

Altivar Process

Ethernet Manual (Embedded)

08/2014



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in death or serious injury**.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in death or serious injury**.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in minor or moderate injury**.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Qualification Of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used. All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

Intended Use

This product is a drive for three-phase synchronous and asynchronous motors and intended for industrial use according to this manual. The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data. Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented. Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design). Any use other than the use explicitly permitted is prohibited and can result in hazards. Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

Product Related Information

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Many components of the product, including the printed circuit boards, operate with mains voltage. Do not touch. Use only electrically insulated tools.
- Do not touch unshielded components or terminals with voltage present.
- Motors can generate voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.
- Before performing work on the drive system:
 - Disconnect all power, including external control power that may be present.
 - Place a **Do Not Turn On** label on all power switches.
 - Lock all power switches in the open position.
 - Wait 15 minutes to allow the DC bus capacitors to discharge. The DC bus LED is not an indicator of the absence of DC bus voltage that can exceed 800 Vdc. Measure the voltage on the DC bus between the DC bus terminals (PA/+, PC/-) using a properly rated voltmeter to verify that the voltage is <42 Vdc
 - If the DC bus capacitors do not discharge properly, contact your local Schneider Electric representative. Do not repair or operate the product.
- Install and close all covers before applying voltage.

Failure to follow these instructions will result in death or serious injury.

WARNING

UNEXPECTED MOVEMENT

Drive systems may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

DANGER

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines (1).
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

(1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control and to NEMA ICS 7.1 (latest edition), Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

Before switching on and configuring the product, verify that it is approved for the mains voltage

Failure to follow these instructions can result in equipment damage.



At a Glance

Document Scope

The purpose of this document is to:

- Show you how to connect the Ethernet fieldbus on your drive.
- Show you how to set up the drive to use Ethernet for monitoring and control.
- Provide examples of setup using commissioning software

NOTE: Read and understand this document and all related documents (see below) before installing, operating, or maintaining your drive.

Validity Note

This documentation is valid for the drive Ethernet fieldbus.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">• Do not include blank spaces in the model number/product range.• To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click Download XXX product datasheet .

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on www.schneider-electric.com

The Internet site provides the information you need for products and solutions

- The whole catalog for detailed characteristics and selection guides
- The CAD files to help design your installation, available in over 20 different file formats
- All software and firmware to maintain your installation up to date
- A large quantity of White papers, environment documents, application solutions, specifications... To gain a better understanding of electrical systems and equipment or automation
- All the user guides related to your drive, listed below:

Title of Documentation	Reference Number
Altivar Process Getting Started	EAV63253
Altivar Process Installation Manual	EAV64301
Altivar Process Programming Manual	EAV64318
Altivar Process Modbus Serial Link Manual (Embedded)	EAV64325
Altivar Process Ethernet Manual (Embedded)	EAV64327
Altivar Process Ethernet IP - Modbus TCP Manual (VW3A3720)	EAV64328
Altivar Process PROFIBUS DP manual (VW3A3607)	EAV64329

Title of Documentation	Reference Number
Altivar Process DeviceNet manual (VW3A3609)	EAV64330
Altivar Process PROFINET manual (VW3A3627)	EAV64333
Altivar Process CANopen Serial Link Manual (VW3A3608, 618, 628)	EAV64331
Altivar Process Communication Parameters	EAV64332
Altivar Process Safety Function Manual	EAV64334

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Standards and Terminology

The technical terms, terminology, and the corresponding descriptions in this manual normally use the terms or definitions in the relevant standards.

In the area of drive systems this includes, but is not limited to, terms such as **error, error message, failure, fault, fault reset, protection, safe state, safety function, warning, warning message**, and so on.

Among others, these standards include:

- IEC 61800 series: Adjustable speed electrical power drive systems
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/programmable electronic safety-related
- EN 954-1 safety of machinery - Safety related parts of control systems
- EN ISO 13849-1 & 2 safety of machinery - Safety related parts of control systems.
- IEC 61158 series: Industrial communication networks - Fieldbus specifications
- IEC 61784 series: Industrial communication networks - Profiles
- IEC 60204-1: Safety of machinery - Electrical equipment of machines – Part 1: General requirements

Chapter 1

Presentation

What Is in This Chapter?

This chapter contains the following topics:

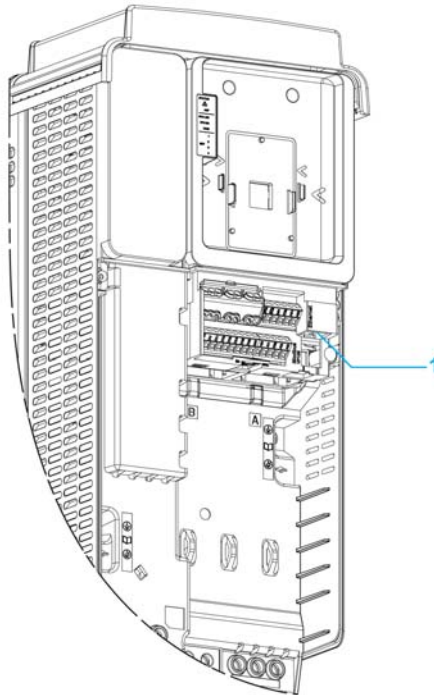
Topic	Page
Hardware Overview	12
Software Overview	13

Hardware Overview

General

The drive embeds an Ethernet communication port that can be used for Modbus TCP industrial communication protocol.

In addition of the communication services provided by the protocol, the embedded adapter provides a set of services at the Ethernet and TCP/IP level. The embedded adapter offers an embedded Web server which offers comfortable displaying and commissioning functions directly from a standard web browser.



1 Ethernet Modbus TCP communication port

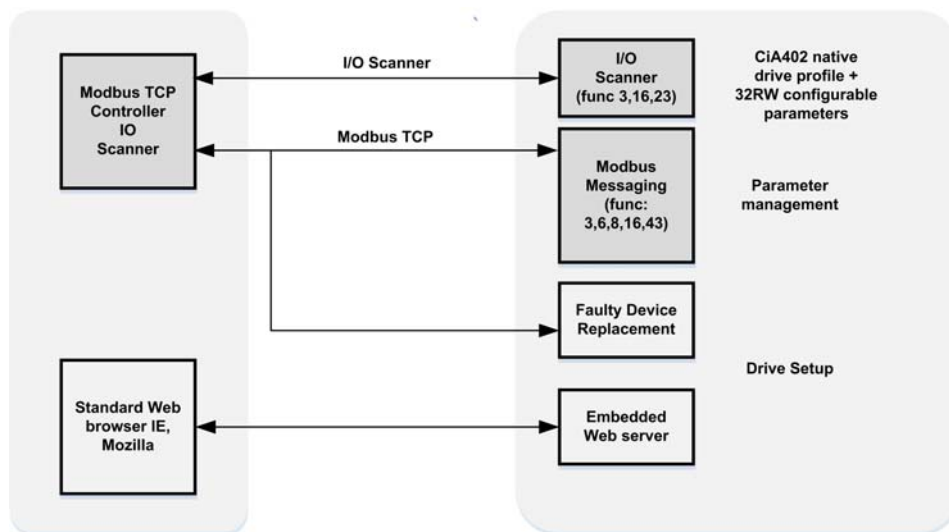
Software Overview

Simplified TCP/IP Model

The table provides the basic overview to the simplified TCP/IP model

Application	Modbus TCP
Transport	TCP / UDP
Network	IP
Link	Ethernet

Modbus TCP Features Overview



Chapter 2

Basics

What Is in This Chapter?

This chapter contains the following sections:

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Section 2.1

Introduction

What Is in This Section?

This section contains the following topics:

Topic	Page
Overview	17
Network Layer Supported Functions/Protocols	18
TCP and UDP Protocol	20

Overview

Modbus TCP

The Modbus application layer is standard. Thousands of manufacturers are already implementing this protocol. Many have already developed a Modbus TCP/IP connection and numerous products are currently available. With the simplicity of its protocol and the fast Ethernet throughput data rate of 100 Mbit/s, Modbus TCP/IP achieves excellent performance.

TCP/IP and Ethernet Features

The product supports the following functions via:

- Manual IP address assignment
- Automatic IP address assignment via BOOTP or DHCP
- Automatic configuration data via FDR
- Commissioning via DTM-based commissioning software
- Diagnostics and configuration via integrated Web server

Webserver

The standard Web server (six languages) provides access to the following pages:

- My dashboard: Customer defined view based on widgets
- Display
- Diagnostics
- Drive
- Setup

Network Layer Supported Functions/Protocols

ARP Protocol

The ARP (Address resolution protocol) is a protocol used by the IP (Internet protocol) network layer protocol to map IP network addresses to hardware addresses (MAC address).

The protocol operates below the network layer as a part of the OSI link layer, and is used when IP is used over Ethernet. A host, wishing to obtain a physical address, broadcasts an ARP request onto the TCP/IP network. The host on the network that has the IP address in the request, then replies with its physical HA (Hardware address).

There are four types of ARP messages which may be sent by the ARP protocol. They are identified by two values in the "operation" field of an ARP message. The types of message are: ARP request; ARP reply.

0		8	15 16	31
Hardware type			Protocol type	
HLEN (Hardware address length)	PLEN (Protocol address length)		Operation	
Sender HA (bytes 0-3)				
Sender HA (bytes 4-5)			Sender IP (bytes 0-1)	
Sender IP (bytes 2-3)			Target HA (bytes 0-1)	
Target HA (bytes 2-5)				
Target IP (bytes 0-3)				

ARP frames are described as follows:

- ARP request: it allows you to get the hardware (MAC) Address of a remote device.
- Gratuitous ARP: it allows you to announce the use of an IP and hardware addresses.
- ARP probe: it allows questioning the network to know if an IP address is already used without updating the ARP table of the other hosts on the network.

	ARP Request	Gratuitous ARP/Response	ARP Probe
Sender IP Address	Local IP address	Local IP address	Zero
Sender Hardware Address	Local MAC address	Local MAC address	Local MAC address
Target IP Address	Non-zero (!= Sender IP address)	Local IP address (= Sender IP address)	IP address to probe
Target Hardware Address	Zero	Non-significant	Zero

ICPM Protocol

The embedded board manages the ICMP protocol.

- ICMP client: not supported
- ICMP server: the managed requests are the following:

Type	Description
0	Echo reply (ping)
3	Destination unreachable
4	Sources quench
5	Redirect
6	Alternate host address
8	Echo request (ping)
9	Router advertisement
10	Router solicitation
11	Time exceeded
12	Parameter problem
13	Time stamp request
14	Time stamp reply
15	Information request

Type	Description
16	Information reply
17	Address mask request
18	Address mask reply

IP Protocol

The Ethernet adapter implements the IP protocols V4 and V6.

SNMP Services

The Ethernet adapter accepts the community name “private” for Writing and the community name “public” for Reading.

MIB

Objects	Description	Access	Default Value
SysDescr	Text description of the product	Read only	Schneider Electric Altivar Ethernet TCP/IP
SysObjectID	Points in the private MIB on the product part number	Read only	1.3.6.1.4.1.3833.1.100.4.1
SysUpTime	Time elapsed since the last power-up	Read only	Managed by the option
SysContact	Information allowing to contact the node manager	Read/write	” ”
SysName	Node administrative name	Read/write	“” or FDR device name if configured
SysLocation	Physical location of the product	Read/write	” ”
SysService	Indicates the service type offered by the product.	Read only	72

TCP and UDP Protocol

Connections

The Ethernet adapter supports up to 32 concurrent TCP/IP and/or TCP/UDP connection.

BOOTP and DHCP Protocol

The Ethernet adapter can use BOOTP and DHCP protocols.

The BOOTP frame is the same: only the OP field is different.

The following table describes the DHCP frame format:

OP (1 byte)	HTYPE (1 byte)	HLEN (1 byte)	HOPS (1 byte)
XID (4 bytes)			
SECS (2 bytes)		FLAGS (2 bytes)	
CIADDR (4 bytes)			
YIADDR (4 bytes)			
SIADDR (4 bytes)			
GIADDR (4 bytes)			
CHADDR (16 bytes)			
SNAME (64 bytes)			
FILE (128 bytes)			
OPTIONS (312 bytes)			

DHCP frame fields are described as follows:

Field	Description
op	Message type DHCP request / DHCP reply
htype	Address hardware type
hlen	Hardware address length
hops	Used by relay agent
xid	Transaction identifier, random number chosen by the client allowing to associate the request and the response
secs	Time in seconds since the beginning of the transaction
flags	First bit used for the broadcast reply flag
ciaddr	Client IP address, only used if the client can respond to ARP request
yiaddr	Client IP address, "your" IP address proposed by the server
siaddr	IP address of the server
giaddr	Gateway IP address, used when a relay agent needs to be crossed
sname	Server name
file	Location of boot file
options	Optional parameters with DHCP extensions

DHCP Message

The DHCP protocol uses 8 different types of message during the IP assigning process.

The table describes 8 messages:

Message	Description
DISCOVER	The client tries to discover the DHCP server using a broadcast
OFFER	The server proposes a configuration
REQUEST	The client chooses a DHCP server and declines other offers
ACK	The chosen server assigns the IP configuration
NAK	The server rejects the client request
DECLINE	The client declines the assigned IP configuration
RELEASE	The client releases its IP address before the end of the lease
INFORM	The client asks for network information (it already has an IP address)

Operating Modes

The choice between DHCP, BOOTP, and fixed configuration is made through one parameter:

- Fixed mode: the Ethernet adapter uses the address stored in parameter.
- BOOTP: the Ethernet adapter receives the addresses from BOOTP server.
- DHCP: if the device name [XXX] is valid, the Ethernet adapter receives the addresses from the DHCP server.

Section 2.2

Modbus TCP Features

What Is in This Section?

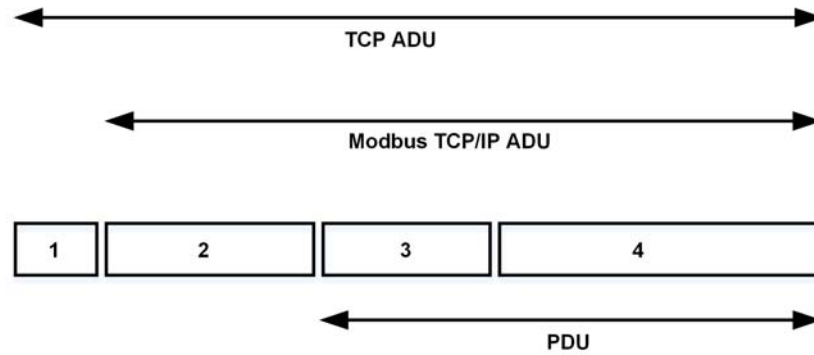
This section contains the following topics:

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Modbus TCP Frames	23
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Supported Modbus TCP Functions	25
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Modbus TCP Frames

TCP Telegrams

Modbus TCP telegrams are not only Modbus standard requests and responses encapsulated in TCP frames.



- 1 TCP header
- 2 MBPA: Modbus application protocol header
- 3 ADU: Application data unit
- 4 PDU: Protocol data unit (The Modbus message itself)

MBAP Header Structure

Fields	Length	Description	Client	Server
Transaction identifier	2 bytes	Identification of a Modbus request / response transaction	Initialized by the client	Recopied by the server from the received request
Protocol identifier	2 bytes	0= Modbus protocol	Initialized by the client	Recopied by the server from the received request
Length	2 bytes	Number of following bytes	Initialized by the client (request)	Initialized by the server (response)
Unit identifier	1 byte	Identification of a remote slave connected on a serial line or on other buses	Initialized by the client	Recopied by the server from the received request

Modbus TCP Servers

Overview

Unit ID	Modbus TCP server	Accessible parameters
0/248	Variable speed drive	See the file related to drive communication parameters.
255	Drive I/O scanner	See I/O scanner setting (see page 25)

Supported Modbus TCP Functions

Modbus TCP Services

The Modbus TCP option supports the following services:

Function Name	Code		Description	Remarks
	Dec	Hex		
Read holding registers	03	03 hex	Read N output words	Max PDU length: 63 words
Write 1 output word (Unit ID 0-248 only)	06	06 hex	Write 1 output word	
Write multiple registers	16	10 hex	Write N output word	Max PDU length: 63 words
Read/write multiple registers (Unit ID 0-248 and 255)	23	17 hex	Read/write multiple registers	Max PDU length: 32 words (W), 32 words (R)
(Subfunction) Read device identification	43/14	2B hex 0E hex	Encapsulated interface transport / read device identification	See the table below

Identification

Id	Value	Comment
00 hex	Schneider electric	Device manufacturer
01 hex	ATVXXX	Drive commercial part number
02 hex	0101	Drive version
04 hex	–	–
05 hex	–	–
06 hex	Customized Name	Device name

I/O Scanning Service

The I/O scanning service is used to exchange periodic I/O data between:

- A controller or PLC (I/O scanner).
- Devices (I/O scanning servers).

This exchange is performed by implicit requests, thus avoiding the need to program the controller (PLC).

The I/O scanner periodically generates the read/write multiple registers (23 = 17 hex) request. The I/O scanning service operates if it has been enabled in the PLC and the drive. The drive parameters assigned to I/O scanning have been selected by default. This assignment can be modified by configuration.

When the I/O scanning service has been enabled in the drive:

- A TCP connection is assigned to it.
- The parameters assigned in the periodic variables are exchanged cyclically between the Ethernet adapter and the drive.
- The parameters assigned to the periodic output variables are reserved for I/O scanning. They cannot be written by other Modbus services, even if the I/O scanner is not sending its periodic output variables.

I/O Scanner Setting

The communication scanner is managed via the DTM-based PC software.

[Scan.Out1 address]	(C n d)
[Scan.Out2 address]	(L F r d)
[Scan.Out3 address]	0
[Scan.Out4...Scan.Out31 address]	0
[Scan.Out32 address]	0
[Scan.IN1 address]	(E t R)
[Scan.IN2 address]	(r F r d)
[Scan.IN3 address]	0
[Scan.IN4...Scan.IN31 address]	0
[Scan.IN32 address]	0

Application Profile with Modbus TCP

Description

The profiles managed with the drive when it is controlled through Modbus TCP are:

- Native profile (CiA402 - IEC 61800-7),
- I/O profile.

For details, refer to CiA®402 - IEC61800-7 functional profile ([see page 63](#))

Chapter 3

Hardware Setup

What Is in This Chapter?

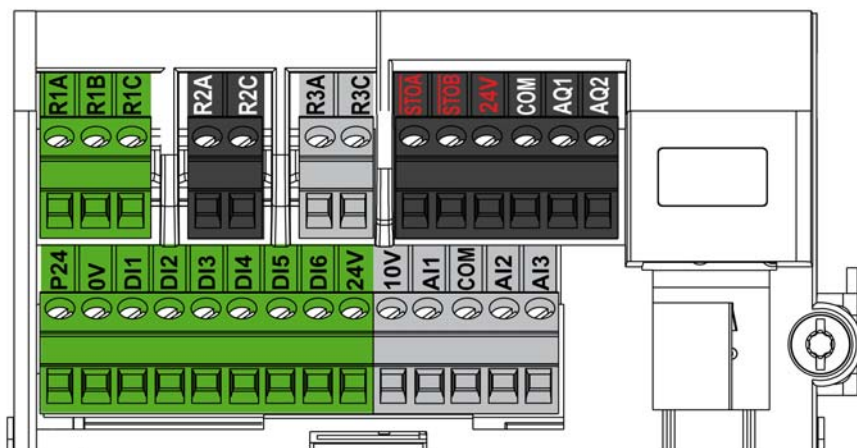
This chapter contains the following topics:

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Connection to the Adapter	30
Electrical Installation	31
Cable Routing Practice	32

Hardware Presentation

Modbus TCP Communication Port

The figure presents the Altivar process terminal view:



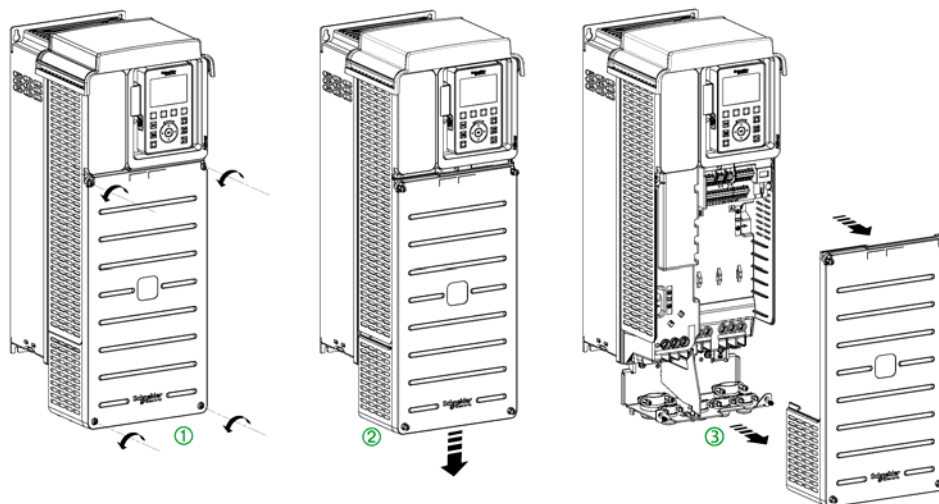
Firmware Version

Compatibility

The drive firmware and embedded communication adapter are provided in a common package for updating the drive.

Connection to the Adapter

Procedure to Remove the Front Cover of the Drive



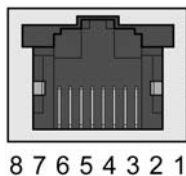
Apply the following instructions to remove the front cover of the drive:

Step	Action
1	Unscrew the four screws attaching the front cover
2	Slide down the front cover
3	Remove the front cover
4	Plug the Ethernet cable in the Ethernet port

Electrical Installation

Pin Layout

The figure shows the RJ45 socket for the Ethernet connection:



The table provides the pin out details of each RJ45 connector:

Pin	Signal	Description
1	Tx+	Ethernet transmit line +
2	Tx-	Ethernet transmit line –
3	Rx+	Ethernet receive line +
4	–	–
5	–	–
6	Rx-	Ethernet receive line –
7	–	–
8	–	–

Cable Specification

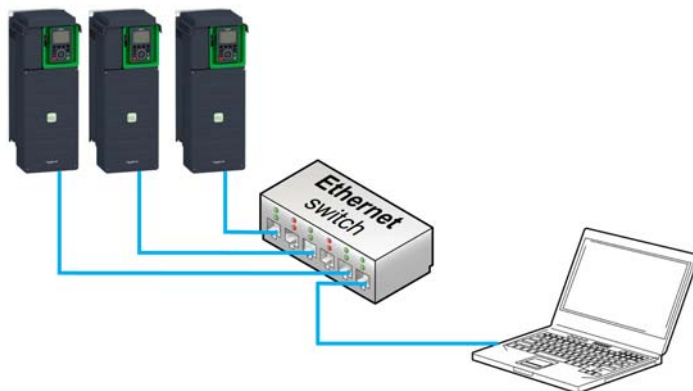
Cable specifications are as follows:

- Minimum Cat 5e,
- Use equipotential bonding conductors
- Connector RJ45
- Shield: both ends grounded
- Twisted-pair cable
- Cable: 8 x 0.25 mm² (8 x AWG 22)
- Use pre-assembled cables to reduce the wiring mistakes,
- Verify that wiring, cables, and connected interfaces meet the PELV requirements.
- Maximum cable length per segment = 100 m (328 ft)

Cable Routing Practice

Installation Topology

The following figure shows the connection between the drive and PC through an Ethernet switch.



The following figure shows the direct connection between the drive and PC.



Chapter 4

Software Setup

What Is in This Chapter?

This chapter contains the following sections:

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4.4	Communication Profile	63
4.5	Embedded Webserver	80

Section 4.1

Basic Settings

What Is in This Section?

This section contains the following topics:

Topic	Page
IP Parameter Settings	35
[Device Name] (P A n)	36
[IP mode Eth Embd] (, n o o)	37
[IP Eth Embd] (, c o 1) (, c o 2) (, c o 3) (, c o 4)	38
[IP Mask Eth Embd] (, n o 1) (, n o 2) (, n o 3) (, n o 4)	39
[IP Gate Eth Embd] (, c o 1) (, c o 2) (, c o 3) (, c o 4)	40
[MAC @] (n a c)	41
[ETH emb Rx frames] (E r x E)	42
[ETH emb Tx frames] (E t x E)	43
[ETH emb error frames] (E e r E)	44
[Ethernet Rate Data] (R r d E)	45
[Ethernet Embd cmd.] (c n d 5)	46
[Ethernet Embd Ref Freq] (L F r 5)	47
[Enable Web Services] (E w e E)	48
[Reset EmbWeb Passwd] (r w p E)	49
[Ethernet Timeout] (t t o b)	50

IP Parameter Settings

Assigning IP Parameters

If not using IPV6 functionalities, following parameters shall be configured:

- The drive IP address.
- The subnet mask.
- The gateway IP address.

These IP addresses can be entered using the display terminal, the embedded webserver, or the DTM-based PC software.

They can be also provided by:

- A BOOTP server (correspondence between the MAC address and the IP addresses).
- Or a DHCP server (correspondence between device name **[DEVICE NAME]** (P R n) and the IP addresses).

If an IP address other than 0.0.0.0 has been entered manually, assignment using a server is disabled. Regardless of the type of IP address assignment, if the address is modified, then the IP address is effective the next time the drive is turned on (control voltage if a separate power supply is being used).

Entering IP Parameters in the Display Terminal

In the **[Communication]** (C o n -) , **[Comm parameters]** (C n P -) menu and **[Ethernet Emdb]** (E E E -) submenu, enter the following IP addresses:

- **[IP Eth Emdb]** (, C 0 1) (, C 0 2) (, C 0 3) (, C 0 4)
- **[IP Mask Eth Emdb]** (, n 0 1) (, n 0 2) (, n 0 3) (, n 0 4),
- **[IP Gate Eth Emdb]** (, G 0 1) (, G 0 2) (, G 0 3) (, G 0 4).

If this address is modified, the new IP address entered is displayed.

Configuring BOOTP

The BOOTP service is used to assign IP addresses based on the MAC address. The MAC address consisting of 6 hexadecimal digits (MM-MM-MM-XX-XX-XX) must be entered in the BOOTP server. The MAC address appears on the fieldbus adapter dedicated menu on the display terminal.

In the **[Communication]** (C o n -) , **[Comm parameters]** (C n P -) menu and **[Ethernet Emdb]** (E E E -) submenu:

- Leave the IP address **[IP Eth Emdb]** (, C 0 1) (, C 0 2) (, C 0 3) (, C 0 4) at the value **[0.0.0.0]** (0) (0) (0) (0).
- Do not enable the FDR service.

Configuring DHCP

The DHCP service is used to assign IP addresses and FDR configuration file path based on the device name **[DEVICE NAME]** (P R n).

The device name consisting of an alphanumeric string must be entered in both the DHCP server and the drive.

In the **[Communication]** (C o n -) , **[Comm parameters]** (C n P -) menu and **[Ethernet Emdb]** (E E E -) submenu, enter the **[DEVICE NAME]** (P R n)

[Device Name] (P A n)

About This Parameter

This parameter is used set the device name.

Access

This parameter is accessible via **[Communication] (C o m -)** , **[Comm parameters] (C m P -)** menu and **[Ethernet Emdb] (E t E -)** submenu.

This is a read/write parameter

Possible Settings

The FDR (Fast Device Replacement) service is based on identification of the device by a **Device Name**. In the case of the Altivar drive, this is represented by the **[Device Name] (P A n)** parameter. Verify that all the network devices have different **Device Name**.

[IP mode Eth Embd] (, П О О)

About This Parameter

This parameter is used to select the IP address assignment method.

Access

This parameter is accessible via **[Communication]** (С О П -) , **[Comm parameters]** (С П П -) menu and **[Ethernet Embd]** (Е Е Е -) submenu.

This is a read/write parameter

The parameter number is 64400.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[Fixed]	П Р О О	0	Manually type the IP address.
[BOOTP]	Б О О Е	1	Automatically gets the IP address from the Bootp or DHCP server using the MAC address.
[DHCP]	Д Н С П	2	Automatically gets the IP address from the DHCP server using the device name. Factory setting: DHCP

[IP Eth Emdb] (, C 0 1) (, C 0 2) (, C 0 3) (, C 0 4)

About This Parameter

This parameter is used to set the IP address and can be edited only when the IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] (C 0 1 -)** , **[Comm parameters] (C 1 1 P -)** menu and **[Ethernet Emdb] (E E E -)** submenu.

This is a read/write parameter

The parameter number for IC01 is 64401

The parameter number for IC02 is 64402

The parameter number for IC03 is 64403

The parameter number for IC04 is 64404

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[139.160.069.241]	1 3 9	0...255	First byte of IP Eth Emdb.
	1 6 0	0...255	Second byte of IP Eth Emdb
	0 6 9	0...255	Third byte of IP Eth Emdb
	2 4 1	0...255	Fourth byte of IP Eth Emdb

[IP Mask Eth Embd] (, П 0 1) (, П 0 2) (, П 0 3) (, П 0 4)

About This Parameter

This parameter is used to set the IP subnet mask and can be edited only when IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] (С о П -)** , **[Comm parameters] (С П P -)** menu and **[Ethernet Embd] (Е т Е -)** submenu.

This is a read/write parameter

The parameter number for IPM1 is 64405

The parameter number for IPM2 is 64406

The parameter number for IPM3 is 64407

The parameter number for IPM4 is 64408

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[255.255.254.0]	2 5 5	0...255	First byte of IP Mask Eth Embd.
	2 5 5	0...255	Second byte of P Mask Eth Embd.
	2 5 4	0...255	Third byte of P Mask Eth Embd.
	0	0...255	Fourth byte of P Mask Eth Embd

[IP Gate Eth Embd] (, G 0 1) (, G 0 2) (, G 0 3) (, G 0 4)

About This Parameter

This parameter is used to set the default gateway address and can be edited only IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] (C o m -)** , **[Comm parameters] (C P P -)** menu and **[Ethernet Embd] (E t E -)** submenu.

This is a read/write parameter

The parameter number for IG01 is 64409

The parameter number for IG02 is 64410

The parameter number for IG03 is 64411

The parameter number for IG04 is 64412

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[0.0.0.0]	0	0...255	First byte of IP Gate Eth Embd.
	1	0...255	Second byte of IP Gate Eth Embd
	2	0...255	Third byte of IP Gate Eth Embd
	3	0...255	Fourth byte of IP Gate Eth Embd

[MAC @] (MAC)

About This Parameter

This parameter displays the MAC address of the device.

Access

This parameter is accessible via **[Display] (F2)**, **[Communication map] (F3)** menu and **[Ethernet Embed Diag] (F4)** submenu.

This is a read-only parameter

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[MM-MM-MM-XX-XX-XX]	MAC - MAC - MAC - XX - XX - XX	MM-MM-MM-XX-XX-XX	MAC address of the embedded Ethernet port

[ETH emb Rx frames] (E r X E)

About This Parameter

This parameter displays the Ethernet embedded received frames counter

Access

This parameter is accessible via **[Display]** (*Π α η -*) , **[Communication map]** (*Σ Π Π -*) menu and **[Ethernet Emdb Diag]** (*Π Ρ Ε -*) submenu.

This is a read-only parameter

The parameter numbers is 64416

[ETH emb Tx frames] (E E X E)

About This Parameter

This parameter displays the Ethernet embedded transmitted frames counter

Access

This parameter is accessible via **[Display]** (*Π ο η -*) , **[Communication map]** (*Ε Π Π -*) menu and **[Ethernet Embd Diag]** (*Π Ρ Ε -*) submenu.

This is a read-only parameter

The parameter number is 64418

[ETH emb error frames] (E E r E)

About This Parameter

This parameter displays the Ethernet embedded error frames counter

Access

This parameter is accessible via **[Display]** (*Π α η -*) , **[Communication map]** (*Σ Π Π -*) menu and **[Ethernet Embd Diag]** (*Π Ρ Ε -*) submenu.

This is a read-only parameter

The parameter numbers is 64420

[Ethernet Rate Data] (R r d E)

About This Parameter

This parameter displays the Ethernet embedded actual rate.

Access

This parameter is accessible via **[Display]** (П о н -) , **[Communication map]** (С П П -) menu and **[Ethernet Emdb Diag]** (П П Е -) submenu.

This is a read-only parameter

The parameter numbers is 64413

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[Auto]	(R u t o)	Auto	Data rate is auto detected depending on the first data packet received.
[10M.Full]	(1 0 F)	10F	Data rate is set to10 Mbit/s full
[10M.Half]	(1 0 H)	10H	Data rate is set to10 Mbit/s half
[100M.Full]	(1 0 0 F)	100F	Data rate is set to100 Mbit/s full
[100M.Half]	(1 0 0 H)	100H	Data rate is set to100 Mbit/s half
Factory setting: Auto			

[Ethernet Embd cmd.] (**Ⓒ Ⓜ Ⓢ**)

About This Parameter

This parameter displays the command word built with Ethernet embedded source (same as CMD).

Access

This parameter is accessible via **[Display]** (**Ⓜ Ⓢ Ⓢ -**) , **[Communication map]** (**Ⓒ Ⓜ Ⓢ -**) menu and **[Command word image]** (**Ⓒ Ⓜ Ⓢ , -**) submenu.

This is a read-only parameter

The parameter numbers is 8515

[Ethernet Embd Ref Freq] (L F r 5)

About This Parameter

This parameter displays the reference frequency built with Ethernet embedded source (same as LFr).

Access

This parameter is accessible via **[Display]** ($\Pi \square \Pi$ -) , **[Communication map]** ($\mathcal{L} \Pi \Pi$ -) menu and **[Command word image]** ($\mathcal{L} \mathbf{w}$, -) submenu.

This is a read-only parameter

The parameter numbers is 8525

[Enable Web Services] (E W E E)

About This Parameter

This parameter is used to manage the embedded Ethernet Web services.

Access

This parameter is accessible via **[My preferences] (П У Р -)** menu and **[Webserver] (W b S -)** submenu.

This is a read/write parameter

The parameter number is 6693

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No]	(n o)	0	Web services disabled
[Yes]	(y e s)	1	Web services enabled
Factory setting: Yes			

[Reset EmbWeb Passwd] (*r W P E*)

About This Parameter

This parameter is used to manage the set to factory value the Ethernet webserver password.

Access

This parameter is accessible via **[My preferences] (*M Y P -*)** menu and **[Webserver] (*W b S -*)** submenu.

This is a read/write parameter

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No]	(<i>n o</i>)	0	Reset of the embedded webserver password not requested
[Yes]	(<i>y e s</i>)	1	Reset of the embedded webserver password requested
			NOTE: The parameter is set to [No] when the operation is done
			Factory setting: Yes

[Ethernet Timeout] (t t o b)

About This Parameter

This parameter is used to set the Ethernet timeout.

Access

This parameter is accessible via fieldbus using the Modbus address.

This is a read/write parameter

The parameter number is 64415.

Possible Settings

The table presents the parameter settings:

Settings	Description
0.1...30 sec	Factory setting: 10 sec

Section 4.2

Additional Settings

What Is in This Section?

This section contains the following topics:

Topic	Page
FDR Settings	52
[Embedded Eth Com Interrupt] (<i>E L H F</i>)	53
[External Error] (<i>E P F I</i>)	54
Configuring I/O Scanning	55

FDR Settings

Access

The parameters are accessible via the webserver or the DTM-based PC software

FDR Configuration

The following figure shows FDR settings via webserver:

The screenshot shows the FDR Configuration web interface. It features a 'FDR' tab and a 'Configuration' sub-tab. The settings are as follows:

- FDR Activation:** Two buttons, 'Enabled' (selected) and 'Disabled'.
- Synchronization Mode:** A dropdown menu with 'Automatic' selected.
- Control Configuration:** Two buttons, 'Served' (selected) and 'Stored'.
- Auto Sync Check Cycle (sec):** A numeric input field with '2560' entered.

At the bottom of the configuration area are two buttons: 'Save' and 'Refresh'.

The table presents the **FDR Configuration** settings:

Parameter	Description	Settings
FDR Activation	This parameter is used to enable or disable the FDR service NOTE: You can enable FDR only if the IP assignment mode selected is DHCP.	Enabled: FDR service enabled Disabled: FDR service disabled. Factory setting: Enabled
Synchronization Mode	Allows to manage the periodic saving of the configuration to FDR server, or manually transfer configuration between drive and FDR server	Automatic: Transfers the configuration file from drive to server. Manual: Allows to transfers the configuration file from drive to server or server to drive. Disabled: Synchronization mode is disabled. Factory setting: Automatic
Control Configuration	This parameter is used to select the server or local configuration.	Served: Transfers the configuration file from server to drive at power-up. Stored: uses the configuration stored in the drive at power-up. Factory setting: served
Automatic Syncho Cycle (Sec)	Allows you to select the interval for periodic synchronization of the drive with the FDR server. NOTE: You can define automatic Syncho cycle only if Synchronization mode selected is automatic.	10...9999 sec Factory setting: 2560 sec

[Embedded Eth Com Interrupt] (*E L H F*)

About This Parameter

This parameter displays the communication option interruption error value.

Access

This is a read-only parameter

The parameter number is 7132.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[1]	<i>I</i>	1	1: Modbus TCP timeout Factory setting: 0

[External Error] (E P F I)

About This Parameter

This parameter displays the external detected error.

Access

This is a read-only parameter

The parameter number is 7143.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[1]	1	–	1: Invalid IP address
[2]	2		2: Duplicate IP address
[4]	4		4: FDR service error

Configuring I/O Scanning

Description

The drive I/O scanning service can be enabled or disabled with the DTM-based PC software.

It is not possible to modify the assignment of the I/O scanning periodic variables using the display terminal.
To configure I/O scanning, use the DTM-based PC software.

Section 4.3

Fast Device Replacement

What Is in This Section?

This section contains the following topics:

Topic	Page
Presentation	57
Startup Detailed Behavior	58
FDR Operation Behavior	59
Local Configuration	60
Downloaded Configuration	61

Presentation

FDR Service

The FDR (Fast Device Replacement) service is used to simplify the maintenance of drives connected on the Ethernet network. In the event of drive not functioning correctly, this service automatically reconfigures its replacement.

The new drive (FDR client) retrieves:

- Its IP addresses and the FDR file path from a DHCP server
- The FDR file from an FTP server, if the drive is not configured in local configuration

In practice, the DHCP server and the FTP server are the same device (PAC M580, M340 PLC, or dedicated PCs).

The FDR file contains:

- The Ethernet parameters (configuration of I/O scanning, FDR, and so on)
- The drive parameters (drive, functions, application, and so on)

The FDR service is based on identification of the device by a **Device Name**. In the case of the Altivar process drive, this is represented by the **[DEVICE NAME] (P A N)** parameter.

The configuration of the FDR service is accessible via embedded webserver or DTM-based software.

NOTE: Check that all the network devices have different **Device Name**.

NOTE: The FDR server controls duplication of **Device Name** (it does not assign an IP address that has already been assigned and is active).

If the same IP address is supplied on 2 devices, the second should trigger an IP address duplication (network management detected error which triggers an **[External Error] (E P F I)** by default).

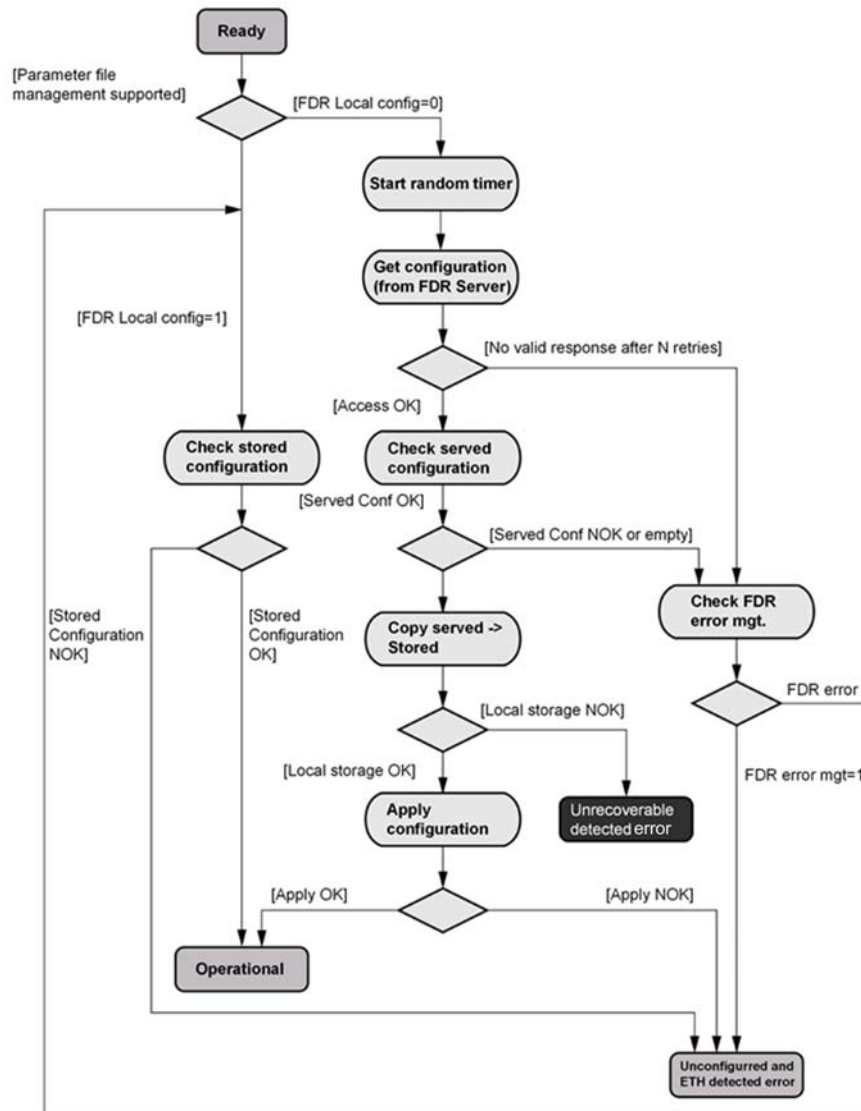
If the FDR service has been enabled, the Ethernet adapter attempts to restore its IP addresses on each power-up. Each time the procedure has detected error, the Ethernet adapter reiterates its FDR requests (DHCP).

Where the configuration also needs to be downloaded by the FDR server:

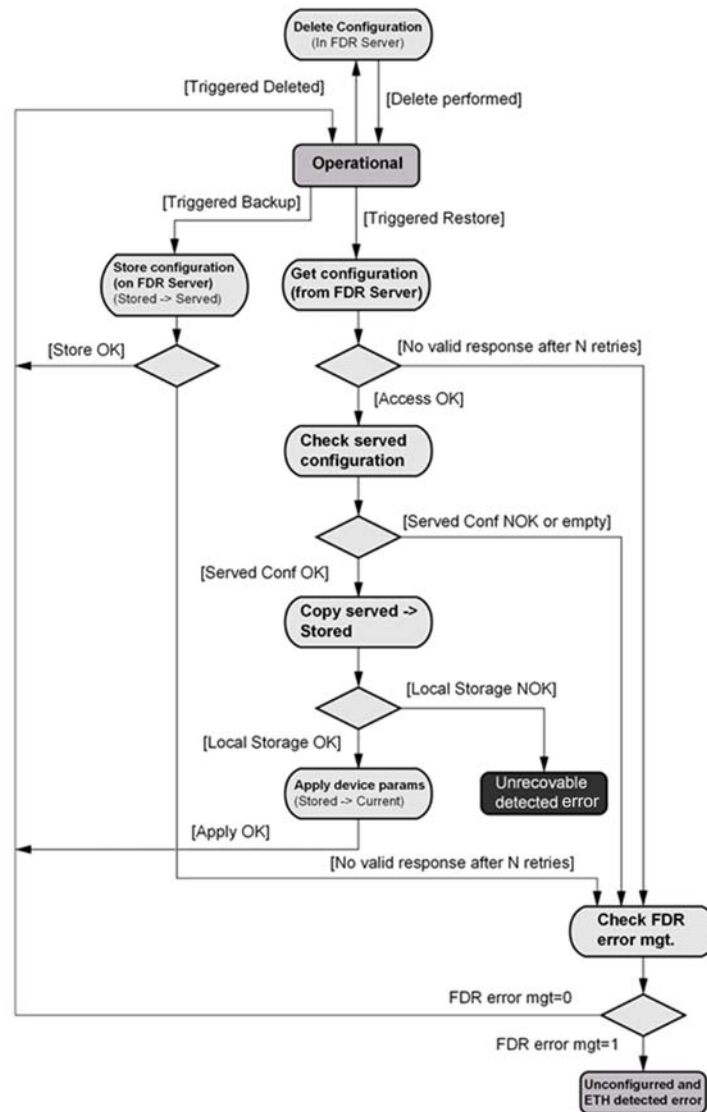
After assigning the Ethernet card IP addresses, if the configuration download has detected error, the Ethernet card detects a network management detected error (triggers an **[External Error] (E P F I)** by default).

Startup Detailed Behavior

Presentation

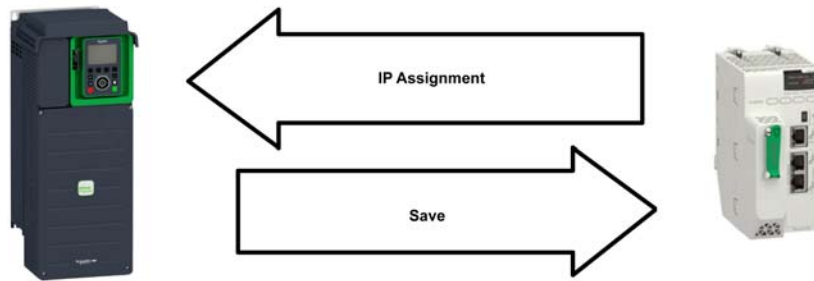


FDR Operation Behavior



Local Configuration

Presentation



IP Assignment Save

If the drive parameter configuration is local, the FDR server only assigns the following IP addresses:

- Card IP address,
- Subnet mask,
- Gateway IP address.

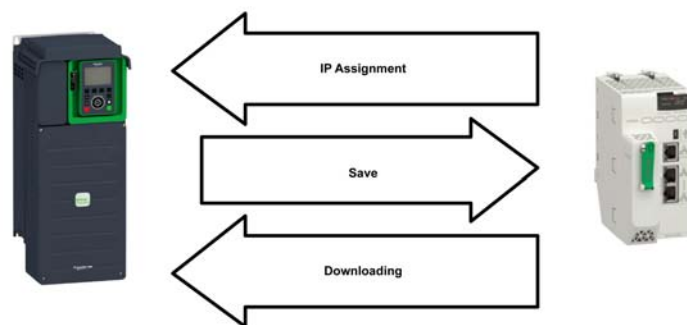
On connection to the network, the drive automatically saves its parameters in the FDR server.

Drive Connection Procedure

Step	Action	Description
1	Configure the FDR server	See the PLC manual or the section on software setup using Unity
2	Configure the drive	In the COMMUNICATION [(COM-)], [Comm parameters] (C Π P -) menu, [Ethernet Emdb] (E Ł E) submenu: Configure [IP mode] (, P Π) =DHCP Enable the FDR service via webserver or DTM-based software: Select local drive configuration with webserver or DTM-based software Enter the device name, DEVICE NAME , in the COMMUNICATION [(COM-)], [Comm parameters] (C Π P -) menu, [Ethernet Emdb] (E Ł E) submenu:
3	Turn off the drive	Turn off the drive and then back on again (control voltage supply if a separate power supply is being used), otherwise the device name is not taken into account
4	Connect the drive to the network	Connect the drive and the FDR server (PLC) to the Ethernet network

Downloaded Configuration

Presentation



IP Assignment Save

If the drive parameter configuration has been downloaded, the FDR server assigns the following addresses:

- Card IP address,
- Subnet mask,
- Gateway IP address,
- FDR server IP address.

Periodic Saving

Periodic saving of the drive configuration can be configured on the FDR server in either local configuration or downloaded configuration mode

Using the embedded webserver or the DTM-based software:

- Set FDR synchronization to automatic mode
- Set the synchronization cycle time

NOTE: Saving too often risks overburdening the fieldbus and adversely affecting its performance (factory setting: 2.560 s.).

Limitations

The FDR service is able to store the current configuration of the drive, but does not provide the possibility to store multi-parameters configurations.

Drive Parameters (Configuration)

In the procedure described below, the configuration file is transferred to the FDR server, via the Ethernet network, using a manual save command.

Step	Action	Description
1	Configure the drive	<p>In the [COMMUNICATION] (C o n -), [Comm parameters] (C n P -) menu, [Ethernet Embd] (E t E -) submenu:</p> <ul style="list-style-type: none"> • Leave the IP address [IP Eth Embd] (, C 0 1) (, C 0 2) (, C 0 3) (, C 0 4) at the value [0.0.0.0] (0) (0) (0) (0) <p>Using the embedded webserver or the DTM-based software:</p> <ul style="list-style-type: none"> • Set FDR synchronization to manual mode. • Before the first connection, select local drive configuration. The drive needs first to push the configuration to the server. <p>Enter the device name, [COMMUNICATION] (C o n -), [Comm parameters] (C n P -) menu, [Ethernet Embd] (E t E -) submenu.</p>
2	Turn off the drive	<p>Turn off the drive and then back on again (control voltage if a separate power supply is being used), otherwise the device name is not taken into account</p>

Step	Action	Description
3	Connect the drive to the fieldbus	Connect the drive and the FDR server (PLC) to the Ethernet fieldbus.
4	Configure the FDR server (see the PLC manual)	The server downloads the IP addresses to the Ethernet card. Check that the operation has proceeded correctly: you can also check, in the [COMMUNICATION] (C o n -) , [Comm parameters] (C n P -) menu, [Ethernet Emdb] (E E E -) submenu. Whether the [IP Eth Emdb] (, C D I) (, C D 2) (, C D 3) (, C D 4) , [P Mask Eth Emdb] (, n D I) (, n D 2) (, n D 3) (, n D 4) and [IP Gate Eth Emdb] (, G D I) (, G D 2) (, G D 3) (, G D 4) parameters have values other than [0.0.0.0] (0) (0) (0) (0)
5	Supply the FDR server with the configuration file	Using the embedded webserver or the DTM-based software <ul style="list-style-type: none"> Specify that the drive configuration is downloaded from the FDR server on each power-up Send a save command to the FDR server.
6	Check that the system is operational	If the save operation has not been successful, the adapter detects a communication error which, in factory settings mode, triggers an [External Error] (E P F I)

Replacing a Drive

For replacing a drive, it is necessary to follow the procedure below:

Step	Action	Action
1	Configure the drive	In the [COMMUNICATION] (C o n -) , [Comm parameters] (C n P -) menu, [Ethernet Emdb] (E E E -) submenu: <ul style="list-style-type: none"> Leave the IP address [IP Eth Emdb] (, C D I) (, C D 2) (, C D 3) (, C D 4) at the value [0.0.0.0] (0) (0) (0) (0) Using the embedded webserver or the DTM-based software: <ul style="list-style-type: none"> Set FDR synchronization to manual mode. Before the first connection, select served drive configuration. The drive needs first to transfer the configuration from the server. Enter the device name, [DEVICE NAME] , [COMMUNICATION] (C o n -) , [Comm parameters] (C n P -) menu, [Ethernet Emdb] (E E E -) submenu.
2	Turn off the drive	Turn off the drive and then back on again (control voltage if a separate power supply is being used), otherwise the device name is not taken into account
3	Connect the drive to the fieldbus	Connect the drive and the FDR server (PLC) to the Ethernet fieldbus
4	Check that the drive is operational	Check that the operation has proceeded correctly. If downloading has not been possible after a period of 2 min following assignment of the IP addresses, the adapter detects a communication error which, in factory settings mode, triggers an [External Error.] (E P F I)

Section 4.4

Communication Profile

What Is in This Section?

This section contains the following topics:

Topic	Page
Definition of a Profile	64
Functional Profiles Supported by the Drive	65
Functional Description	66
CIA402 Operating State Diagram	67
Description of Operating States	68
Summary	70
Control Word (<i>CW</i>)	71
Stop Commands	72
Assigning Control Word Bits	73
Status Word (<i>SW</i>)	74
Starting Sequence	75
Sequence for a Drive Powered by the Power Stage Supply	76
Sequence for a Drive with Separate Control Stage	77
Sequence for a Drive with Mains Contactor Control	79

Definition of a Profile

Types of Profiles

There are 3 types of profile:

- Communication profiles
- Functional profiles
- Application profiles

Communication Profile

A communication profile describes the characteristics of the bus or network:

- Cables
- Connectors
- Electrical characteristics
- Access protocol
- Addressing system
- Periodic exchange service
- Messaging service
- ...

A communication profile is unique to a type of fieldbus (such as Modbus, PROFIBUS DP, and so on) and is used by various different types of device.

Functional Profile

A functional profile describes the behavior of a type of device:

- Functions
- Parameters (such as name, format, unit, type, and so on.)
- Periodic I/O variables
- State chart
- ...

A functional profile is common to all members of a device family (such as variable speed drives, encoders, I/O modules, displays, and so on).

They can feature common or similar parts. The standardized (IEC 61800-7) functional profiles of variable speed drives are:

- CiA402
- PROFIDRIVE
- CIP

DRIVECOM has been available since 1991.

CiA402 device profile for drives and motion control represents the next stage of this standard development and is now part of the IEC 61800-7 standard.

Some protocols also support the Open DeviceNet Vendor Association profile (ODVA).

Application Profile

Application profile defines the services to be provided by the devices on a machine. For example, CiA DSP 417-2 V 1.01 part 2: CANopen application profile for lift control systems - virtual device definitions.

Interchangeability

The aim of communication and functional profiles is to achieve interchangeability of the devices connected via the fieldbus.

Functional Profiles Supported by the Drive

I/O Profile

Using the I/O profile simplifies PLC programming.

The I/O profile mirrors the use of the terminal strip for control by utilizing 1 bit to control a function.

The I/O profile for the drive can also be used when controlling via a fieldbus. The drive starts up as soon as the `run` command is sent. 15 bits of the control word (bits 1...15) can be assigned to a specific function.

This profile can be developed for simultaneous control of the drive via:

- The terminals
- The Modbus control word
- The CANopen control word
- Ethernet Modbus TCP embedded
- The fieldbus module control word

The I/O profile is supported by the drive itself and therefore in turn by all the communication ports (integrated Modbus, CANopen, Ethernet, PROFIBUS DP, PROFINET, and DeviceNet fieldbus modules).

CiA402 Profile

The drive only starts up following a command sequence.

The control word is standardized.

5 bits of the control word (bits 11...15) can be assigned to a function.

The CiA402 profile is supported by the drive itself and therefore by all the communication ports (Modbus, CANopen, Ethernet, PROFIBUS DP, PROFINET, and DeviceNet).

The drive supports the `velocity` mode of CiA402 profile.

In the CiA402 profile, there are two modes that are specific to the drive and characterize commands and references value management:

- Separate **[Separate]** (`SEPAR`)
- Not separate **[Not separ.]** (`NOTSEPAR`),

Functional Description

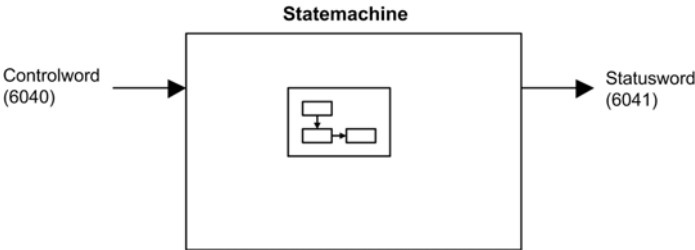
Introduction

Drive operation involves two main functions, which are illustrated in the diagrams below.

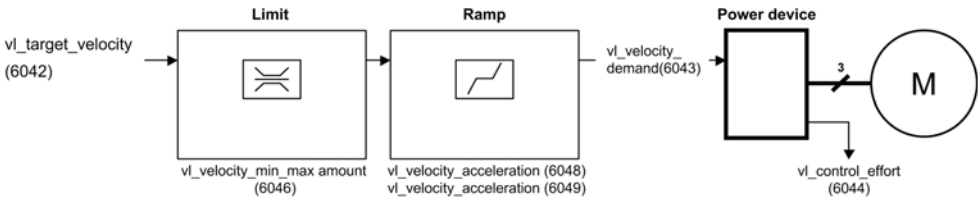
CiA402

The main parameters are shown with their CiA402 name and their CiA402/Drivecom index (the values in brackets are the CANopen addresses of the parameter).

The following figure shows the control diagram for drive operation:



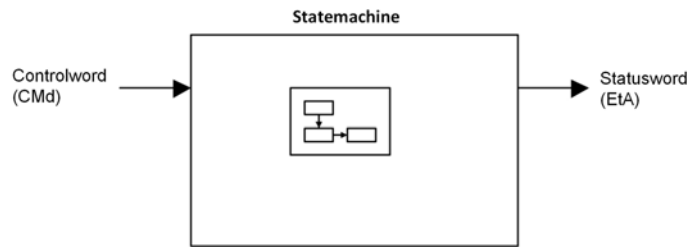
Simplified diagram for speed control in Velocity mode:



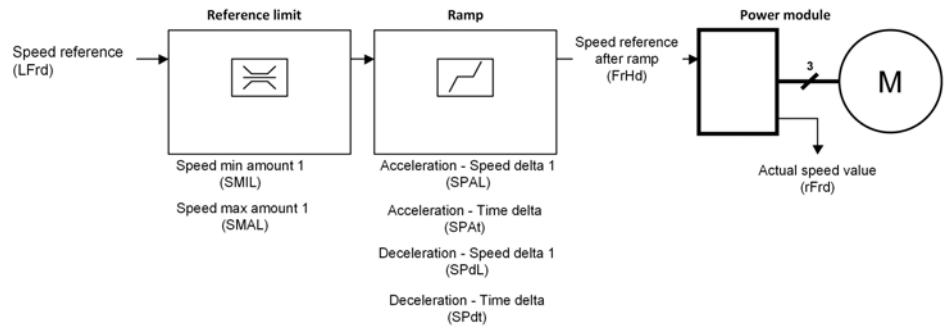
Altivar Process

These diagrams translate as follows for the Altivar process system.

The following figure shows the control diagram for drive operation:



Simplified diagram for speed control in Velocity mode:



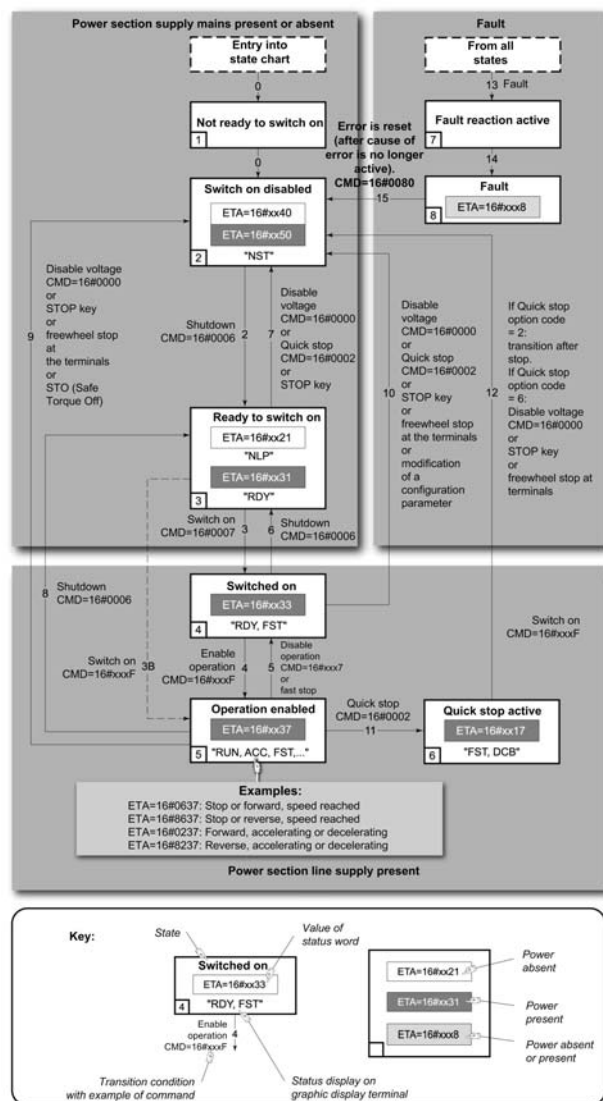
CIA402 Operating State Diagram

State Diagram

After switching on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions. The operating states are internally monitored and influenced by monitoring functions.

The following figure shows the CIA402 state diagram:



Description of Operating States

Drive Operating State

The operating state of the drive changes depending on whether the control word is sent (**EN**) or an event occurs (an error detection, for example).

The drive operating state can be identified by the value of the status word (**ELR**).

Operating State	Description
1 - Not ready to switch on	Initialization starts. This is a transient state invisible to the communication network.
2 - Switch on disabled	<p>The power stage is not ready to switch on.</p> <p>The drive is locked, no power is supplied to the motor.</p> <p>For a separate control stage, it is not necessary to supply the power.</p> <p>For a separate control stage with mains contactor, the contactor is not closed.</p> <p>The configuration and adjustment parameters can be modified.</p>
3 - Ready to switch on	<p>The power stage is ready to switch on and awaiting power stage supply mains.</p> <p>For a separate control stage, it is not necessary to supply the power stage, but the system expects it in order to change to state 4 - Switched on.</p> <p>For a separate control stage with mains contactor, the contactor is not closed.</p> <p>The drive is locked, no power is supplied to the motor.</p> <p>The configuration and adjustment parameters can be modified.</p>
4 - Switched on	<p>Power stage is switched on.</p> <p>For a separate control stage, the power stage must be supplied.</p> <p>For a separate control stage with mains contactor, the contactor is closed.</p> <p>The drive is locked, no power is supplied to the motor.</p> <p>The power stage of the drive is ready to operate, but voltage has not yet been applied to the output.</p> <p>The adjustment parameters can be modified.</p> <p>If a configuration parameter is modified, the drive returns to the state 2 - Switch on disable.</p>
5 - Operation enabled	<p>Power stage is enabled. The drive is in running state</p> <p>For a separate control stage, the power stage must be supplied.</p> <p>For a separate control stage with mains contactor, the contactor is closed.</p> <p>The drive is unlocked, power is supplied to the motor.</p> <p>The drive functions are activated and voltage is applied to the motor terminals.</p> <p>If the reference value is zero or the Halt command is applied, no power is supplied to the motor and no torque is applied. To perform [Auto tuning] (EN), the drive must be in state 5 - Operation enabled.</p> <p>The adjustment parameters can be modified.</p> <p>The configuration parameters cannot be modified.</p> <p>NOTE: The command 4 - Enable operation must be taken into consideration only if the channel is valid. In particular, if the channel is involved in the command and the reference value, transition 4 is possible only after the reference value has been received once.</p> <p>The reaction of the drive to a Disable operation command depends on the value of the [Dis. operat opt code] (dod) parameter:</p> <ul style="list-style-type: none"> • If the [Dis. operat opt code] (dod) parameter is set to 0, the drive changes to operating state 4 - Switched on and stops in freewheel stop. • If the [Dis. operat opt code] (dod) parameter is set to 1, the drive stops on ramp and then changes to operating state 4 - Switched on.

Operating State	Description
6 - Quick stop active	<p>The drive performs a fast stop and remains locked in the operating state 6-Quick stop active. Before restarting the motor, it is required to go to the operating state 2-switch on disabled.</p> <p>During fast stop, the drive is unlocked and power is supplied to the motor. The configuration parameters cannot be modified.</p> <p>The condition for transition 12 to state 2 - Switch on disabled depends on the value of the parameter</p> <p>Quick stop mode (QStd):</p> <p>If the Quick stop mode parameter has the value FST2, the drive stops according to the fast stop ramp and then changes to state 2 - Switch on disabled.</p> <p>If the Quick stop mode parameter has the value FST6, the drive stops according to the fast stop ramp and then remains in state 6 - Quick stop active until:</p> <ul style="list-style-type: none"> • A Disable voltage command is received or • The STOP key is pressed or • A freewheel stop command via the digital input of the terminal.
7 - Fault reaction active	Transient state during which the drive performs an action corresponding to the selected error response.
8 - Fault	<p>Error response terminated. Power stage is disabled.</p> <p>The drive is locked, no power is supplied to the motor.</p>

Summary

Device Status Summary

Operating State	Power Stage Supply for Separate Control Stage	Power Supplied to Motor	Modification of Configuration Parameters
1 - Not ready to switch on	Not required	No	Yes
2 - Switch on disabled	Not required	No	Yes
3 - Ready to switch on	Not required	No	Yes
4 - Switched on	Required	No	Yes, return to 2 - Switch on disabled operating state
5 - Operation enabled	Required	Yes	No
6 - Quick stop active	Required	Yes, during fast stop	No
7 - Fault reaction active	Depends on error response configuration	Depends on error response configuration	–
8 - Fault	Not required	No	Yes

Control Word (CWD)

Bit Mapping

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Reserved (=0)	Reserved (=0)	Reserved (=0)	Enable operation	Quick stop	Enable voltage	Switch on
0 to 1 transition = Error is reset (after cause of error is no longer active)				1 = Run command	0 = Quick stop active	Authorization to supply AC power	Mains contactor control

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific	Reserved (=0)	Reserved (=0)	Halt
				0 = Forward direction asked 1 = Reverse direction asked			Halt

Command	State Transition	Final Operating State	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Example Value
			Fault Reset	Enable Operation	Quick Stop	Enable Voltage	Switch On	
Shutdown	2, 6, 8	3 - Ready to switch on	X	X	1	1	0	0006 hex
Switch on	3	4 - Switched on	X	X	1	1	1	0007 hex
Enable operation	4	5 - Operation enabled	X	1	1	1	1	000F hex
Disable operation	5	4 - Switched on	X	0	1	1	1	0007 hex
Disable voltage	7, 9, 10, 12	2 - Switch on disabled	X	X	X	0	X	0000 hex
Quick stop	11	6 - Quick stop active	X	X	0	1	X	0002 hex
	7, 10	2 - Switch on disabled						
Fault reset	15	2 - Switch on disabled	0 → 1	X	X	X	X	0080 hex
X: Value is of no significance for this command. 0 → 1: Command on rising edge.								

Stop Commands

Halt Command

The `Halt` command enables movement to be interrupted without having to leave the 5 - Operation enabled state. The stop is performed in accordance with the **[Type of stop] (5 L L)** parameter.

If the `Halt` command is active, no power is supplied to the motor and no torque is applied.

Regardless of the assignment of the **[Type of stop] (5 L L)** parameter **[Fast stop assign] (F 5 L)**, **[Ramp stop] (r P)**, **[Freewheel] (n 5 L)**, or **[DC injection assign.] (d L)**, the drive remains in the 5 - Operation enabled state.

Fast Stop Command

A `Fast Stop` command at the terminals or using a bit of the control word assigned to `Fast Stop` causes a change to the 4 - Switched on

Freewheel Command

A `Freewheel Stop` command using a digital input of the terminal or a bit of the control word assigned to `Freewheel Stop` causes a change to operating state 2 - Switch on disabled.

Assigning Control Word Bits

Function Codes

In the CiA402 profile, fixed assignment of a function input is possible using the following codes:

Bit	Integrated Ethernet Modbus TCP adapter
Bit 11	C511
Bit 12	C512
Bit 13	C513
Bit 14	C514
Bit 15	C515

For example, to assign the DC injection braking to bit13 of embedded Ethernet, simply configure the **[DC injection assign.]** (*d C i*) parameter with the **[C513]** (*C 5 1 3*) value.

Bit 11 is assigned by default to the operating direction command **[Reverse assign.]** (*r r 5*).

Status Word (E L R)

Bit Mapping

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Detected error	Operation enabled	Switched on	Ready to switch on
A warning is active	Power stage supply disabled	0 = Quick stop is active	Power stage supply present	Detected error	Running	Ready	1 = Awaiting power Stage supply

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer-specific Direction of rotation	Manufacturer-specific Stop via STOP key	Reserved (=0)	Reserved (=0)	Internal limit active	Target reached	Remote	Reserved (=0)
				Reference value outside limits	Reference value reached	Command or reference value via fieldbus	

Operating State	Bit 6 Switch On Disabled	Bit 5 Quick Stop	Bit 4 Voltage Enabled	Bit 3 Fault	Bit 2 Operation Enabled	Bit 1 Switched On	Bit 0 Ready to Switch On	ETA Masked by 006F H ⁽¹⁾
1 -Not ready to switch on	0	X	X	0	0	0	0	–
2 -Switch on disabled	1	X	X	0	0	0	0	0040 hex
3 -Ready to switch on	0	1	X	0	0	0	1	0021 hex
4 - Switched on	0	1	1	0	0	1	1	0023 hex
5 - Operation enabled	0	1	11	0	1	1	1	0027 hex
6 -Quick stop active	0	0		0	1	1	1	0007 hex
7 -Fault reaction active	0	X	X	1	1	1	1	–
8 -Fault	0	X	X	1	0	0	0	0008 hex ⁽²⁾ .. .0028 hex

⁽¹⁾ This mask can be used by the PLC program to test the diagram state.

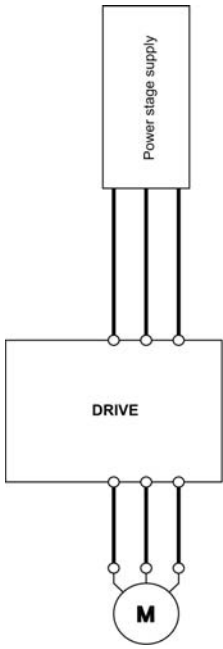
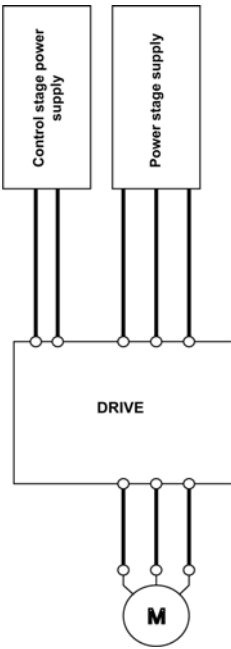
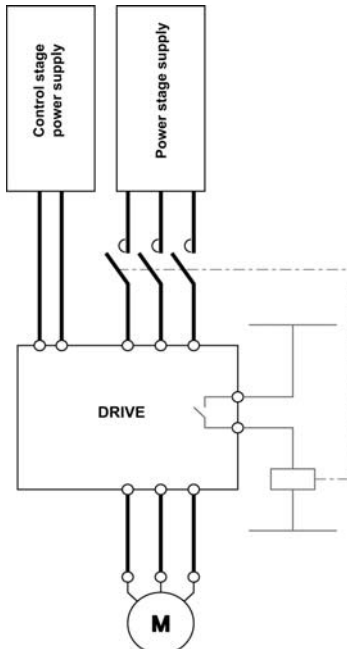
⁽²⁾ detected error following operating state 6 - Quick stop active.

X: In this state, the value of the bit can be 0 or 1.

Starting Sequence

Description

The command sequence in the state diagram depends on how power is being supplied to the drive. There are 3 possible scenarios:

			
Power stage supply	Direct	Direct	Mains contactor controlled by the drive
Control stage supply	Not separate ⁽¹⁾	Separate	Separate
⁽¹⁾ The power stage supplies the control stage.			

Sequence for a Drive Powered by the Power Stage Supply

Description

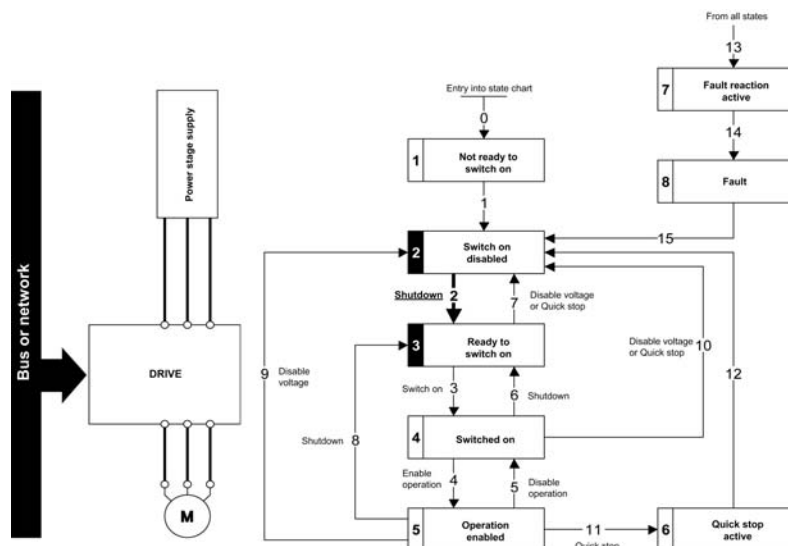
Both the power and control stages are powered by the power stage supply.

If power is supplied to the control stage, it has to be supplied to the power stage as well.

The following sequence must be applied:

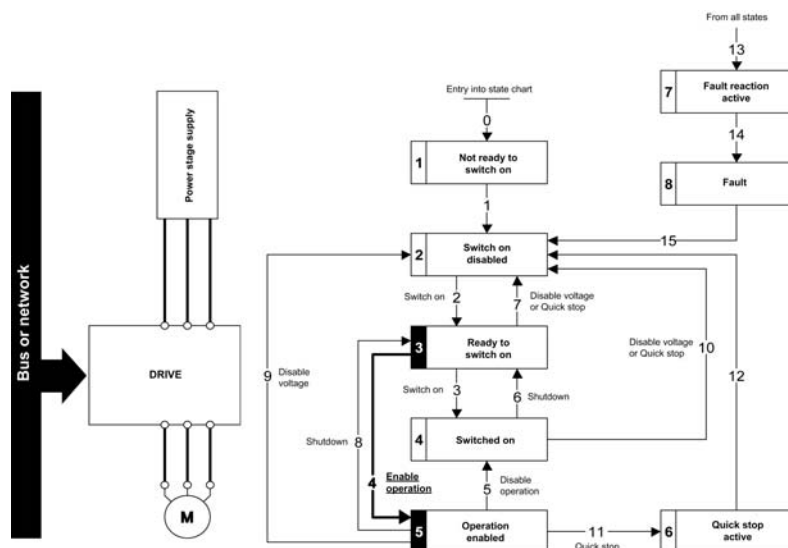
Step 1

Apply the 2 - Shut down command



Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Then apply the 4 - Enable operation command.
- The motor can be controlled (send a reference value not equal to zero).



NOTE: It is possible, but not necessary to apply the 3 - Switch on command followed by the 4 - Enable Operation command to switch successively into the operating states 3 - Ready to Switch on, 4 - Switched on and then 5 - Operation Enabled. The 4 - Enable operation command is sufficient.

Sequence for a Drive with Separate Control Stage

Description

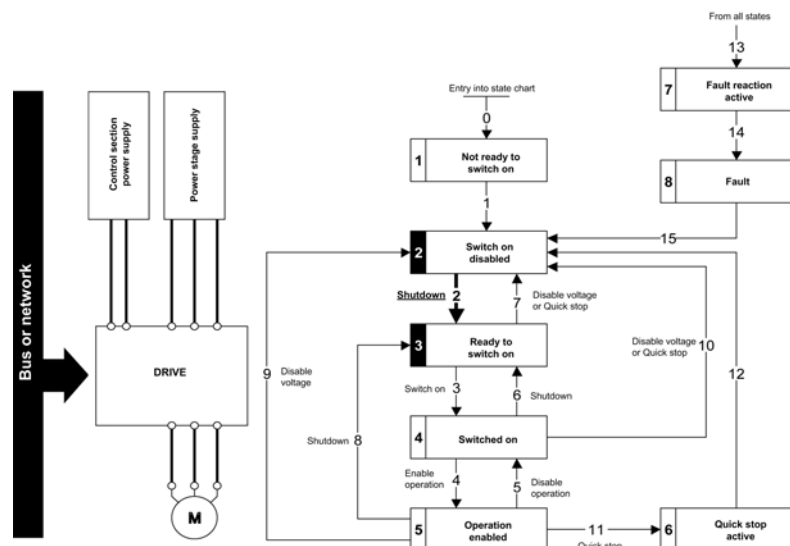
Power is supplied separately to the power and control stages.

If power is supplied to the control stage, it does not have to be supplied to the power stage as well.

The following sequence must be applied:

Step 1

- The power stage supply is not necessarily present.
- Apply the 2 - Shut down command

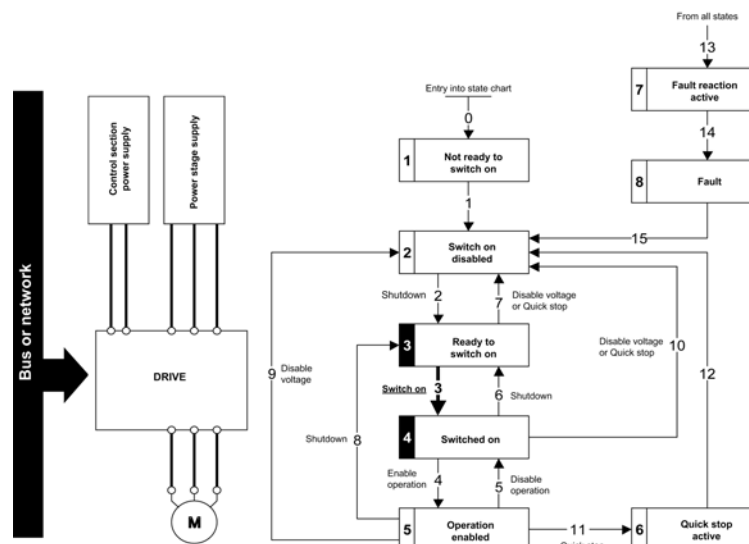


Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Check that the power stage supply is present (Voltage enabled of the status word).

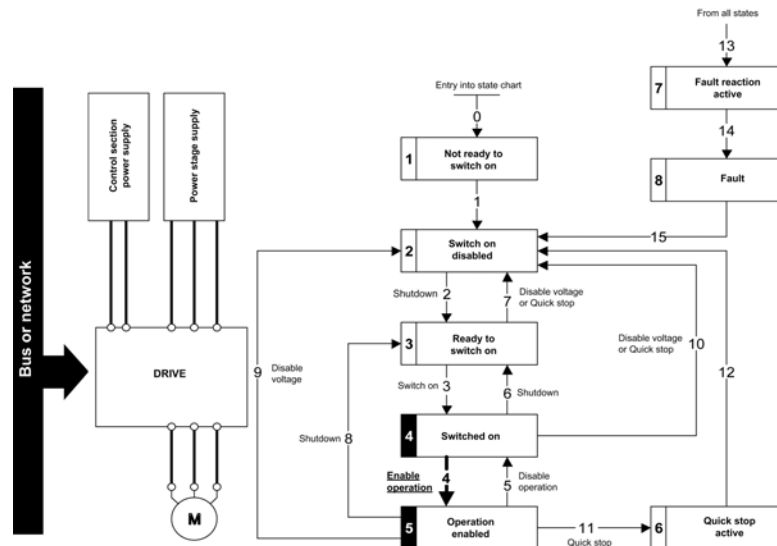
Power Stage Supply	Terminal Display	Status Word
Absent	$\neg L P$	21 hex
Present	$r d Y$	31 hex

- Apply the 3 - Switch on command



Step 3

- Check that the drive is in the operating state 4 - Switched on.
- Then apply the 4 - Enable operation command.
- The motor can be controlled (send a reference value not equal to zero).
- If the power stage supply is still not present in the operating state 4 - Switched on after a time delay [Mains V. time out] (L C E), the drive triggers an error [input contactor] (L C F).



Sequence for a Drive with Mains Contactor Control

Description

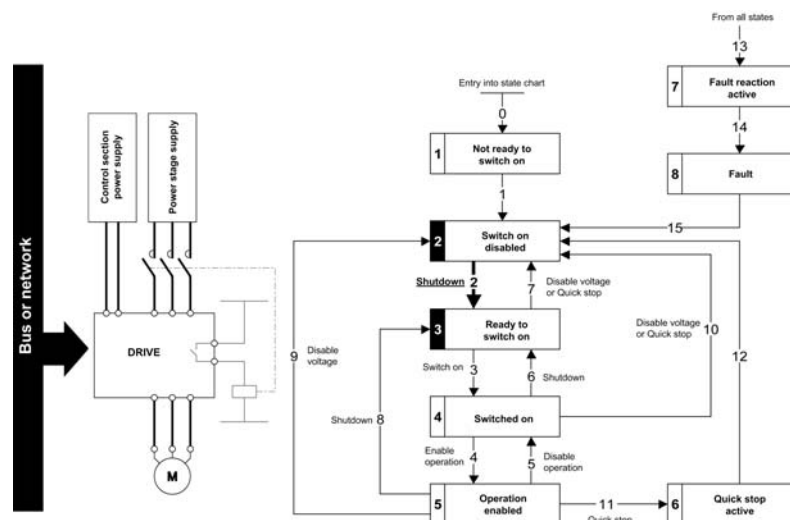
Power is supplied separately to the power and control stages.

If power is supplied to the control stage, it does not have to be supplied to the power stage as well. The drive controls the mains contactor.

The following sequence must be applied:

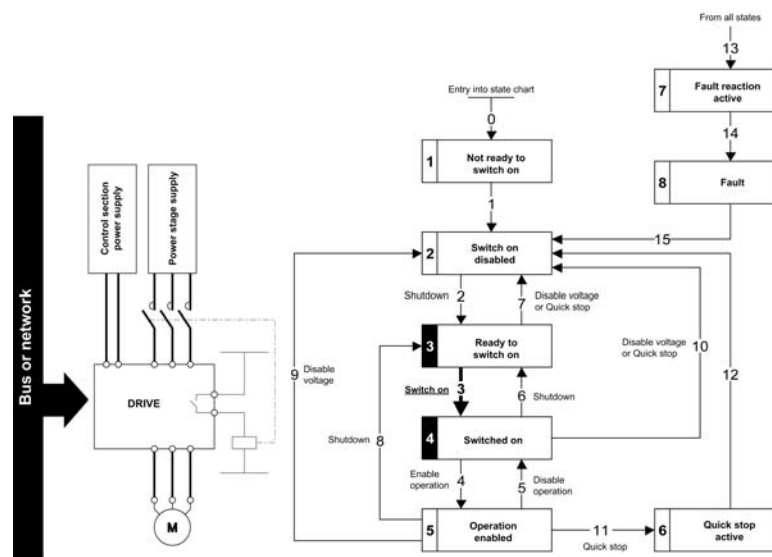
Step 1

- The power stage supply is not present as the mains contactor is not being controlled.
- Apply the 2 - Shutdown command.



Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Apply the 3 - Switch on command, which closes the mains contactor and switch on the power stage supply.



Section 4.5

Embedded Webserver

What Is in This Section?

This section contains the following topics:

Topic	Page
Overview	81
Connection to the Webserver	82

Overview

Webserver

The Ethernet adapter provides an integrated Web server which allows several functions like: display, parameter settings, and diagnostics. This chapter describes the services provided by this webserver.

The webserver can be accessed from standard browsers like Internet Explorer, chrome, safari, or Firefox.

Connection to the Webserver

Access

The webserver can be accessed from standard browsers.

In the following example, the drive has received the IP address 10.0.0.5:



First connect the computer to the drive by typing http:// followed by the drive IP address.

You are asked to first enter a **User Name** and a **Password**.

By default the user name is ADMIN and the password is also ADMIN.

Once connected, the webserver home page is displayed.

Using IPV6 network discovery service, there is no need to set IP parameters. The drive appears automatically in the network explorer of the PC while physically connected.

The drive is identified as ATV6ppppppp-MMMM where MMMM is the two last bytes of the MAC address.

Right-click and select **Display device web page** to open the webserver.

User Rights - Password and User Names

A new password is required if you are connecting to the webserver for the first time. Default security access rule requires minimum eight characters for the new password.

The user names and the password of both level can be modified from the administration section.

Web Server Site Map

My Dashboard		Widget-based page to be customized
Display	Drive	Drive parameters for display. Customised tab can be created.
	Energy Dashboard	Trend view and energy report.
	Pump Dashboard	Pump and process data, pump curves
	Chart Viewer	Charts for display. Customized chart can be created.
Diagnostics	Drive	Drive related diagnostics.
	Fieldbus	Fieldbus-related diagnostics
Drive	Drive parameter	Drive configuration
	Drive communication	Fieldbus configuration
Setup	Fieldbus	Ethernet services configuration
	File transfer	Data transfer management
	My Preference	Webserver configuration

Chapter 5

Operations

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
5.1	Operating States	84
5.2	Operating Modes	86

Section 5.1

Operating States

Configuring Communication Detected Error Response

Description

The response of the drive in the event of an Ethernet communication interruption can be configured. Configuration can be performed using the display terminal from the **[Complete settings]** (*C 5 E -*), **[Error/warning handling]** (*C 5 W 0*) menu, **[Fieldbus monitoring]** (*C L L -*) submenu, via the **[Eth Error Response]** (*E E H L*).

The values of the **[Eth Error Response]** (*E E H L*) parameter, which triggers a drive detected error **[Embedded Eth Com Interrupt]** (*E E H F*), are:

Value	Meaning
[Freewheel] (<i>Y E 5</i>)	Freewheel stop (factory setting)
[Ramp stop] (<i>r 0 P</i>)	Stop on ramp
[Fast stop] (<i>F 5 E</i>)	Fast stop
[DC injection] (<i>d C i</i>)	DC injection stop

The values of the **[Eth Error Response]** (*E E H L*) parameter, which does not trigger a drive detected error, are:

Value	Meaning
[Ignore] (<i>n a</i>)	Detected error ignored
[Per STT] (<i>5 E E</i>)	Stop according to configuration of [Type of stop] (<i>5 E E</i>)
[fallback spd] (<i>L F F</i>)	Change to fallback speed, maintained as long as the detected error persists and the run command has not been removed
[Spd maint.] (<i>r L 5</i>)	The drive maintains the speed at the time the detected error occurred, as long as the detected error persists, and the run command has not been removed

The fallback speed can be configured in the **[Complete settings]** (*C 5 E -*), **[Error/warning handling]** (*C 5 W 0*) menu, **[Fallback speed]** (*L F F -*) submenu, using the **[Fallback speed]** (*L F F*) parameter.

WARNING

LOSS OF CONTROL

If this parameter is set to *n a*, Modbus communication monitoring is disabled.

- Only use this setting after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.
- Only use this setting for tests during commissioning.
- Verify that communication monitoring has been re-enabled before completing the commissioning procedure and performing the final commissioning test.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Detected Errors

Parameter	Description	Possible Values	Terminal Display
[Embedded Eth Com Interrupt] (E L H F) Written to the device	This parameter is used to indicate that fieldbus error has been detected. When the detected error is active, the value of ETHF corresponds to the cause of the error. When the cause of the error is no longer active, ETHF is reset to 0.	1: Modbus TCP timeout	[1] (1)
[int. com.link] (, L F)	This parameter is used to indicate that an internal error has been detected. The error can only be reset by switching off the product.	1: Flash error 2: Internal error	[1] (1) [2] (2)
[External Error] (E P F 1)	—	1: Invalid IP address 2: Duplicate IP address 4: FDR service error	[1] (1) [2] (2) [4] (4)

Section 5.2

Operating Modes

What Is in This Section?

This section contains the following topics:

Topic	Page
Configuring the Control Channel	87
Configuration of the Drive for Operation in I/O Profile	88
Configuration of the Drive for Operation with CiA 402 Profile in Combined Mode	89
Configuration of the Drive for Operation with CiA 402 Profile in Separate Mode	90

Configuring the Control Channel

Overview

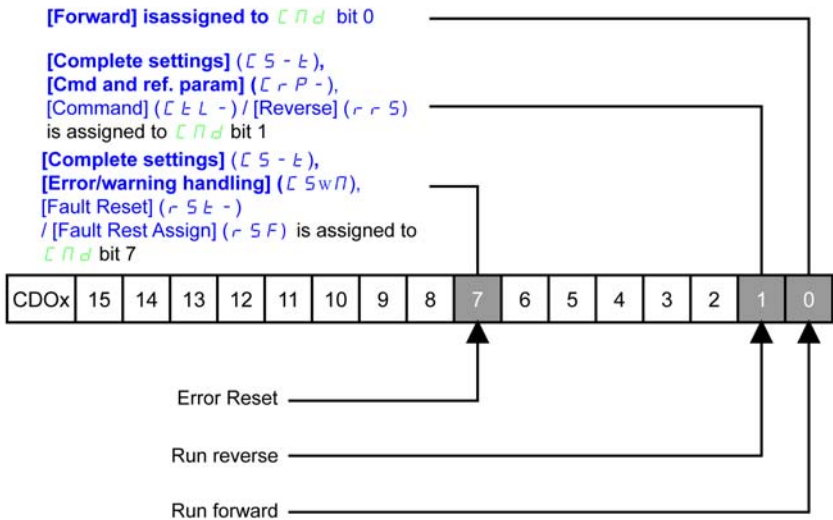
This chapter explains how to configure the drive for operation from communication network through three following examples.

- I/O mode - a simple command word (based on forward, reverse, and reset binary commands).
- Combined mode (with native profile CiA 402) - Both reference value and command word come from the communication network.
- Separate (with native profile CiA 402) - reference value and command come from separate sources: for example, the command (in CiA 402) comes from the communication network and the reference value from the HMI.

Configuration of the Drive for Operation in I/O Profile

Description

The I/O profile, here is a simple example, which can be extended with additional features. The command word is made of run forward (bit 0 of Cmd), run reverse (bit 1 of Cmd), and the function fault reset (bit 7 of Cmd).



The settings are the following:

[Ref.1 channel] (F r 1)	[HMI] (H n i)
[RV Inhibition] (r i n)	Default
[Stop Key priority] (P S E)	Default
[Profile] (C H C F)	[I/O profile] i o
[Cmd switching] (C C S)	Default
[Cmd channel 1] (C d 1)	[Ethernet] (E E H)

The bits of the command word can now be configured.

In the **[Command and Reference] (C r P -)** menu configure:

[Reverse assign.] (r r S)	[Cd01] (C d 0 1)
---------------------------	------------------

In the **[Error/warning handling] (C S w n)** menu, **[Fault Reset] (r S E -)** submenu, configure:

[Fault Reset Assign] (r S F)	[Cd07] (C d 0 7)
------------------------------	------------------

Configuration of the Drive for Operation with CiA 402 Profile in Combined Mode

Description

This section describes how to configure the settings of the drive if it is controlled in CiA 402 mode. The example focuses on the not separate mode. Additional modes are detailed in the drive programming manual.

In the **[Complete settings]** (*L 5 L -*) menu, **[Command and reference]** (*L r P -*) submenu:):

- **[Ref.1 Channel]** (*F r 1*): is set on according to the communication source you can choose in the following table:

Origin of the Control	Ref1 Channel Setting
Modbus TCP	[Ethernet] (<i>E L H</i>)

- **[Profile]** (*L H L F*): defines if the drive operates in combined mode (reference value and command from the same channel).

Configuration of the Drive for Operation with CiA 402 Profile in Separate Mode

Description

Alternate combinations are possible, see the drive programming manual for the list of possible settings.
For example:



The drive is controlled from the communication (Ethernet) but the reference value is adjusted on display terminal. The control word comes from the controller and is written according to CiA 402 profile.

The settings are as shown in the table:

[Ref.1 channel] (F r l)	[HMI] (L C C)
[RV Inhibition] (r i n)	Default
[Stop Key priority] (P 5 E)	Default
[Profile] (C H C F)	[Separate] (S E P)
[Cmd switching] (C C 5)	Default
[Cmd channel 1] (C d l)	[Ethernet] E E H

Chapter 6

Diagnostic and Troubleshooting

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Fieldbus Status LEDs	92
Connection for Fieldbus Mode	94
Fieldbus Functions Test	95

Fieldbus Status LEDs

LED Indicators

The following figure describes the LEDs status for fieldbus monitoring



LED Description

Item	LED	Description
1	ETH LINK	ETH LNK: Connection
2	ETH NS	ETH NS: Network status

LED 1 ETH LNK: Link Activity

This LED indicates the status of the Modbus TCP port:

Color & Status	Description
OFF	No link
Flashing Green/Yellow	Power on testing
Green ON	Link established at 100 Mbit/s
Yellow ON	Link established at 10 Mbit/s
Green Blinking	Fieldbus activity at 100 Mbit/s
Yellow blinking	Fieldbus activity at 10 Mbit/s

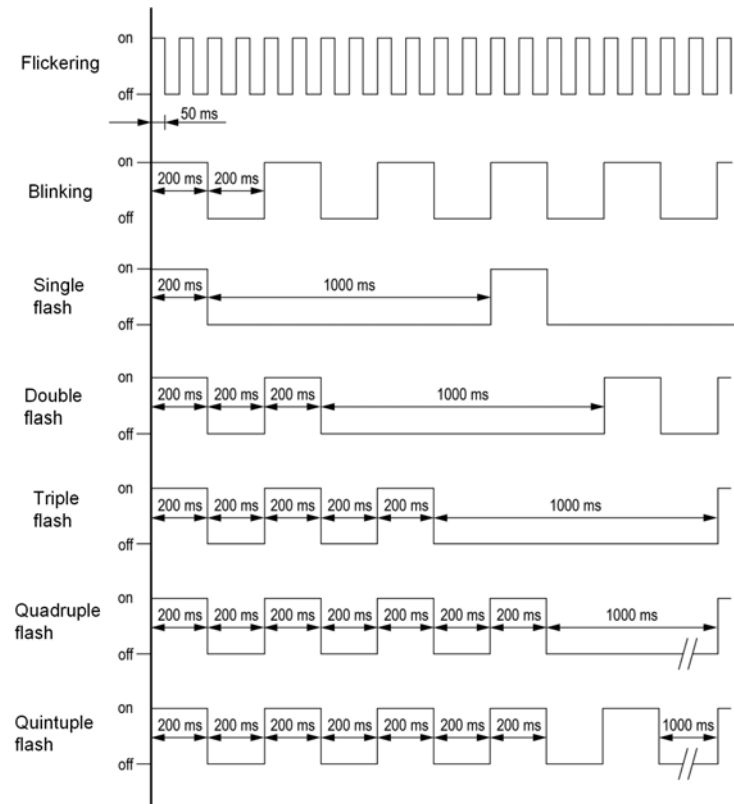
LED 2 ETH NS: Network Status

This LED indicates the status of Modbus TCP

Color & Status	Description
OFF	The device does not have an IP address or powered off
Flashing Green/Red	Power on testing
Green ON	A modbus connection is established to control the command word.
Green flashing	Device has a valid IP, but no modbus command word connection.
Red ON	Duplicated IP
Red flashing	An established modbus connection to control the command word is closed or timed out

LED Behaviour

LED behavior



Connection for Fieldbus Mode

Description

If the product cannot be addressed via the fieldbus, first check the connections. The product manuals contains the technical data of the device and information on fieldbus and device installation.

Verify the following:

- Power connections to the device
- Fieldbus cable and fieldbus wiring
- Fieldbus connection to the device

Fieldbus Functions Test

Channels for Commands and Reference Values

All the drive commands and reference value parameters are managed on a channel-by-channel basis.

Parameter Name	Parameter Code				
	Taken Into Account by the Drive	Modbus Serial	CANopen	Fieldbus Module	Ethernet Embedded
Control word	(<i>C N d</i>)	(<i>C N d 1</i>)	(<i>C N d 2</i>)	(<i>C N d 3</i>)	(<i>C N d 5</i>)
Extended control word	(<i>C N i</i>)	(<i>C N i 1</i>)	(<i>C N i 2</i>)	(<i>C N i 3</i>)	(<i>C N i 5</i>)
Reference speed (rpm)	(<i>L F r d</i>)	(<i>L F r d 1</i>)	(<i>L F r d 2</i>)	(<i>L F r d 3</i>)	(<i>L F r d 5</i>)
Reference frequency (0.1 Hz)	(<i>L F r</i>)	(<i>L F r 1</i>)	(<i>L F r 2</i>)	(<i>L F r 3</i>)	(<i>L F r 5</i>)
Reference value supplied by PI controller	(<i>P i S P</i>)	(<i>P i r 1</i>)	(<i>P i r 2</i>)	(<i>P i r 3</i>)	(<i>P i r 5</i>)
Reference value supplied by analog multiplier function	(<i>Π F r</i>)	(<i>Π F r 1</i>)	(<i>Π F r 2</i>)	(<i>Π F r 3</i>)	(<i>Π F r 5</i>)

Fieldbus Monitoring Criteria

The fieldbus is monitored according to the protocol-specific criteria.

Protocol	Criteria	Related Detected Error
Integrated Modbus serial port	Adjustable time-out for received requests destined for the drive.	[Modbus Com Interruption] (<i>S L F 1</i>)
Embedded Ethernet	FDR detected error IP address duplication detected error Adjustable time-out for received control word (I/O scanning or messaging) Fieldbus overload	[External Error] (<i>E P F 1</i>) [Embedded Eth Com Interrupt] (<i>E E H F</i>)

Monitoring of Communication Channels

Communication channels are monitored if they are involved in one of the following parameters:

- The control word ([**Cmd value**] (*C N d*)) from the active command channel
- The control word containing the command switch (bit configured on [**Cmd switching**] (*C L 5*))
- The control word containing the switch for reference value 1'1B (bit configured on [**Ref 1B switching**] (*r C b*))
- The control word containing the switch for reference value 1'2 (bit configured on [**Ref. 2 switching**] (*r F C*))
- The reference frequency or reference speed ([**HMI Frequency ref.**] (*L F r*)) or LFRD: Nominal speed value) from the active channel for reference value
- Summing reference frequency or reference speed ([**HMI Frequency ref.**] (*L F r*)) or LFRD: Nominal speed value) 2 (assigned to [**Summing ref. 2**] (*S A 2*))
- Summing reference frequency or reference speed ([**HMI Frequency ref.**] (*L F r*)) or LFRD: Nominal speed value) 3 (assigned to [**Summing ref. 3**] (*S A 3*))
- Subtracting reference frequency or reference speed ([**HMI Frequency ref.**] (*L F r*)) or LFRD: Nominal speed value) 2 (assigned to [**Subtract ref. 2**] (*d A 2*))
- Subtracting reference frequency or reference speed ([**HMI Frequency ref.**] (*L F r*)) or LFRD: Nominal speed value) 3 (assigned to [**Subtract ref. 3**] (*d A 3*))
- The reference value given by the PID controller (PISP)
- The PID controller feedback ([**AI Virtual 1**] (*A i u 1*))
- The multiplication coefficient of the reference values ([**Multiplying coeff.**] (*Π F r*)) 2 (assigned to [**Multiplier ref. 2**] (*Π A 2*))
- The multiplication coefficient of the reference values ([**Multiplying coeff.**] (*Π F r*)) 3 (assigned to [**Multiplier ref. 3**] (*Π A 3*))

As soon as one of these parameters has been written once to a communication channel, it activates monitoring for that channel.

If a communication warning is sent (in accordance with the protocol criteria) by a monitored port or fieldbus module, the drive triggers a communication interruption.

The drive reacts according to the communication interruption configuration (operating state Fault, maintenance, fallback, and so on)

If a communication warning occurs on a channel that is not being monitored, the drive does not trigger a communication interruption.

Enabling of Communication Channels

A communication channel is enabled once all the parameters involved have been written at least one time. The drive is only able to start if all channels involved in command and reference value are enabled.

For example:

A drive in DSP402 profile is connected to an active communication channel.

It is mandatory to write at least 1 time the reference value and the command in order to switch from 4-Switched on to operating state 5-Operation enabled.

A communication channel is disabled:

- In the event of a communication warning.
- In forced local mode.

NOTE: On exiting forced local mode:

- The drive copies the `run` commands, the direction, and the forced local reference to the active channel (maintained).
- Monitoring of the active channel for commands and/or reference value resumes following a time delay **[Time-out forc. local] (F L o E)**.
- Drive control only takes effect once the drive has received the reference value and the command from the active channel.



A

Abbreviations

Req. = Required

Opt. = Optional

D

Display terminal

The display terminal menus are shown in square brackets.

For example: **[Communication]**

The codes are shown in round brackets.

For example: (**C o n -**)

Parameter names are displayed on the display terminal in square brackets.

For example: **[fallback spd]**

Parameter codes are displayed in round brackets.

For example: (**L F F**)

E

Error

Discrepancy between a detected (computed, measured, or signaled) value or condition and the specified or theoretically correct value or condition.

F

Factory setting

Factory settings when the product is shipped

Fault

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset

A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

M

Monitoring function

Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection.

P

Parameter

Device data and values that can be read and set (to a certain extent) by the user.

PELV

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

PLC

Programmable logic controller

Power stage

The power stage controls the motor. The power stage generates current for controlling the motor.

Q

Quick Stop

The Quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.

W

Warning

If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.

