial communication protocol.

The fault queue values are number coded. The number coding for both the warnings, and faults is listed below.

Warnings

Warnings are diagnostic messages generated by the drive for the user. These messages do not cause the drive to fault, but they are still recorded into the fault queue.

The following warning codes can be returned, when the fault queue parameters are read using serial communication:

Table 4-8 Drive warnings

Number	Text in display	Meaning
2	1 SAMI TEMP	Drive overheat
4	2 MOT STALL	Motor stall
6	3 MOT TEMP	Motor overload
12	6 UNDER LD	Under load warning
14	7 AI<2V/4mA	Analog input under 2V/4mA
16	8 EEPROM WR	EEPROM writing warning

Faults

Faults are non-normal 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 more detailed description of the corresponding faults see *Installation & Start-up Manual* for ACS drives. The following fault codes can be returned, when the fault queue parameters are read using serial communication:

Table 4-9 Drive Faults

Number	Text in display	Meaning
1	1 START/STOP	Start/stop request and status contradiction
3	2 SAMI TEMP	Drive overheat heat sink
5	3 MOT STALL	Motor stall
7	4 MOT TEMP	Motor overload
13	7 UNDER LD	Under load
15	8 OVER CURR1	Over current
17	9 OVER VOLT	Over voltage
19	10 UNDER V 1	Under voltage trip
21	11 AI<2V/4mA	Analog input under 2V/4mA
31	16 POW RANG	Power range programming changed
33	17 RS-485	RS-485 serial communication fault
37	19 IN COMMS	Internal serial communication fault
39	20 CON INT	Control interface (HW) fault
41	21 MOT CONT	Motor controller (HW) fault
43	22 PAR REST	Parameter reading error
45	23 UNDER V 2	Unsuccessful DC-link charging
47	24 GND FAULT	Ground fault
49	25 EXT FLT	External fault

Chapter 5 – Start-up procedure

This chapter describes safety considerations and the start-up procedures for the installation of the CDI 300 network update EPROM for the ACS and ACH 500 drives.

Overview

CDI 300 wiring

The CDI 300 network should be wired according the information given in Chapter 3 - Installation.

To avoid any damages caused by loose wires, the following items should be checked before applying power to the drives:

- Check that there are no loose wires or threads on the serial connector.
- Verify that all wires and shields are well connected to the corresponding screw terminals.
- Verify that all wires are connected to the correct screws on the terminal block, and that no wires are swapped.

If there would be a possibility of a mechanical pull on the communication cable, this should be stopped by some method of strain relief. The terminal block is not designed for blocking the mechanical pull.

EPROM update

The CDI 300 network updates comes as an EPROM update. This EPROM should replace the original EPROM on the drive.

ESD procedures must be followed during the change of the EPROM on the drive. The EPROM must be placed correctly onto the control board. Verify the alignment from the original EPROM residing on the drive.

The EPROM updates must be done while the drive is disconnected from the power supply.

After the EPROM change, there will be a fault text PAR REST generated to the drive when the drive is first time connected to power. After this fault message, the electrical power must be disconnected, which will clear the fault message. After the second power up, the drive will operate normally, and the drive can be programmed normally.

Grounding

Grounding for the serial communication cable is described on the *Chapter 3 - Installation.*

The drives must also be grounded from the frame. This grounding should go to the same grounding point for all of the drives connected together using the communication network.

The drive control board is grounded at the factory using a ground wire from terminal block X50, pin 8 to the drive chassis ground. This wire must be removed for the CDI 300 network operation.

The removal of this grounding wire will cause the control boards to float in their potentials. This must be remembered while connecting any possible analog or digital inputs to the drive.

The control boards are also connected together through the RS-485 wiring.

Programming

The drives must be programmed using the drive panel for the installation. The parameters that need to be considered for the serial interface are listed in *Chapter 4 - Programming.*

Chapter 6 – Fault Tracing

This chapter describes trouble shooting procedures for the CDI 300 network installation using diagnostics counters, fault queues, and drive status displays. Also some possible fault origins are discussed.

Fault diagnostics

This chapter concentrates on the problems and possible remedies for the serial communication connection for the CDI 300 network. For other general fault diagnostics with the ACS 500 or ACH 500 drives consult the appropriate product manual.

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

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

The major diagnostic features for fault tracing on the network include Group 10.8 External Communication parameters 5 `BAD MESSAGE COUNTER` and 6 `GOOD MESS 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 MESS COUNTER` should be constantly advancing on all the stations, and the `BAD MESSAGE COUNTER` should advance very slowly, if at all.

If there would be problems, the `BAD MESSAGE COUNTER` will advance whenever there is a bad character received, and the `GOOD MESS COUNTER` will advance for each of the received good characters on wire.

No Bus Administrator on line

How to diagnose: The `GOOD MESS COUNTER` nor the `BAD MESSAGE COUNTER` does not increase on any of the stations.

How to correct: Check that one of the stations on line is programmed to be station zero. Verify that the BA has power connected to it. Verify that the cable is connected, and is not cut or short circuited.

Duplicate station

How to diagnose: Datasets being transmitted from one station are not received by any of the stations. The BAD MESSAGE COUNTER is advancing slowly.

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

Duplicate dataset number

How to diagnose: The dataset being transmitted either never comes, or its data is random. The BAD MESSAGE COUNTER is advancing.

How to fix: Check all the dataset numbers from all of the stations. Change the conflicting dataset numbers.

Improper grounding

How to diagnose: The BAD MESSAGE COUNTER is advancing. If the drives are turned on, the BAD MESSAGE COUNTER advances faster.

There might also be a CON INT, IN COMMS, or MOT CONT faults coming randomly.

How to fix: Check the wiring, shield connections, and grounding. See that no noise is brought to the drive through analog or digital inputs or outputs. Verify that the grounding wire from screw 8 on terminal block X50 is removed.

Swapped wires

How to diagnose: The GOOD MESS COUNTER is not advancing. The BAD MESSAGE COUNTER is advancing.

How to fix: Check that the RS-485 line lines are not swapped. Verify that the control boards are connected together using the wire on screw 4 on the serial communication terminal block.

Summary

The problems described here cover the most usual problems on starting up the CDI 300 network. Intermittent problems might well be caused by marginally loose connections, vibration caused wear on wires, or especially through insufficient grounding and shielding on both the devices and on the communication cables.

If after basic troubleshooting, the problem continues, contact ABB technical support (800) 243 4384.

Appendix A – Parameter List

This chapter lists all the parameters from the ACS 500 drive. This chapter is intended for reference purposes.

All the numbers read and written to the drive are in 16 bit integer format. To use these numbers properly, there is a need to know the units for each one of the parameters. These units are listed within this chapter. For the message communication it is also necessary to know the parameter address. These addressees are listed in the parameter list below.

For more detailed information, refer to the *ACS 500 Programming Manual*, and to the *Chapter 4 - Programming* in this manual.

Parameters

The following table lists all of the parameters. For each parameter, the following information is provided:

- The parameter name, as it appears on the local drive panel.
- The unique read identification for the parameter. This is used for message reads and writes as the address.
- The parameter name, as it appears on the local drive panel.
- The scaling for the parameter

Table A-9 Parameter Settings

Parameter	Address	Alternative Settings	Units
START-UP DATA			
A LANGUAGE	5/00/001	0:FINNISH; 1:SWEDISH; 2:ENGLISH; 3:GERMANY; 4:ITALIAN; 5:SPANISH; 6:DUTCH; 7:FRENCH; 8:DANISH	LIST
B APPLICATIONS	5/00/002	1:FACTORY; 2:HAND/AUTO; 3:PI-CONTROL; 4:OPT. PACK; 5:SEQ CTRL	LIST
C APPLIC. RESTORE	5/00/003	0:NO; 1:YES	LIST
D SUPPLY VOLTAGE	5/00/004	0:208; 1:220; 2:230; 3:240; 0:380; 1:400; 2:415; 0:440; 1:460; 2:480; 3:500	LIST
E USER DISPLAY SCALE	5/00/005	0 – 10000	100 = 100
F MOTOR CURRENT -FLA	5/00/006	0 A – 1000 A (printed on the motor nameplate)	[0.1 A] 10 = 1.0A
G MOTOR POWER hp (kW)	5/00/007	0.7 hp – 1340 hp (0.5 kW – 1000 kW) (printed on the motor nameplate)	[0.1 Hp] 10 = 1.0 Hp
H MOTOR POWER FACTOR	5/00/008	0.1 – 1.0 (printed on the motor nameplate)	[0.01] 100 = 1.0
I MOTOR BASE FREQ.	5/00/009	30 Hz – 500 Hz (printed on the motor nameplate)	[10 Hz] 6 = 60 Hz
J MOTOR BASE R.P.M.	5/00/010	200 RPM – SYNC. SPEED (printed on the motor nameplate)	[rpm] 1728 = 1728 rpm
K MOTOR NOM. VOLTAGE	5/00/011	110 V – 575 V (printed on the motor nameplate)	[V] 230 = 230 V

Parameter	Address	Alternative Settings	Units
OPERATING DATA			
1 OUTPUT FREQUENCY	0/00/001	Hz	[0.01 Hz] 100 = 1.00 Hz
2 SPEED	0/00/002	RPM; %; USER SCALING	1728 = 1728 rpm
3 MOTOR CURRENT	0/00/003	A	[0.1 A] 10 = 1.0 A
4 % RATED TORQUE	0/00/004	%	[%] 10 = 10 %
5 % RATED POWER	0/00/005	%	[%] 10 = 10 %
6 DC BUS VOLTAGE	0/00/006	% OF RATED NOMINAL	[%] 100 = 100 % of nominal
7 OUTPUT VOLTAGE	0/00/007	V	[%] 100 = 100 % of nominal
8 DRIVE TEMPERATURE	0/00/008	degrees C and F	[°C] 25 = 25 °C
9 CONTROL LOCATION	0/00/009	0:KEYPAD R1; 1:KEYPAD PI; 2:EXTERNAL	LIST
10 KEYPAD REF 1	0/00/010	Hz	[0.01 Hz] 100 = 1.00 Hz
11 KEYPAD PI (REF 2)	0/00/011	%	[0.01 %] 100 = 1.00 %
12 EXT REF 1 OR 2	0/00/012	0:REF1; 1:REF2	LIST
13 EXTERNAL REF 1	0/00/013	Hz	[0.01 Hz] 100 = 1.0 Hz
14 EXTERNAL REF 2	0/00/014	%	[0.01 %] 100 = 1.00 %
15 RUN TIME	0/00/015	h/min	[h] 100 = 100 hours
16 KILOWATT HOURS	0/00/016	kWh	[kWh] 1 = 1 kWh
17 LAST-RECD FAULT	0/00/017	FAULT; WARNING	See table s 4-8 and 4-9
18 SECOND-RECD FAULT	0/00/018	FAULT; WARNING	See table s 4-8 and 4-9
19 FIRST-RECD FAULT	0/00/019	FAULT; WARNING	See table s 4-8 and 4-9
20 PARAMETER LOCK	0/00/020	OPEN xxx; LOCKED xxx; OPEN; LOCKED	0: OPEN 1:LOCKED

Parameter	Address	Alternative Settings	Units
10 CONTROL CONNECTIONS			
10.1 START/STOP/DIRECTION			
10.1.1 EXT 1 STRT/STP/DIR	1/01/001	0:NOT SEL; 1:DI1; 2:DI1,2; 3:DI1P,2P; 4:DI1P,2P,3; 5:DI1P,2P,3P; 6:DI6; 7:DI6,5; 8:KEYPAD; 9:STD COMM	LIST
10.1.2 EXT 2 STRT/STP/DIR	1/01/002	0:NOT SEL; 1:DI1; 2:DI1,2; 3:DI1P,2P; 4:DI1P,2P,3; 5:DI6; 6:DI6,5; 7:KEYPAD; 8:STD COMM	LIST
10.1.3 LOC/EXT DIRECTION	1/01/003	0:REVERSE; 1:FORWARD; 2:REQUEST; 3:FAST REV	LIST
10.2 EX REFERENCE SELECT			
10.2.1EXT 1/EXT 2 SELECT	1/02/001	0:OP DATA 12; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6; 7:STD COMM	LIST
10.2.2 EXTERNAL REF1 SEL	1/02/002	0:OP DATA 13; 1:AI1; 2:AI2; 3:AI1/JOYST; 4:DI3U,4D(R); 5:DI3U,4D; 6:DI5U,6D; 7:STD COMM	LIST
10.2.3 EXT REF1 MINIMUM	1/02/003	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.2.4 EXT REF1 MAXIMUM	1/02/004	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.2.5 EXT REF1 OFFSET	1/02/005	-30 Hz – 30 Hz	[0.01 Hz] 100 = 1.00 Hz
10.2.6 EXT REF1 GAIN	1/02/006	-100 % – 100 %	[0.01 %] 100 = 1.00 %
10.2.7 EXTERNAL REF2 SEL	1/02/007	0:OP DATA 14; 1:AI1; 2:AI2; 3:DI3U,4D(R); 4:DI3U,4D; 5:DI5U,6D	LIST
10.2.8 EXT REF2 MINIMUM	1/02/008	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.2.9 EXT REF2 MAXIMUM	1/02/009	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.2.10 EXT REF1 OFFSET	1/02/010	-30 Hz – 30 Hz	[0.01 Hz] 100 = 1.00 Hz
10.2.11 EXT REF1 GAIN	1/02/011	-100 % – 100 %	[0.01 %] 100 = 1.00 %

Parameter	Address	Alternative Settings	Units
10.3 PRESET SPEEDS			
10.3.1 PRESET SPEED SEL	1/03/001	0:NOT SEL; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6; 7:DI1,2; 8:DI3,4; 9:DI5,6; 10:DI1,2,3; 11:DI3,4,5; 12:DI4,5,6	LIST
10.3.2 PRESET SPEED 1	1/03/002	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.3 PRESET SPEED 2	1/03/003	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.4 PRESET SPEED 3	1/03/004	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.5 PRESET SPEED 4	1/03/005	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.6 PRESET SPEED 5	1/03/006	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.7 PRESET SPEED 6	1/03/007	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.3.8 PRESET SPEED 7	1/03/008	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
10.4 SYSTEM CONTR INPUTS			
10.4.1 RUN ENABLE	1/04/001	0:YES; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6	LIST
10.4.2 FAULT RESET SELECT	1/04/002	0:NOT SEL; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6; 7:ON STOP; 8:STD COMM.	LIST
10.4.3 PARAM. LOCK SEL	1/04/003	0:OP DATA 20; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6; 7:STD COMM.	LIST
10.4.4 EXTERNAL FAULT	1/04/004	0:NOT SEL; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6	LIST

Parameter	Address	Alternative Settings	Units
10.5 ANALOG INPUTS			
10.5.1 MINIMUM AI1	1/05/001	0:0 V/0 mA; 1:2 V/4 mA; 2:READ INPUT	LIST
10.5.2 MAXIMUM AI1	1/05/002	0:10 V/20 mA; 1:READ INPUT	LIST
10.5.3 RC FILTER ON AI1	1/05/003	0.01s – 10s	[0.01 s] 100 = 1.00 s
10.5.4 INVERT AI1	1/05/004	0:NO; 1:YES	LIST
10.5.5 MINIMUM AI2	1/05/005	0:0 V/0 mA; 1:2 V/4 mA; 2:READ INPUT	LIST
10.5.6 MAXIMUM AI2	1/05/006	0:10 V/20 mA; 1:READ INPUT	LIST
10.5.7 RC FILTER ON AI2	1/05/007	0.01s – 10s	[0.01 s] 100 = 1.00 s
10.5.8 INVERT AI2	1/05/008	0:NO; 1:YES	LIST
10.6 RELAY OUTPUTS			
10.6.1 RELAY RO1 OUTPUT	1/06/001	0:NOT USED; 1:READY; 2:RUN; 3:FAULT; 4:FAULT(-1); 5:FAULT(RST); 6:STALL FLT; 7:MOT OT FLT; 8:OT FAULT; 9:FAULT/WARN; 10:WARNING; 11:OT WARNING; 12:REVERSED; 13:EXT. CTRL; 14:REF 2 SEL; 15:PRESET SPD; 16:DC BUS LIM; 17:FREQ 1 LIM; 18:FREQ 2 LIM; 19:CURR LIMIT; 20:REF 1 LIMIT; 21:REF 2 LIMIT; 22:AT SPEED; 23:(P&F AUTOM)	LIST
10.6.2 RELAY RO2 OUTPUT	1/06/002		
10.6.3 RELAY RO3 OUTPUT	1/06/003		

Parameter	Address	Alternative Settings	Units
10.7 ANALOG OUTPUTS			
10.7.1 ANALOG OUTPUT 1	1/07/001	0:NOT USED; 1:OUT FREQ; 2:MOT SPEED; 3:OUT CURR; 4:MOT TORQ; 5:MOT POWER; 6:V/DC BUS; 7:MOTOR VOLT; 8:REFERENCE	LIST
10.7.2 SCALE AO1	1/07/002	10% – 1000%	[%] 100 = 100 %
10.7.3 MINIMUM AO1	1/07/003	0:0 mA; 1:4 mA	LIST
10.7.4 RC FILTER ON AO1	1/07/004	0.01s – 10s	[0.01 s] 100 = 1.00 s
10.7.5 INVERT AO1	1/07/005	0:NOT USED; 1:OUT FREQ; 2:MOT SPEED; 3:OUT CURR; 4:MOT TORQ; 5:MOT POWER; 6:V/DC BUS; 7:MOTOR VOLT; 8:REFERENCE	LIST
10.7.6 ANALOG OUTPUT 2	1/07/006	10% – 1000%	[%] 100 = 100 %
10.7.7 SCALE AO2	1/07/007	0:0 mA; 1:4 mA	LIST
10.7.8 MINIMUM AO2	1/07/008	0.01s – 10s	[0.01 s] 100 = 1.00 s
10.7.9 RC FILTER ON AO2	1/07/009	0:NO; 1:YES	LIST
10.7.10 INVERT AO2	1/07/010	0:NOT USED; 1:OUT FREQ; 2:MOT SPEED; 3:OUT CURR; 4:MOT TORQ; 5:MOT POWER; 6:V/DC BUS; 7:MOTOR VOLT; 8:REFERENCE	LIST

Parameter	Address	Alternative Settings	Units
10.8 EXT COMMUNICATION			
10.8.1 DRIVE ID-NUMBER	1/08/001	0 – 31	Number 1 = 1
10.8.2 DEVICE NAME	1/08/002	"No Name"	Text string
10.8.3 CONTROL SOURCE	1/08/003	0 – 32	Number 1 = 1
10.8.4 COMMS FAULT FUNCT	1/08/004	0:NONE; 1:FAULT; 2:FAULT+STOP	LIST
10.8.5 BAD MESSAG COUNTER	1/08/005	0 – 65535	Number 1 = 1
10.8.6 GOOD MESS COUNTER	1/08/006	0 – 255	Number 1 = 1
10.8.7 DATASET 1 WRIT ID	1/08/007	0 – 64	Number 1 = 1
10.8.8 DATASET 1 W CYCLE	1/08/008	0.1 s – 25.5 s	[0.1 s] 10 = 1.0 s
10.8.9 DATASET 1.1 WRITE	1/08/009	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.10 DATASET 1.2 WRITE	1/08/010	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.11 DATASET 1.3 WRITE	1/08/011	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.12 DATASET 1.4 WRITE	1/08/012	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.13 DATASET 1.5 WRITE	1/08/013	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.14 DATASET 1.6 WRITE	1/08/014	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.15 DATASET 1.7 WRITE	1/08/015	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.16 DATASET 1.8 WRITE	1/08/016	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03

Parameter	Address	Alternative Settings	Units
10.8.17 DATASET 2 WRIT ID	1/08/017	0 – 64	Number 1 = 1
10.8.18 DATASET 2 W CYCLE	1/08/018	0.1 s – 25.5 s	[0.1 s] 10 = 1.0 s
10.8.19 DATASET 2.1 WRITE	1/08/019	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.20 DATASET 2.2 WRITE	1/08/020	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.21 DATASET 2.3 WRITE	1/08/021	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.22 DATASET 2.4 WRITE	1/08/022	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.23 DATASET 2.5 WRITE	1/08/023	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.24 DATASET 2.6 WRITE	1/08/024	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.25 DATASET 2.7 WRITE	1/08/025	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03
10.8.26 DATASET 2.8 WRITE	1/08/026	0/00/00 – 5/01/01	Number 0 = 0/00/00, 10203 = 1/02/03

Parameter	Address	Alternative Settings	Units
10.8.27 DATASET 1 READ	1/08/027	0 – 64	Number 1 = 1
10.8.28 DATASET 1.1 READ	1/08/028	0:NOT SEL; 1:CMD WORD; 2:ACS CMD WD; 3:EXT REF 1; 4:E REF1offs; 5:E REF1gain; 6:EXT REF 2; 7:E REF2offs; 8:E REF2gain; 9:E REF1 SEL; 10:E REF2 SEL; 11:EXT1 1/0; 12:EXT2 1/0; 13:CURR LIMIT; 14:ACC TIME; 15:DEC TIME; 16:PI GAIN; 17:PI I-TIME	LIST
10.8.29 DATASET 1.2 READ	1/08/029		LIST
10.8.30 DATASET 1.3 READ	1/08/030		LIST
10.8.31 DATASET 1.4 READ	1/08/031		LIST
10.8.32 DATASET 1.5 READ	1/08/032		LIST
10.8.33 DATASET 1.6 READ	1/08/033		LIST
10.8.34 DATASET 1.7 READ	1/08/034		LIST
10.8.35 DATASET 1.8 READ	1/08/035		LIST
10.8.36 DATASET 2 READ	1/08/036	0 – 64	Number 1 = 1
10.8.37 DATASET 1.1 READ	1/08/037	0:NOT SEL; 1:CMD WORD; 2:ACS CMD WD; 3:EXT REF 1; 4:E REF1offs; 5:E REF1gain; 6:EXT REF 2; 7:E REF2offs; 8:E REF2gain; 9:E REF1 SEL; 10:E REF2 SEL; 11:EXT1 1/0; 12:EXT2 1/0; 13:CURR LIMIT; 14:ACC TIME; 15:DEC TIME; 16:PI GAIN; 17:PI I-TIME	LIST
10.8.38 DATASET 1.2 READ	1/08/038		LIST
10.8.39 DATASET 1.3 READ	1/08/039		LIST
10.8.40 DATASET 1.4 READ	1/08/040		LIST
10.8.41 DATASET 1.5 READ	1/08/041		LIST
10.8.42 DATASET 1.6 READ	1/08/042		LIST
10.8.43 DATASET 1.7 READ	1/08/043		LIST
10.8.44 DATASET 1.8 READ	1/08/044		LIST

Parameter	Address	Alternative Settings	Units
20 DRIVE PARAMETERS			
20.1 FREQ/CURRENT LIMITS			
20.1.1 MINIMUM FREQUENCY	2/01/001	0 Hz – MAX. FREQ.	[0.01 Hz] 100 = 1.00 Hz
20.1.2 MAXIMUM FREQUENCY	2/01/002	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.1.3 FREQUENCY RANGE	2/01/003	0:0 Hz – 120 Hz; 1:0 Hz – 500 Hz (ACS 501 only)	LIST
20.1.4 CURRENT LIMIT	2/01/004	0.5 – 2.0 x I_N (ACS 500)	[% of I_n] 100 = 100% I_n
20.2 START/STOP			
20.2.1 START FUNCTION	2/02/001	0:RAMP; 1:FLYING; 2:TORQ BOOST; 3:FLYING+TQB	LIST
20.2.2 TORQUE BOOST CURR	2/02/002	0.5 – 2.0 x I_N (ACS 500)	[% of I_n] 100 = 100% I_n
20.2.3 STOP FUNCTION	2/02/003	0:COAST; 1:RAMP; 2:DC BRAKE	LIST
20.2.4 BRAKE CHOPPER	2/02/004	0:NO; 1:YES	LIST
20.2.5 DC HOLD	2/02/005	0:OFF; 1:ON	LIST
20.2.6 DC HOLD VOLTAGE	2/02/006	0.01 – 0.1 x V_N	[0.1 % V_{Supply}] 100 = 10% * V_{Supply}
20.2.7 DC BRAKE VOLTAGE	2/02/007	0.01 – 0.1 x V_N	[0.1 % V_{Supply}] 100 = 10% * V_{Supply}
20.2.8 DC BRAKE TIME	2/02/008	0s – 250s	[s] 1 = 1 s

Parameter	Address	Alternative Settings	Units
20.3 ACCEL/DECEL			
20.3.1 ACC/DEC 1 0R 2 SEL	2/03/001	0:NOT SEL; 1:DI1; 2:DI2; 3:DI3; 4:DI4; 5:DI5; 6:DI6	LIST
20.3.2 ACC/DEC RAMP SHAPE	2/03/002	0:LINEAR; 1:S1; 2:S2; 3:S3	LIST
20.3.3 ACCEL TIME 1	2/03/003	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.3.4 DECEL TIME 1	2/03/004	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.3.5 ACCEL TIME 2	2/03/005	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.3.6 DECEL TIME 2	2/03/006	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.3.7 ACCEL REF2 TIME	2/03/007	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.3.8 DECEL REF2 TIME	2/03/008	0.1s – 1800s	[0.1 s] 10 = 1.0 s
20.4 MOTOR CONTROL			
20.4.1 SWITCHING FREQ	2/04/001	1.0 kHz – 12.0 kHz (ACS 501); 3.0 kHz (ACS 502)	[100 Hz] 30 = 3.0 kHz
20.4.2 MAX OUTPUT VOLTAGE	2/04/002	0.15 – 1.05 x V_N	[0.1% V_{Supply}] 1000 = 100.0 % V_{Supply}
20.4.3 V/HZ RATIO	2/04/003	0:LINEAR; 1:SQUARED; 2:AUTOMATIC	LIST
20.4.4 FIELD WEAK POINT	2/04/004	30 Hz – 500 Hz	[Hz] 60 = 60 Hz
20.4.5 IR COMPENSATION	2/04/005	0:NO; 1:MANUAL; 2:AUTOMATIC	LIST
20.4.6 IR COMP VOLTAGE	2/04/006	0.01 – 0.15 x V_N	[0.1% V_{Supply}] 100 = 10.0 % V_{Supply}
20.4.7 IR COMP RANGE	2/04/007	0 Hz – FWP	[Hz] 60 = 60 Hz
20.4.8 SLIP COMPENSATION	2/04/008	0:OFF; 1:ON	LIST
20.4.9 NOMINAL SLIP	2/04/009	0.1% – 10%	[0.1 %] 100 = 10.0 %
20.4.10 VOLTAGE LIMIT	2/04/010	0:OFF; 1:ON	LIST

Parameter	Address	Alternative Settings	Units
20.5 CRITICAL FREQUENCIES			
20.5.1 CRIT FREQ SELECT	2/05/001	0:OFF; 1:ON	LIST
20.5.2 CRIT FREQ 1 LOW	2/05/002	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.3 CRIT FREQ 1 HIGH	2/05/003	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.4 CRIT FREQ 2 LOW	2/05/004	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.5 CRIT FREQ 2 HIGH	2/05/005	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.6 CRIT FREQ 3 LOW	2/05/006	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.7 CRIT FREQ 3 HIGH	2/05/007	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.8 CRIT FREQ 4 LOW	2/05/008	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.9 CRIT FREQ 4 HIGH	2/05/009	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.10 CRIT FREQ 5 LOW	2/05/010	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
20.5.11 CRIT FREQ 5 HIGH	2/05/011	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz

Parameter	Address	Alternative Settings	Units
30 PROTECTION/INFORMAT			
30.1 FAULT FUNCTION			
30.1.1 SERIAL FAULT FUNC	3/01/001	0:STOP; 1:PRE SPEED7	LIST
30.1.2 AI <MIN FUNCTION	3/01/002	0:NO; 1:WARNING; 2:FAULT; 3:PRE SPEED7	LIST
30.1.3 MOT TEMP FLT FUNC	3/01/003	0:NO; 1:WARNING; 2:FAULT	LIST
30.1.4 MOTOR THERM TIME	3/01/004	300s – 10000s	[s] 120 = 120 s
30.1.5 MOTOR LOAD CURVE	3/01/005	50% – 150%	[%] 50 = 50%
30.1.6 ZERO SPEED LOAD	3/01/006	40% – MOTOR LOAD CURVE	[%] 100 = 100%
30.1.7 BREAK POINT	3/01/007	1 Hz – 500 Hz	[Hz] 60 = 60 Hz
30.1.8 STALL FUNCTION	3/01/008	0:NO; 1:WARNING; 2:FAULT	LIST
30.1.9 STALL CURRENT	3/01/009	0 – 1.5 x I_N	[0.01 I_N] 150 = 1.5 * I_N
30.1.10 STALL TIME/FREQ	3/01/010	0:10s/15 Hz; 2:20s/25 Hz; 3:30s/35 Hz	LIST
30.1.11 UNDERLOAD FUNC	3/01/011	0:NO; 1:WARNING; 2:FAULT	LIST
30.1.12 UNDERLOAD TIME	3/01/012	0 – 600s	[s] 100 = 100 s
30.1.13 UNDERLOAD CURVE	3/01/013	1 – 5	Number
30.2 AUTOMATIC RESET			
30.2.1 NUMBER OF RESETS	3/02/001	0 – 5	Number
30.2.2 TIME WINDOW	3/02/002	1s – 180s	[s] 10 = 10 s
30.2.3 TIME BETW. RESET ATTEMPTS	3/2/003	0s – 120s	[s] 10 = 10 s
30.2.4 OVERVOLTAGE	3/02/004	0:NO; 1:YES	LIST
30.2.5 UNDERVOLTAGE	3/02/005	0:NO; 1:YES	LIST
30.2.6 OVERCURRENT	3/02/006	0:NO; 1:YES	LIST
30.2.7 AI SIGNAL <MIN	3/02/007	0:NO; 1:YES	LIST

Parameter	Address	Alternative Settings	Units
30.3 SUPERVISION			
30.3.1 OUTPUT FREQ 1 FUNC	3/03/001	0:NO; 1:LOW LIMIT; 2:HIGH LIMIT	LIST
30.3.2 OUTPUT FREQ 1 LIM	3/03/002	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.1 Hz] 10 = 1.0 Hz
30.3.3 OUTPUT FREQ 2 FUNC	3/03/003	0:NO; 1:LOW LIMIT; 2:HIGH LIMIT	LIST
30.3.4 OUTPUT FREQ 2 LIM	3/03/004	0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.1 Hz] 10 = 1.0 Hz
30.3.5 CURRENT FUNCTION	3/03/005	0:NO; 1:LOW LIMIT; 2:HIGH LIMIT	LIST
30.3.6 CURRENT LIMIT	3/03/006	0 – 2 x I_N (ACS 500)	[% I_N] 100 = 100% I_N
30.3.7 REF1 FUNCTION	3/03/007	0:NO; 1:LOW LIMIT; 2:HIGH LIMIT	LIST
30.3.8 REF1 LIMIT	3/03/008	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
30.3.9 REF2 FUNCTION	3/03/009	0:NO; 1:LOW LIMIT; 2:HIGH LIMIT	LIST
30.3.10 REF2 LIMIT	3/03/010	0% – 100%	[0.01 %] 100 = 1.00 %
30.3.11 SUPERVIS MESSAGES	3/03/011	0:OFF; 1:ON	LIST
30.4 INFORMATION			
30.4.11 CRI PROG VERSION	3/04/001	(Version in Drive)	Not supported on communication
30.4.2 MC PROG VERSION	3/04/002	(Version in Drive)	
30.4.3 TEST DATE	3/04/003	(Date Tested)	

Parameter	Address	Alternative Settings	Units
40 APPLICATION PARAMETERS		(CAN BE SEEN ONLY WITH APPLICATION MACROS)	
40.1 PI-CONTROL		(CAN BE SEEN ONLY WITH PI-CONTROL MACRO)	
40.1.1 PI-CONT GAIN	4/01/001	3% – 800%	[0.1 %] 10 = 1.0 %
40.1.2 PI-CONT I-TIME	4/01/002	0.02s – 320s	[0.01 s] 100 = 1.00 s
40.1.3 PI-CONT MIN LIMIT	4/01/003	0 Hz – PI-CONT MAX LIMIT	[0.01 Hz] 100 = 1.00 Hz
40.1.4 PI-CONT MAX LIMIT	4/01/004	0 Hz – 120 Hz / 0 Hz – 500 Hz (ACS 501); 0 Hz – 120 Hz (ACS 502)	[0.01 Hz] 100 = 1.00 Hz
40.1.5 ERROR VALUE INVERT	4/01/005	0:NO; 1:YES	LIST
40.1.6 ACTUAL VALUE SEL	4/01/006	0:ACT1; 1:ACT1-ACT2; 2:ACT1+ACT2; 3:ACT1*ACT2	LIST
40.1.7 ACTUAL 1 INPUT	4/01/007	0:NO; 1:AI1; 2:AI2	LIST
40.1.8 ACTUAL 2 INPUT	4/01/008	0:NO; 1:AI1; 2:AI2	LIST
40.1.9 ACT 1 MIN SCALE	4/01/009	-1600.0% – 1600.0%	[0.1 %] 10 = 1.0 %
40.1.10 ACT 1 MAX SCALE	4/01/010	-1600.0% – 1600.0%	[0.1 %] 10 = 1.0 %
40.1.11 ACT 2 MIN SCALE	4/01/011	-1600.0% – 1600.0%	[0.1 %] 10 = 1.0 %
40.1.12 ACT 2 MAX SCALE	4/01/012	-1600.0% – 1600.0%	[0.1 %] 10 = 1.0 %

CDI 300-04
EFFECTIVE 9/23/93

ABB Drives Inc.
Standard Drives Division
16250 West Glendale Drive
New Berlin, WI 53151
Telephone: (414) 785-3416
Fax: (414) 785-0397

ABB Drives
P.O. Box 184
00381 Helsinki
FINLAND
Telephone: +358-0-5641
Telefax: +358-0-564 2681
Telex: +57-12440502 str sf

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