GEFRAN

Instruction manual

EXP-ETH-IP-ADV

Industrial Ethernet* interface expansion card

1S5L19, EXP-ETH-IP-ADV -IT/EN
manual (rev 0.4 - 7-4-2021)

** Compatible to industry standards.*

1. Introduction

This manual describes the EXP-ETH-IP-ADV option card aimed at connecting the ADV200 series Drives to Industrial Ethernet networks.

It is possible to use only one field bus expansion card per Drive.

This manual is intended for design engineers and technicians responsible for the maintenance, commissioning and operation of Industrial Ethernet systems.

Basic knowledge of Industrial Ethernet is required. The EXP-ETH-IP-ADV200 card is only suitable for use with drives running firmware version 4.00 or later.

1.1. Reinforced insulation

PELV (Protective Extra Low Voltage) EN 61800-5-1.

1.2. Features

- Standard RJ45 with support for shielded twisted pair, half-duplex / full-duplex and 10Mbs / 100Mbs connectivity
- Dual 100Mbps Industrial Ethernet interfaces for use in line topologies i.e. daisy chaining
- Control cycle times down to 1ms
- Configured Station Alias
- Maximum input data length 32+4 bytes
- Maximum output data length 32 bytes
- Vendor ID = 949

1.3. What is EtherNet/IP?

EtherNet/IP is the name given to the Common Industrial Protocol (CIP) , as implemented over standard Ethernet (IEEE 802.3 and the TCP/IP protocol suite).

EtherNet/IP is an industrial Ethernet solution available for manufacturing automation , based on the Common Industrial Protocol (CIP) , a media independent connection based , object oriented protocol designed for automation applications , encompassing a comprehensive set of communication services for automation applications : control , safety , synchronization , motion , configuration and information .

The “IP” in “EtherNet/IP” refers to “Industrial Protocol” . It is built on the Ethernet physical layer network infrastructure and the TCP-IP protocol , and therefore can be used in automation networks which can tolerate some amount of non-determinism . Among other things this enables :

- Transfer of basic I/O data via User Datagram Protocol (UDP)-based Implicit Messaging,
- Uploading and downloading of parameters via TCP , using Explicit Messaging
- Polled monitoring via UDP,
- “EtherNet/IP” makes use of well known TCP port number 44818 for explicit, messaging and UDP port number 2222 for implicit messaging.

1.4. Safety

Before installing the card, read the safety instruction section carefully, see ADV200 Quick Start-up guide, Chapter 1 - Safety Precautions.

1.5. Mounting

Refer to ADV200 Quick Start up manual, chapter “Installation of optional cards**”: the card must be inserted on slot 3**.

Caution

Use only supplied screws.

1.6. Connections

Bus media

The Industrial Ethernet option module incorporates two 100 BASE-TX RJ45 interfaces.

Cabling considerations

To ensure long-term reliability it is recommended that any cables used to connect a system together be tested using a suitable Ethernet cable tester, this is of particular importance when cables are constructed on site.

Cable

Cables should be shielded and as a minimum, meet TIA Cat 5e requirements.

Cabling issues are the single biggest cause of network downtime. Ensure cabling is correctly routed, wiring is correct, connectors are correctly installed and any switches or routers used are rated for industrial use. Office grade Ethernet equipment does not generally offer the same degree of noise immunity as equipment intended for industrial use.

Maximum network length

The main restriction imposed on Ethernet cabling is the length of a single segment of cable.

The ADV-Industrial Ethernet module has two 100BASE-TX Ethernet ports, which support segment lengths of up to 100m. This means that the maximum cable length which can be used between one ADV-Industrial Ethernet port and another 100BASE-TX port is 100m however it is not recommended that the full 100m cable length is used.

The total network length is not restricted by the Ethernet standard but depends on the number of devices on the network and the transmission media (copper, fiber optic, etc.).

The Industrial Ethernet system designer must consider the impact that the selected network structure will have on performance.

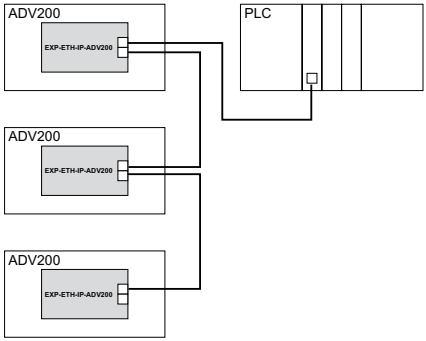
ADV-Industrial Ethernet terminal descriptions

The ADV-Industrial Ethernet module has two RJ45 Ethernet ports for the Industrial Ethernet network.

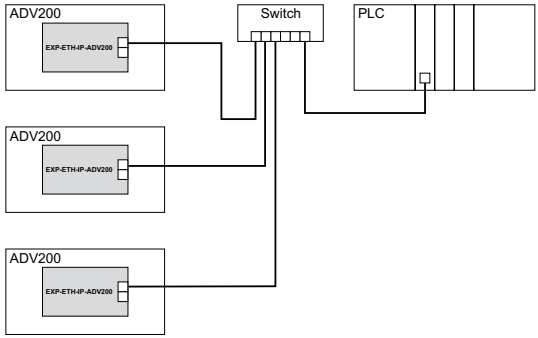
Industrial Ethernet terminal connections			
Pin	**A - IN (J1(**	**Pin**	**B - OUT (J2)**
1	Transmit +	1	Transmit +
2	Transmit -	2	Transmit -
3	Receive +	3	Receive +
4	Not used	4	Not used
5	Not used	5	Not used
6	Receive -	6	Receive -
7	Not used	7	Not used
8	Not used	8	Not used

Network topology

Devices may be connected via daisy chaining:



Or switch:



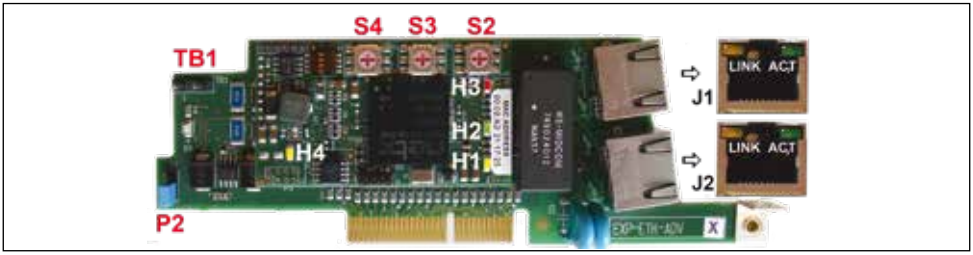
The two Ethernet ports are interchangeable, in that there is no specific input or output port; the card acts as an Ethernet switch.

Minimum node-to-node cable length

There is no minimum length of cable recommended in the Ethernet standards.

To avoid possible problems it is recommended that you allow sufficient cable length to ensure good bend radii on cables and avoid unnecessary strain on connectors.

1.7. Leds - Rotary switch - Jumper - Terminal



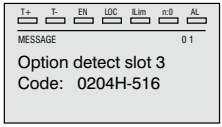
LEDs				
Reference	Color	Display	Status	Descriptions
LINK (J1) (Eth0 IN)	yellow	off	-	no connection with the previous Industrial Ethernet device
		on	linked	previous Industrial Ethernet-device connected
ACT (J1) (Eth0 IN)	green	blinking	active	communication with the previous Industrial Ethernet device
		off	-	no connection with the previous Industrial Ethernet device
		on	-	no communication with the previous Industrial Ethernet device
LINK (J2) (Eth1 OUT)	yellow	off	-	no connection with the next Industrial Ethernet device
		on	linked	next Industrial Ethernet device connected
ACT (J2) (Eth1 OUT)	green	blinking	active	communication with the next Industrial Ethernet device
		off	-	no connection with the next Industrial Ethernet device
		on	-	o communication with next previous Industrial Ethernet device
H1 (RDY)	yellow			Indicates the processor mode. Off in boot mode. On when the software is installed.
H2 (RUN)	green			RUN: Indicates that the processor is executing a software program. Off when the processor is executing the program. Flashes in boot mode.
H3 (FAIL)	red			FAIL: Indicates a system malfunction. Lit when errors are present.
H4 (PWR)	yellow			PWR: Indicates the presence of the card power supply. Lit when the card is powered.

ROTARY SWITCH	
Reference	Descriptions
S4	Node address for 1. It must always be left in position 0.
S3	Node address for 10. It must always be left in position 0.
S2	Node address for 100. It must always be left in position 0.

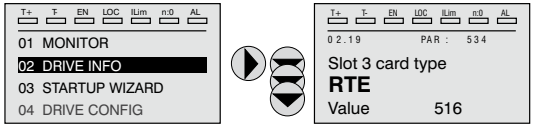
JUMPER	
Reference	Descriptions
P2	If terminals are mounted, the jumper must be installed in position 2-3.

TERMINAL	
Reference	Descriptions
TB1	If contacts are mounted they must be left NOT CONNECTED.

1.8. Optional card recognition



At power-on, the drive recognizes the presence of optional card in the expansion slot 3, this message is shown on the display.



On 02 DRIVE INFO menu, select the PAR 534 Slot 3 card type to read the recognized card type.

Value	Description	Card type
0	None	-
516	RTE	EXP-ETH-IP-ADV
255	Unknown	-

2. Start-up guide

This section is intended to provide a generic guide for setting up module with a master/controller PLC. It will cover the basic steps required to get cyclic data communicating using the Industrial Ethernet protocol on the module.

Gefran EDS file

Gefran provides an Industrial Ethernet device description file EXP-ETH-IP-ADV200, “RTE v1.1.eds”, which contains all the information required by the Industrial Ethernet master to facilitate configuration. Please contact the Gefran Customer Service: technohelp@gefran.com.

Configuring the -Industrial Ethernet module for cyclic communications

Configuring the Industrial Ethernet module for cyclic communication

In the Industrial Ethernet protocol configuration, the instances for describing I/O polling data exchange have a fixed size, which must correspond to the settings on the master and on the device.

The network transmission speed is fixed. The module must be associated with a unique IP address for the sub-network in which it is used, according to the procedure described in “Industrial Ethernet node address”.

The LED on the front of the module relating to the connector to be used indicates whether the Ethernet cable has been connected properly to the Industrial Ethernet module on the drive: if it is green, the master is connected, if it is not lit check the wiring and that the master has started the communication.

Set the IP address of the EXP-ETH-IP-ADV200 card as described in paragraph “5. IP address Management Procedure” on page 25.

In the master, scan the network to check that the Industrial Ethernet module has been properly connected to the master. If the network has been configured correctly, one or more Industrial Ethernet nodes will appear in the master PLC.

Decide which input/output data are to be sent cyclically (objects and/or parameters). The input/output data associated with polling cyclic data exchange can be configured directly via the drive parameters (setting in the FIELDBUS M2S and FIELDBUS S2M menus).

It is important to set a data area size that is compatible with the Master and the Industrial Ethernet device: if set on the drive, make sure the number of bytes used corresponds to the size of the I/O area set on the master. The size in bytes used by the drive is obtained from the settings in the FIELDBUS M2S and S2M menus, by adding the size in bytes of each parameter set via the relative “Fieldbus M->S n sys” or “Fieldbus S->M n sys” parameter, according to the table below:

Not assigned	The datum in question and all subsequent data (even if assigned) do not contribute to the I/O area.
Count16,Par16,Fill16,MdpPlc16,Eu	2 byte
Count32,Par32,Fill32,MdpPlc32, Eu float	4 byte

The I/O data area of the “Master to Slave (M2S)” and “Slave to Master(S2M)” drive and the assembly instance are associated as follows:

- M2S assembly instance 100 connection output
- S2M assembly instance101 connection input.

IMPORTANT:

the size of the connection input on the master must always be increased by 4 bytes.

Download the configuration to the master

After downloading the configuration to the master the LED(s) on the front of the Industrial Ethernet should flash, depending on the port(s) connected.

If configured correctly, when the master passes to “Run” mode (drive parameter 4014 “Fieldbus State” passes to “Operational”) the output values sent by the master are visible in the drive parameters associated with the channels configured in the “Fieldbus M2S” menu, while the input values received are updated to the values of the “Fieldbus S2M” menu parameters.

Menu Fieldbus

To enable the EXP-ETH-IP-ADV card set PAR 4000 **Fieldbus type** as “RTE”.

The following parameters are available in the COMMUNICATION->FIELDBUS CONFIG menu:

PAR	Parameter description	Type	Default value	Attr
4000	Fieldbus Type	Enum	RTE	Write
4006	Fieldbus address	2 byte unsigned	0	Write
4010	Fieldbus M->S enable	Enum	On	Write
4012	Fieldbus alarm mode	2 byte unsigned	0	Write
4014	Fieldbus state	Enum	Stop	Read only
4398	RTE protocol	Enum	None	Read only

Note:

The drive must be reset to make all fieldbus settings and configurations effective.

- **Fieldbus address** = not used. The master identifies the card via the IP address (see “5. IP address Management Procedure” on page 25).
- **Fieldbus M->S enable** = if set to Off the data the PLC sends the drive (master to slave) are not updated anymore by the drive and the current values are maintained.
- **Fieldbus alarm mode** = if set to On the drive generates **Opt Bus Fault** errors relating to the loss of communication (Bus Loss) even when the drive is not enabled.
- **Fieldbus state** = state of the communication on the RTE network :

Industrial Ethernet	PAR 4014 Fieldbus state
Boot	Stop
Init	Init
No connection (explicit messages available)	Pre-operational
Connecting	Safe-op
Connection established	Operational

- **RTE Protocol** = EthernetIP

Configuration example

This chapter provides an example of how to configure the parameters of ADV200 drives so that they can be read and written by a Scanner Industrial Ethernet via the processing channels (Dati di input/output cyclic datas). See the chapter “2.2.2. Writing Output data” on page 14 for the configuration channels.

The paragraph “2.1. Industrial Ethernet Scanner” on page 10 provides the information required on a Scanner Industrial Ethernet controlling a machine. The paragraph “2.1.3. Composition of I/O” on page 11 contains basic information for programming the ADV200 drive starting from the factory settings.

2.1. Industrial Ethernet Scanner

This section contains an example of data exchange seen from the PLC side. This is the data normally contained in the machine specifications in the case of applications controlled by a Industrial Ethernet Scanner.

2.1.1. Description of Master -> Slave cyclic input/output data communication

There are two parameters to be written via the processing channels. The first is a control word, in which the single bits contain certain commands (e.g. enable, start, etc.). The second processing channel contains the ramp reference 1 (RampRef1) in rpm.

Industrial Ethernet cyclic input/output data: Master -> Drive (max 16 words)

Position	Description	Format	Unit of Measure
Word1 M -> S	Control word	16 bit Word	...
Word2 M -> S	Ramp Ref 1	Int 16 bit	rpm
Word3 M -> S			
Word4 M -> S			
Word5 M -> S			
Word6 M -> S			
Word7 M -> S			
...			
...			
Word16 M > S			

CONTROL WORD

Bit	Description	Remarks
0	EnableCmd	Enable command from PLC
1	StartCmd	Start command from PLC
2	Free	
3	Free	
4	Free	
5	Free	
6	Free	
7	Free	
8	Digital Out3	Digital output 3 command from PLC
9	Digital Out4	Digital output 4 command from PLC
10	Free	
11	Free	
12	Free	
13	Free	
14	Free	
15	Free	

2.1.2. Description of Slave -> Master cyclic input/output data communication

The Industrial Ethernet Scanner reads three parameters from the drive. The first contains a status word in which the single bits carry information about the status of the drive (e.g. DriveOk). The second parameter is the actual speed in rpm. The third parameter contains the value of analog input 2.

Industrial Ethernet Slave > Master cyclic input/output data (max 16 Words)

Position	Description	Format	Unit of Measure
Word1 S -> M	Status Word	16 bit Word	BitWide
Word2 S -> M	Actual Speed	Int 16 bit	rpm
Word3 S -> M	Analog Input 2	Int 16 bit	
Word4 S -> M			
Word5 S -> M			
Word6 S -> M			
Word7 S -> M			
...			
...			
Word16 S -> M			

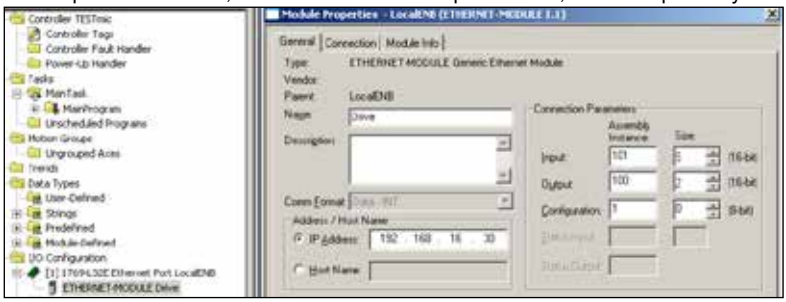
STATUS WORD

Bit	Description	Remarks
0	EnableState	Drive enabled
1	Drive Ok	Drive Ok
2	Speed is zero	Zero speed threshold
3	Free	
4	Free	
5	Free	
6	Free	
7	Free	
8	Digital Input 4	ADV200 digital input 4 status
9	Digital Input 5	ADV200 digital input 5 status
10	Free	
11	Free	
12	Free	
13	Free	
14	Free	
15	Free	

2.1.3. Composition of I/O

By analysing the size of the data in the composition instances we know that:

- Input instance 101, associated with 3 read parameters, is made up of 6 bytes, to which 4 bytes must be added (reserved), for a total of 10 bytes;
- Output instance 100, associated with 2 write parameters, is made up of 4 bytes.



The I/O data are thus associated in the instances:

- **Composition of Instance 101:**

Mode	Instance	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Transparent	101	0	Reserved							
		1	Reserved							
		2	Reserved							
		3	Reserved							
		4	Low byte (4432 Word comp mon)							
		5	High byte (4432 Word comp mon)							
		6	Low byte (260 Motor Speed)							
		7	High byte (260 Motor Speed)							
		8	Low byte (1500 Analog input 1mon)							
		9	High byte (1500 Analog input 1mon)							
		xxx								

- **Composition of Instance 100:**

Mode	Instance	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Transparent	100	0	Low byte (4452 Word decomp src)							
		1	High byte (4452 Word decomp src)							
		2	Low byte (610 Ramp ref 1 src)							
		3	High byte (610 Ramp ref 1 src)							
		4								
		5								
		6								
		7								
		8								
		9								
		xxx								

2.2. ADV200 Configuration

The example given in this section is based on the assumption that the parameters of the ADV200 drive are the factory settings (**Default parameter** command).

The I/O data exchanged via the EXP-ETH-IP-ADV200 card can be configured by associating them with the drive parameters. The data written by the Industrial Ethernet scanner to the drive are associated with output instance 100 and configured on the drive via the parameters in the “Fieldbus M2S” (Master to Slave) menu.

The data read by the scanner are associated with input instance 101 and configured on the drive via the parameters in the “Fieldbus S2M” (Slave to Master) menu.

Parameters can be either 2 or 4 bytes long, depending on the associated format, selected via the “Fieldbus M2S n sys” and “Fieldbus S2M n sys” settings.

There are 16 input channels and 16 output channels in which from 0 to 16 data

can be configured, as long as the total number of bytes requested does not exceed 32 input bytes and 32 output bytes.

Example:

It is possible to have:

- from 0 to 16 data items of 2 byte
- 1 datum of 4 bytes + from 0 to 14 data items of 2 bytes
- 2 data items of 4 bytes + from 0 to 12 data items of 2 bytes
- ...
- 8 data items of 4 bytes

The data exchanged via the PDC can be of two types:

- drive parameters
- variables of an MDPlc application

2.2.1. Reading states and writing commands to the drive

Specific parameters are available for reading states and writing commands to the drive, in which each bit can be programmed and associated with a function.

Commands can be sent to the drive using the functions of PAR 4452 **Word decomp src**. The meaning of the single bits is programmable. It can be set on a Field bus M->Sn channel as Count 16.

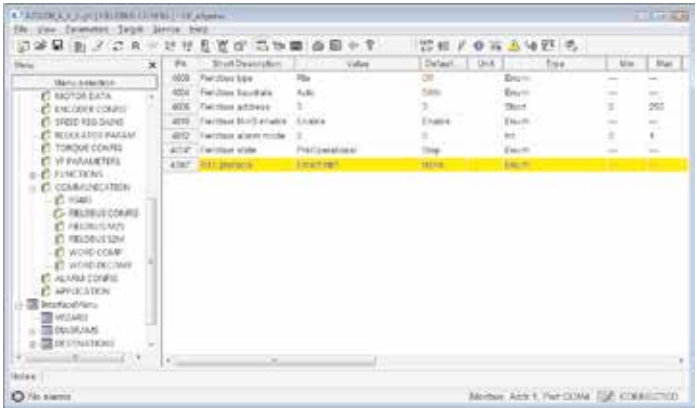
The drive state is read in PAR 4432 **Word Comp mon**, programmable on any Field bus S->Mn channel as Count 16. The meaning of each single bit can be selected by the user using PAR 4400 **Word Bit 0 src** ... PAR 4430 **Word Bit 15 src**.

For a detailed description of these parameters see the drive manual.

2.2.1.1. FIELDBUS CONFIG menu

Note: The drive must be reset to make all fieldbus settings and configurations effective.

Configure the fieldbus menu parameters as shown below:



I/O data exchange is only actually active when parameter 4014 “Fieldbus state” is

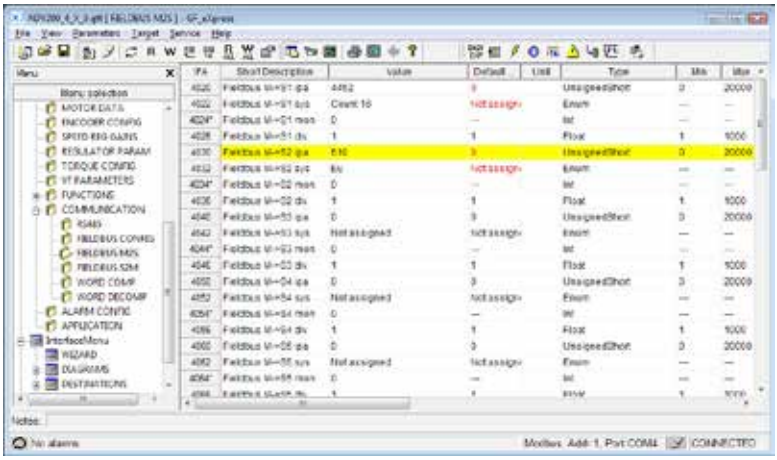
set to “Operational”. In all other cases, the scanner has not started to exchange I/O data with the EXP-ETH-IP-ADV200 card. This could be due to incorrect assembly instance configuration, for example if the size set on the scanner is not the same as that obtained from the settings in the “Fieldbus M2S” and “Fieldbus S2M” menus, or if the scanner is not in the “Run” state.

If parameter 4014 “Fieldbus state” is “Operational” the I/O data are updated with the programmed parameter values. The drive can only be enabled in this state.

2.2.2. Writing Output data

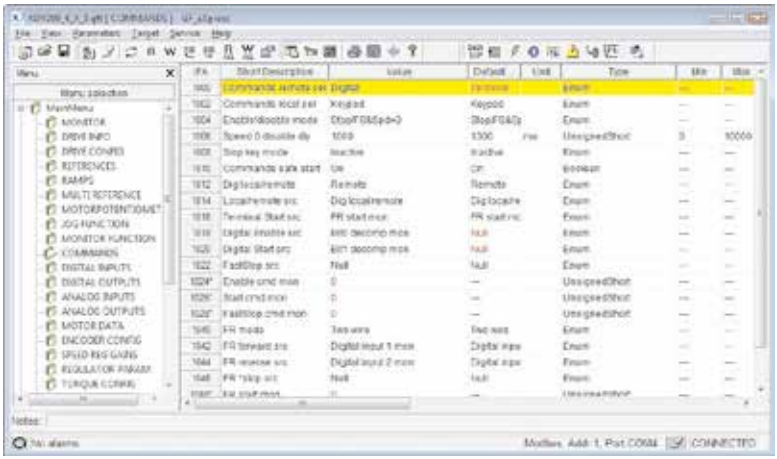
2.2.2.1. Fieldbus M2S Menu

Wdecomp is used to **configure the control word**. The Wdecomp configuration on the first M -> S word (“Export” mode) is shown below:

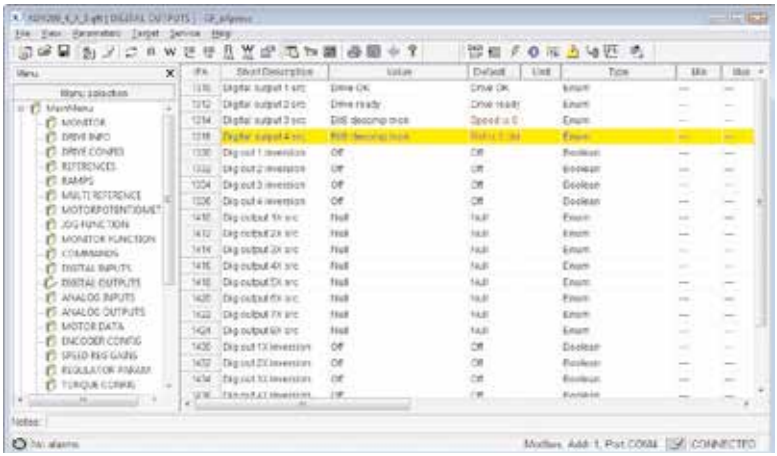


Now simply connect the single Wdecomp bits. For Commands the drive must be set to “**Remote**” and “**Digital**” mode, as explained in the ADV200 manual.

Configure the first two bits in the commands menu as shown below:

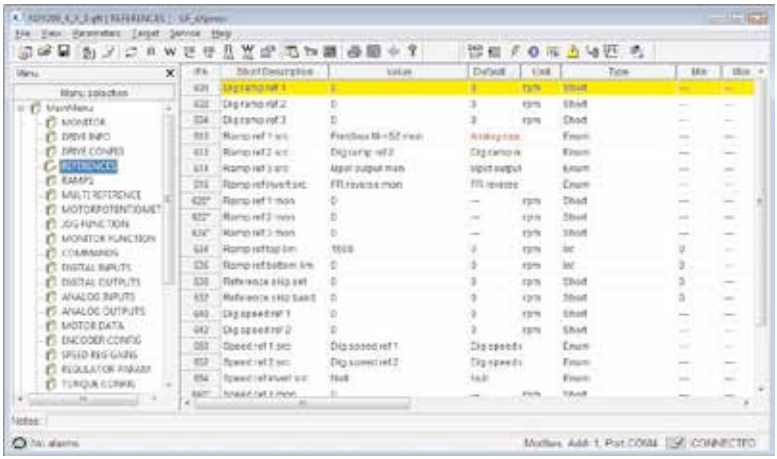


Configure bits 8 and 9 of the “Command word” as shown below (Digital Outputs menu):

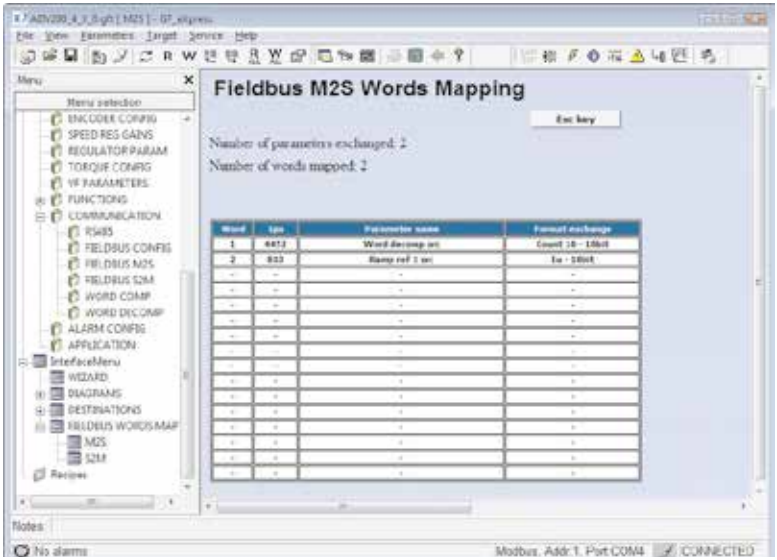


2.2.2.2. REFERENCES Menù

The second word is configured in the “References” menu:



After sending a save command and re-starting the drive, check that the M -> S channels have been configured correctly as shown (Html page):

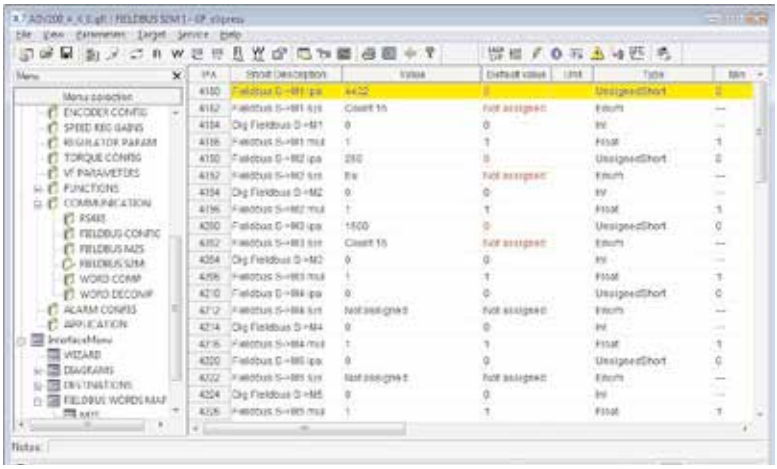


2.2.3. Writing Input data

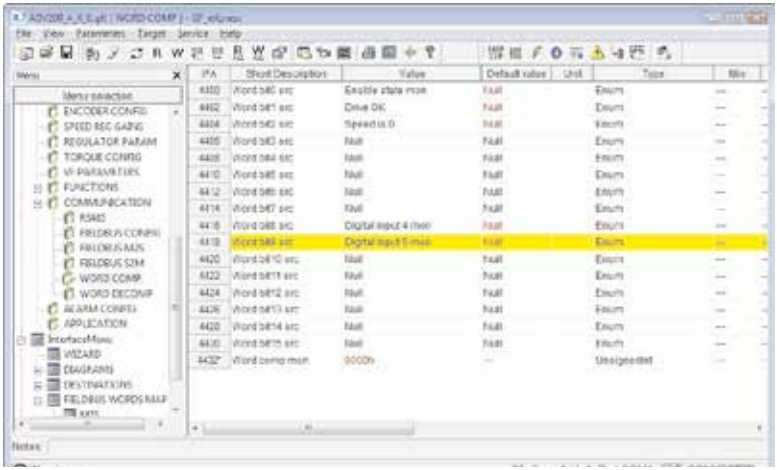
2.2.3.1. FIELDBUS S2M Menu

These channels are configured in the Fieldbus S2M menu. Use Wcomp to configure the first channel.

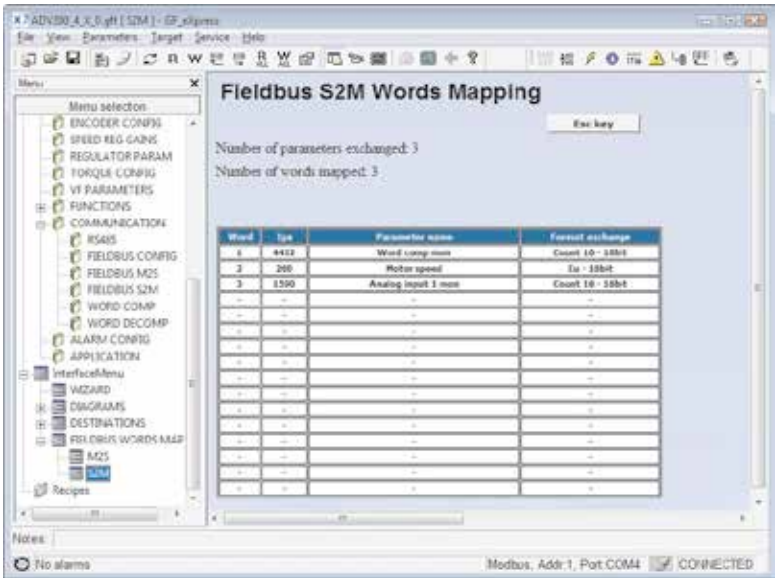
S2M configuration is shown below:



Wcomp configuration is shown below:



Save and then re-start the drive to check the correct configuration of the Slave -> Master channels in the same way:



2.3. Communication check

Some notes/suggestions for checking communication.

- Cyclic input/output data communication is only active if the state of parameter 4014 **Fieldbus state** is “Operational”. Check the status using Gf_eXpress or the expansion card LED.
- For Master -> Slave communication in the FIELDBUS M2S menu you can check the value received by the communication channel (e.g. for the first channel it is the Fieldbus M->S1 Mon parameter).
- For EU (engineering unit) communication, remember that the value read on the Mon parameters of FIELDBUS MS2 is in internal units (see conversion tables on chapter 5.0 SYSTEM INTERNAL VARIABLES, “ADV200, Write the applications with the MDPlc” manual available on www.gefran.com).

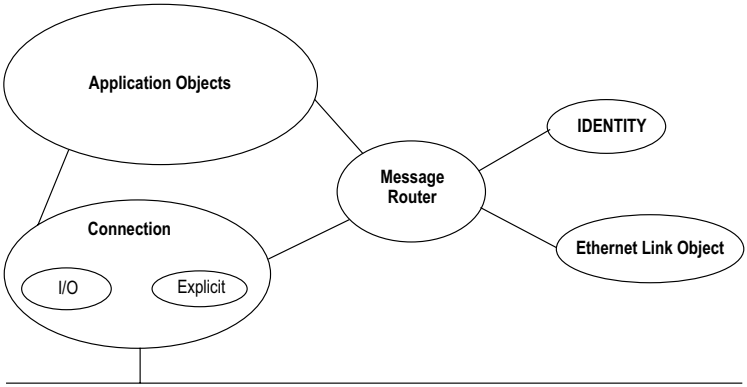
3. Protocols

The EXP-ETH-IP-ADV200 board operates as an “Industrial Ethernet I/O adapter” , receiving implicit communication request from an I/O scannet and produces I/O data. It is also an “Explicit message server”. The following features are supported :

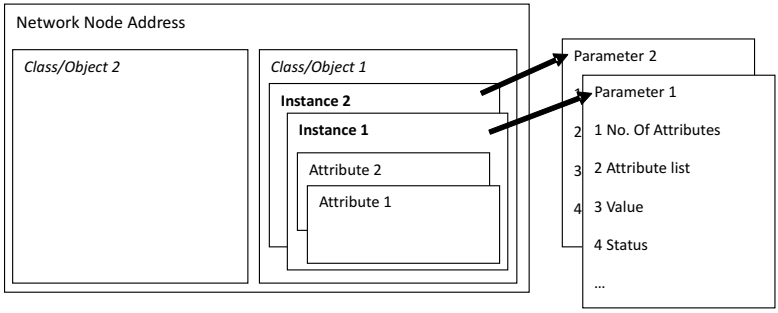
- Industrial Ethernet ‘Transparent mode’
- I/O connection: 1 explicit owner , 2 listen only
- I/O connection type: cyclic, (minimum 2 ms)
- Explicit messages supported
- UCMM supported
- Identity object
- Message Router object
- Assembly object
- Connection object
- Ethernet link object
- TCP/IP object
- DHCP/BOOTP
- Baud rate: 10 / 100 mbit autosensing
- Data transport layer: Ethernet II , IEEE 802.3
- Default IP address: 192.168.1.100 /24.

3.1. Description of data exchanged by an RTE device

The basic diagram of the device is shown below:



Addressing data within a CIP device utilizes an object oriented view. A class (of objects) is a set of objects that represent the same type of system component (See next figure). Sometimes it is necessary to have more than one “copy” of an object, called object instances , within a device.This set of objects is called an “object class”. Each instance of the object class will have the same set of attributes , but a unique set of values. An object instance or an object class has attributes, providing services and implementing behavior .



Accessing data within a device using a non-time critical message (explicit message) contains the following information : network address ,Class ID , Instance ID, Attribute ID, Service Code. This addressing is also used in Electronic Data Sheets (EDS) to identify configurable parameters within a device .

In addition to specifying how device data is represented, CIP also specifies methods by which I/O data can be accessed, using triggers, and how data from different objects can be combined in an I/O or configuration message using the Assembly Object.

3.2. Description of objects

- **Identity Object (0x01)**

This object is used to identify and obtain general information from the device.

Instance	Name	Attribute ID	Name	Supported Services	
				Get Attribute Single	Get Attribute All
0	Class	1	Revision	yes	yes
		2	Max. Instance		
		6	Max. Class Attrib.		
		7	Max. Instance Attrib.		
1	Instance Attributes	1	Vendor	yes	yes
		2	Product type		
		3	Product code		
		4	Major Revision		
		5	Status		
		6	Serial number		
		7	Product Name		
		10	Heartbeat interval		

- **Message Router Object (0x02)**

This object allows a potential client to address the device and gather information in server classes.

Object class	Attributes	Not supported
	Services	Not supported
Object instance	Attributes	Not supported
	Services	Not supported

- **Assembly Object (0x04)**

Assembly instances are used to connect input/output data to the communication connection.

Instance	Name	Attribute ID	Name	Supported Services	
				Get Attribute Single	Set Attribute Single
0	Class	1	Revision	yes	no
		2	Max. Instance	yes	no
1-x	Instance Attributes	3	Data	yes	yes
		4	Size	yes	no

- **Composition of assembly instances**

Mode	Instance	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Transparent	100 (Output)	0	User specific input (little endian format)							
		1								
		2								
		---	...							
		Xxx								
	101 (Input)	0	User specific output (little endian format)							
		1								
		2								
		---	...							
		Xxx								

- **Vendor_Class_Parameter (0x90)**

This is used to read and write data about the connected device using explicit messages.

Instance	Name	Attribute ID	Name	Supported Services	
				Get Attribute Single	Set Attribute Single
0	Class	1	Revision	yes	no
1-x	Instance Attributes	1	Sub-Index 1	yes	yes
		2	Sub-Index 2		
		3	Sub-Index 3		
		4	Sub-Index 4		
		5	Sub-Index 5		
		6	Sub-Index 6		
		7	Sub-Index 7		
		8	Sub-Index 8		
		9	Sub-Index 9		
		10	Sub-Index 10		
		...	...	...	
		200	Sub-Index 200	yes	

Drive parameters can be accessed via this class: the instance is given by the number of the parameter + 8192, the attribute (sub-index) is always 1.

Example of how to access a read parameter:

Supposing you want to read parameter 250 “Output current”, send the following request via explicit message to the “Vendor Class Parameter”, using the standard “get_attribute_single” service.

- 0xe Service
- Class 0x90
- Instance 0x20FA (250 + 8192 = 8442)
- Attribute 1

The response contains the value of parameter 250 “Output current”, divided into 4 bytes with 32-bit IEEE754 float, since this is a float parameter (see the drive manual for information about the format of individual parameters).

4. Alarm

If the drive detects a problem with the Industrial Ethernet communication, it may generate the “Opt bus fault” alarm, which indicates the presence of a fault condition.

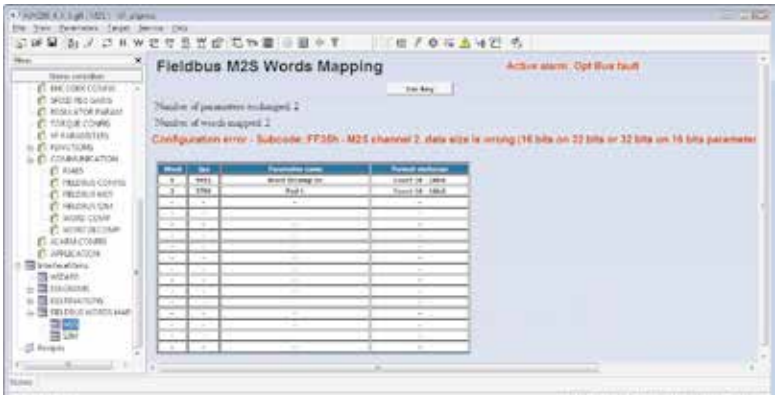
The “Opt bus fault” alarm may be generated for a series of reasons:

- Configuration alarm. This appears at drive start-up (press Esc to continue: however, Industrial Ethernet communication will not be available).
  It indicates an unrecoverable problem in the configuration of the drive or EXP-ETH-IP-ADV200 card. Check the settings in the “Fieldbus”, “Fieldbus M2S” and “Fieldbus S2M” menus. The alarm sub-code indicates the cause of the problem.
- Hardware alarm. This indicates an unrecoverable problem on the EXP-ETH-IP-ADV200 card, which occurred after start-up and during normal operation. If the problem persists, replace the card.
- Bus loss alarm, sub-code = 0. This indicates the loss of communication (passage from network Run to Off) when the drive is enabled, or parameter 4012 = 1. Data exchange must be active (4014 = Operational) when the drive is enabled.

Subcode	Description	Note
0	Bus Loss	connection with the scanner no longer present or Industrial Ethernet state no more Operational
0x8101	NetX system error.	If not recoverable, replace the module.
0x8102,0x8104	DPRAM Error, after WarmStart.	If not recoverable, replace the module
0x8110	Not Ready timeout, NetX not available.	If not recoverable, replace the module.
0xFF02	Communication with the module not available	DPRAM not recognized. Replace the module
0xFF04	Module software version not compatible	
FF01	Fieldbus type does not match expansion card	Verify if EXP-ETH-IP-ADV card is properly installed
FF14..FF23	Wrong object selected for mapping in channel M2S n	Check “Fieldbus M-> Sn Dest”
FF24..FF33	More than 1 Src pointing to M2S Channel n	Check for multiple destinations on “Fieldbus M-> Sn Dest”
FF34..FF43	M2S Channel n, data size is wrong (16 bits on 32 bits or 32 bits on 16 bits parameter)	Check “Fieldbus M-> Sn sys”
FF44..FF53	Invalid parameter in Channel S2M	Check “Fieldbus S-> Mn src”
FF54..FF63	S2M Channel n, data size is wrong (16 bits on 32 bits or 32 bits on 16 bits parameter)	Check “Fieldbus S-> Mn sys”
FF64..FF73	Wrong object selected for mapping in Channel S2M n	Check “Fieldbus S-> Mn src”
FF74..FF83	M2S Channel n: too many words in PDC	“Fieldbus M-> Sn Dest” & “Fieldbus M-> Sn sys” address more than 16 words in PDC
FF84..FF93	S2M Channel n: too many words in PDC	“Fieldbus S-> Mn src” & “Fieldbus S-> Mn sys” address more than 16 words in PDC
FFB4..FFC3	Internal database error on Channel n	Internal error, contact manufacturer

Parameter 4670 “Optionbus activity” can be used to configure drive operation in the loss of communication condition. The default setting is “Disable”, which indicates that the drive must be disabled. This parameter may also be set to “Warning”, in which case the drive can continue to operate, but an error message is displayed. For further details please consult the drive manual.

With Gf_eXpress you can obtain a description of what caused the “Opt bus fault” alarm, by logging on to the relative HTML page as shown in the figure below:



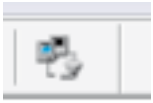
5. IP address Management Procedure

The default setting for the EXP-ETH-IP-ADV200 card is to use IP address 192.168.1.100. Each device in a local Industrial Ethernet network must have a unique address. You must therefore configure different addresses for each single EXP-ETH-IP-ADV200 card in the network.

This can be done using a PC with Ethernet card.

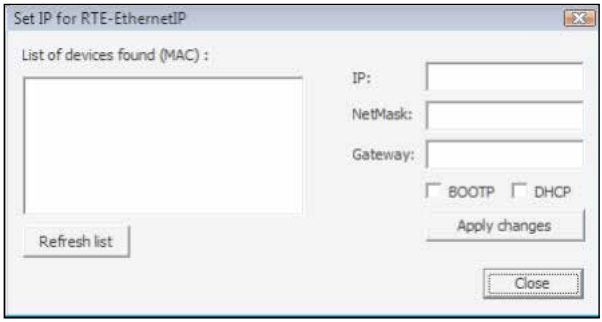
The PC Ethernet card must be configured with an address that is not the same as any of those to be used, yet compatible with the sub-network of the card whose address is to be modified. The PC is now ready for connection to the Industrial Ethernet network.

The Gf_eXpress configurator includes an integrated tool for configuring the IP address of the EXP-ETH-IP-ADV200 card, accessible via the toolbar icon:



.

2. Press the Refresh List button and wait while browsing the network
3. Click on the MAC field of the drive in the “List of devices Found”
4. Set the new parameters (number 3) IP =192.168.27.101, NM= 255.255.255.0 Gateway = 0.0.0.0
5. Press Apply changes
6. Reset the drive



The RTE has a UDP communication channel to implement a protocol for discovering and setting TCP/IP communication parameters.

Send UDP broadcast messages to port 502 to contact an RTE device. Two messages have been implemented:

- **Read**
- **Write**

NB! Reboot the device to enable the new Ethernet interface configuration values (IP, Netmask, gateway, DHCP, BOOTP).

5.1. Read command

The client must send a UDP broadcast message to port 502 of the server. The message consists of the following:

Message from Client to Server (RTE)		
Byte 0	'R'	Message: 'RteR'
Byte 1	't'	
Byte 2	'e'	
Byte 3	'R'	
Total length 4 bytes		

Message from Server (RTE) to client		
Byte 0	'R'	Message: 'RteR'
Byte 1	't'	
Byte 2	'e'	
Byte 3	'R'	
Byte 4	0x00	Mac Address : es. 00:02:A2:21:17:EB
Byte 5	0x02	
Byte 6	0xA2	
Byte 7	0x21	
Byte 8	0x17	
Byte 9	xEB	
Byte 10	192	Ip Address : es. 192.168.1.100
Byte 11	168	
Byte 12	1	
Byte 13	100	
Byte 14	255	Net Mask : es. 255.255.255.0
Byte 15	255	
Byte 16	255	
Byte 17	0	
Byte 18	192	Gateway ip Address: es. 192.168.1.254
Byte 19	168	
Byte 20	1	
Byte 21	254	
Byte 22	0	Flag. Default value = 39 (No BOOTP, No DHCP) If BOOTP is active, flag = 47 If DHCP is active, flag = 55 If DHCP+BOOTP are active, flag = 63
Byte 23	0	
Byte 24	0	
Byte 25	39	
Total length 26 bytes		

5.2. Write command

The client must send a UDP broadcast message to port 502 and specify the MAC address of the addressee. The message consists of the following:

Message from Client to Server (RTE)		
Byte 0	'R'	Message:'RteR'
Byte 1	't'	
Byte 2	'e'	
Byte 3	'W'	
Byte 4	0x00	Addressee's MAC Address: e.g. 00:02:A2:21:17:EB
Byte 5	0x02	
Byte 6	0xA2	
Byte 7	0x21	
Byte 8	0x17	
Byte 9	xEB	
Byte 10	102 (IP4)	Ip Address : es. 192.168.1.102
Byte 11	1 (IP3)	
Byte 12	168 (IP2)	
Byte 13	192 (IP1)	
Byte 14	0 (NM4)	Net Mask : es. 255.255.255.0
Byte 15	255 (NM3)	
Byte 16	255 (NM2)	
Byte 17	255 (NM1)	
Byte 18	254 (Gw 4)	Gateway ip Address: es. 192.168.1.254
Byte 19	1 (Gw 3)	
Byte 20	168 (Gw 2)	
Byte 21	192 (Gw 1)	
Byte 22	39 (FLG 4)	Flag. Default value = 39 (No BOOTP, No DHCP)
Byte 23	0 (FLG 3)	If BOOTP is active, flag = 47
Byte 24	0 (FLG 2)	If DHCP is active, flag = 55
Byte 25	0 (FLG 1)	If DHCP+BOOTP are active, flag = 63
Total length 26 bytes		

Message from Server (RTE) to client		
Byte 0	'R'	Message:'RteR'
Byte 1	't'	
Byte 2	'e'	
Byte 3	'W'	
Total length 4 bytes		

6. In general

6.1. Glossary

I/O Scanner

Device that controls implicit I/O data exchange on the network. This is usually a PLC.

I/O Adapter

Device that receives requests for implicit communication connection from the scanner and responds with I/O data. The EXP-ETH-IP-ADV200 card installed in the drive acts as adapter and explicit message server.

Explicit Messaging

Connected or unconnected point-to-point messages used to access the objects of a device, with latency not predefined.

Implicit Messaging

Messages exchanged via I/O connections, to transmit specific process data with reduced latency.

Explicit Message Client

Starts the request for explicit communication. Devices of this type

Explicit Message Server

Responds to the client's requests for explicit communication. The EXP-ETH-IP-ADV200 card installed in the drive acts as the server.

Unconnected Messaging

Method for exchanging data between nodes without opening any CIP connection. Only used for explicit messages.

Connected Messaging

A CIP connection can be established between 2 or more application objects between different nodes. This creates a virtual data exchange circuit, in which the resources are pre-allocated and always available. It is used for both implicit (I/O) and explicit messages.

Ethernet

Networking technology for local area networks (LANs) , standardized in IEEE 802.3

6.2. Abbreviations

EtherNet/IP	Ethernet Industrial Protocol
CIP	Common Industrial Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
UDP	User Datagram Protocol
I/O	Input / Output
M2S	Master to Slave (data written to drive), associated with the output instance
S2M	Slave to Master (data read by drive), associated with the input instance
PLC	Programmable Logic Controller.

6.3. References

1. PUB00213R0 "EtherNet/IP_Developers_Guide" Quick Start for Vendors Handbook
2. ADV200 "Quick Start-up guide - Specification and installation" manual
3. ADV200 "Functions description and parameters" list manual