GEFRAN

IR 12/24
IR-CONTROLLER

USER MANUAL PROFINET IO PROTOCOL

Software version: 1.5x

cod.:

80628_MSW_IR 12/24_PROFINET_07-2021_ENG

ATTENTION !

This manual is an integral part of the product and must always be available to persons who operate it.

This manual must always accompany the product if it is sold to another user.

Installers and/or maintenance personnel MUST read this manual and precisely follow the instructions contained herein and in the attachments. **GEFRAN** will not be liable for any harm to persons and/or damage to property or to the product itself if the conditions described below are not conformed to.

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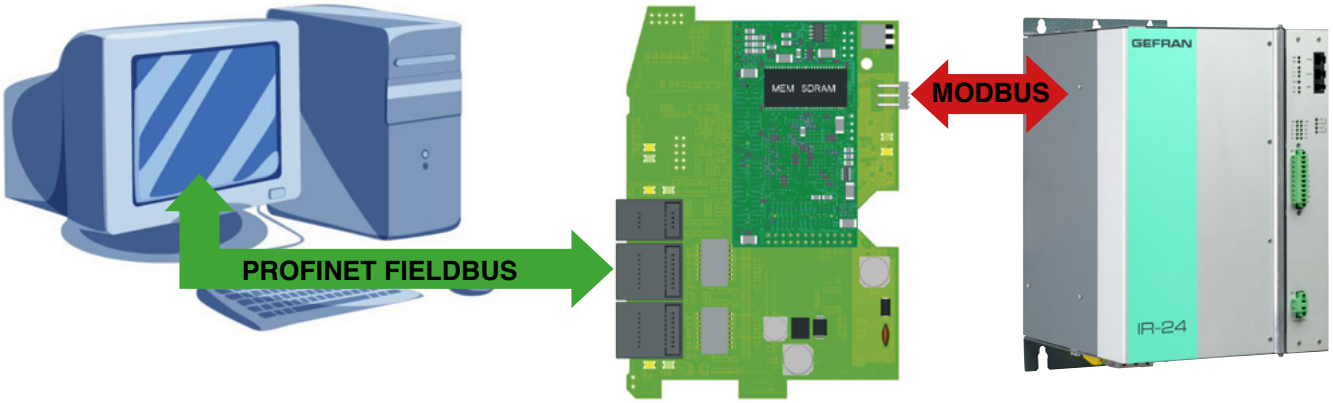
SUMMARY

1 • INTRODUCTION

The RTE (Real Time Ethernet) card is a device that implements Profinet IO device protocol for the hosts connected to it. The block diagram of the communication can be illustrated as in Figure:



we have:

- a Profinet controller connected to Profinet-IO devices (Gefran RTE Profinet Bridge) connected via the Profinet protocol
- a Modbus RTU Master running on RTE (Gefran Profinet Bridge) connected via serial line to a Modbus slave RTU (Gefran IR 12/24 (IR-CONTROLLER)

2 • MAIN CHARACTERISTICS

- Profinet-IO to Modbus Master RTU
- TWO Ethernet port RJ45 : Eth 0 ed Eth 1
- Internal swicth
- Baud rate 100Mbits base-tx
- Auto-Crossover
- Internal installation
- Data transport layer Ethernet II , IEEE 802.3
- RTC – Real time Cyclic Protocol
- - Class 1 & Class 2 (unsynchronized)
- RTA – Real time Acyclic Protocol
- DCP – Discovery and Configuration Protocol
- CL-RPC – Connectionless Remote Procedure Call
- LLDP – Link Layer Discovery Protocol
- No fast startup
- 142 input words (7 data records)

Input record 1	Modbus Address	Input Data Offset
Percentage of modulation of output 1 phase L1	0	0
Percentage of modulation of output 2 phase L1	1	2
Percentage of modulation of output 3 phase L1	2	4
Percentage of modulation of output 4 phase L1	3	6
Percentage of modulation of output 5 phase L1 (1)	4	8
Percentage of modulation of output 6 phase L1 (1)	5	10
Percentage of modulation of output 7 phase L1 (1)	6	12
Percentage of modulation of output 8 phase L1 (1)	7	14
Percentage of modulation of output 1 phase L2	8	16
Percentage of modulation of output 2 phase L2	9	18
Percentage of modulation of output 3 phase L2	10	20
Percentage of modulation of output 4 phase L2	11	22
Percentage of modulation of output 5 phase L2 (1)	12	24
Percentage of modulation of output 6 phase L2 (1)	13	26
Percentage of modulation of output 7 phase L2 (1)	14	28
Percentage of modulation of output 8 phase L2 (1)	15	30

Input record 2	Modbus Address	Input Data Offset
Percentage of modulation of output 1 phase L3	16	32
Percentage of modulation of output 2 phase L3	17	34
Percentage of modulation of output 3 phase L3	18	36
Percentage of modulation of output 4 phase L3	19	38
Percentage of modulation of output 5 phase L3 (1)	20	40
Percentage of modulation of output 6 phase L3 (1)	21	42
Percentage of modulation of output 7 phase L3 (1)	22	44
Percentage of modulation of output 8 phase L3 (1)	23	46

Input record 3	Modbus Address	Input Data Offset
Voltage measure of phase L1	24	48
Voltage measure of phase L2	25	50
Voltage measure of phase L3	26	52
Temperature of heatsink 1	27	54
Temperature of heatsink 2	28	56
Status of digital I/O (2)	29	58
General status (3)	30	60
Status of alarms (4)	31	62
Enable of L1 channels (5)	32	64
Enable of L2 channels (6)	33	66
Enable of L3 channels (7)	34	68
Minimum number of cycles in BF mode	35	70
Automatic cycle start/stop	36	72
Nominale voltage of phase L1	37	74
Nominale voltage of phase L2	38	76
Nominale voltage of phase L3	39	78

Input record 4	Modbus Address	Input Data Offset
Sequence number	40	80
Type of firing	41	82
Type of load	42	84
Device options	43	86
Length of softstart ramp in manual mode	44	88

Input record 5	Modbus Address	Input Data Offset
Automatic cycle status	49	90

Input record 6	Modbus Address	Input Data Offset
Device operating status	129	92
Manual power of output 1 phase L1	130	94
Manual power of output 2 phase L1	131	96
Manual power of output 3 phase L1	132	98
Manual power of output 4 phase L1	133	100
Manual power of output 5 phase L1 (1)	134	102
Manual power of output 6 phase L1 (1)	135	104
Manual power of output 7 phase L1 (1)	136	106
Manual power of output 8 phase L1 (1)	137	108
Manual power of output 1 phase L2	138	110
Manual power of output 2 phase L2	139	112
Manual power of output 3 phase L2	140	114
Manual power of output 4 phase L2	141	116
Manual power of output 5 phase L2 (1)	142	118
Manual power of output 6 phase L2 (1)	143	120
Manual power of output 7 phase L2 (1)	144	122

Input record 7	Modbus Address	Input Data Offset
Manual power of output 8 phase L2 (1)	145	124
Manual power of output 1 phase L3	146	126
Manual power of output 2 phase L3	147	128
Manual power of output 3 phase L3	148	130
Manual power of output 4 phase L3	149	132
Manual power of output 5 phase L3 (1)	150	134
Manual power of output 6 phase L3 (1)	151	136
Manual power of output 7 phase L3 (1)	152	138
Manual power of output 8 phase L3 (1)	153	140

76 output words (3 records)

Output record 1	Modbus Address	Output Data Offset
Enable of L1 channels	32	0
Enable of L2 channels	33	2
Enable of L3 channels	34	4
Minimum number of cycles in BF mode	35	6
Automatic cycle start/stop	36	8
Nominale voltage of phase L1	37	10
Nominale voltage of phase L2	38	12
Nominale voltage of phase L3	39	14
Sequence number	40	16
Type of firing	41	18
Type of load	42	20
Device options	43	22
Length of softstart ramp in manual mode	44	24

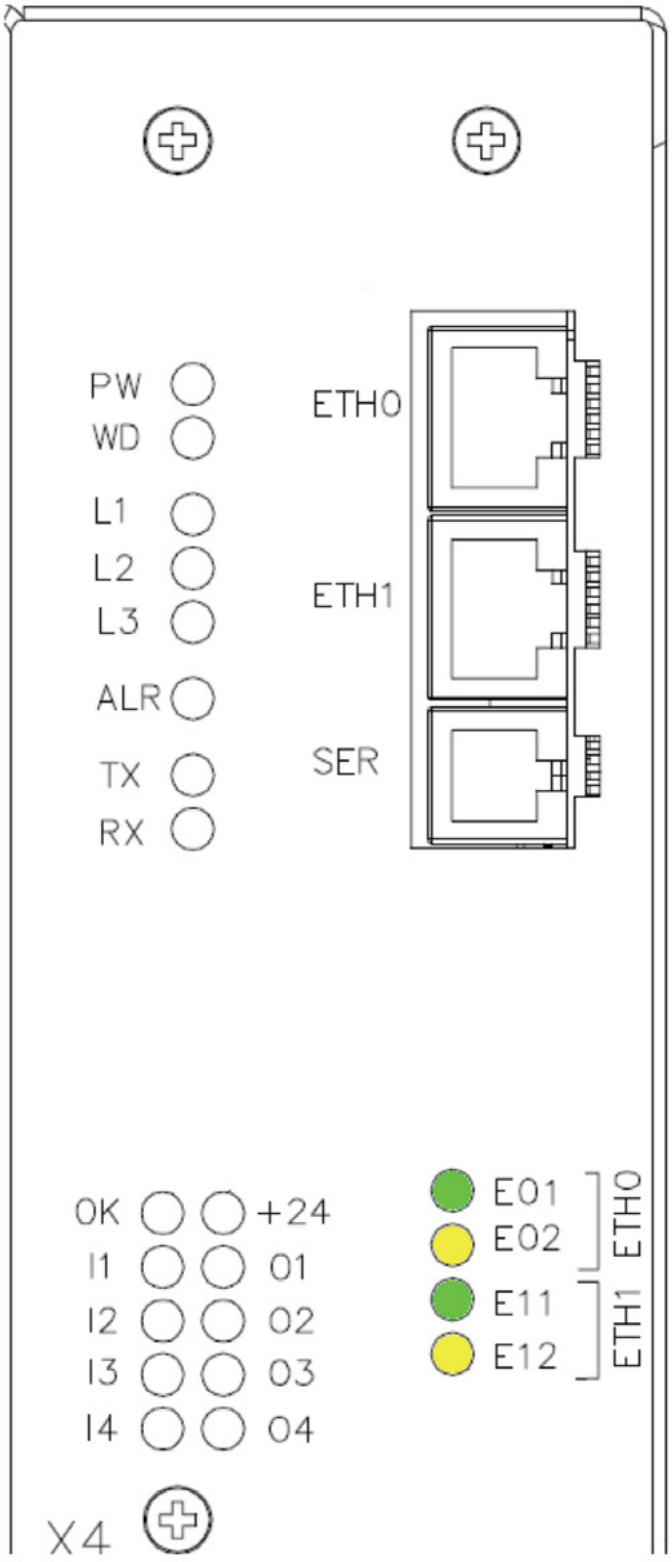
Output record 2	Modbus Address	Output Data Offset
Device operating status	129	26
Manual power of output 1 phase L1	130	28
Manual power of output 2 phase L1	131	30
Manual power of output 3 phase L1	132	32
Manual power of output 4 phase L1	133	34
Manual power of output 5 phase L1 (1)	134	36
Manual power of output 6 phase L1 (1)	135	38
Manual power of output 7 phase L1 (1)	136	40
Manual power of output 8 phase L1 (1)	137	42
Manual power of output 1 phase L2	138	44
Manual power of output 2 phase L2	139	46
Manual power of output 3 phase L2	140	48
Manual power of output 4 phase L2	141	50
Manual power of output 5 phase L2 (1)	142	52
Manual power of output 6 phase L2 (1)	143	54
Manual power of output 7 phase L2 (1)	144	56

Output record 3	Modbus Address	Output Data Offset
Manual power of output 8 phase L2 (1)	145	58
Manual power of output 1 phase L3	146	60
Manual power of output 2 phase L3	147	62
Manual power of output 3 phase L3	148	64
Manual power of output 4 phase L3	149	66
Manual power of output 5 phase L3 (1)	150	68
Manual power of output 6 phase L3 (1)	151	70
Manual power of output 7 phase L3 (1)	152	72
Manual power of output 8 phase L3 (1)	153	74

Note (1): valid only for 24 zones

- Minimum device interval for Profinet cyclic data IO : 8ms
- Support an Supervisor Device Access Ar
- Minimum cycle time for modbus Rtu communication 50ms (for record)

- E01 led : link for eth0 port (green)
- E02 led : DCP signal led / diagnose (yellow)
- E11 led : link for eth1 port (green)
- E12 led : data exchange for eth1 port (yellow)



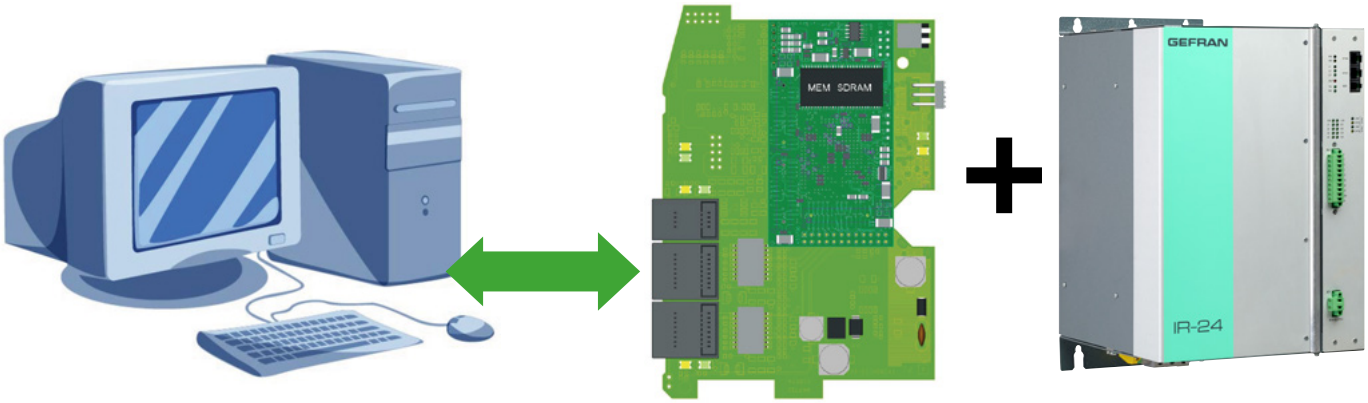
3 · CONNECTING HOST DEVICES

The internal connection to the host device can take place according to the ways of exchanging data via a serial connection and encapsulation of the information via Modbus RTU. Serial port must be configured as

- Link speed di 57600 baud
- No parity
- Data 8 bits
- Device equipped with the Profinet-io card rte must have address 1

AVAILABLES CONNECTION

Connection 1: One IR 12/24 (IR-CONTROLLER) Rotary must be equal to 01



4 • DESCRIPTION OF THE DATA EXCHANGED

The device supports the following types of data

- Parameter data
- Cyclic data
- Acyclic data

This information must be characterized by the device description file GSDML. The meaning of data is known only to applications that must handle this bit stream.

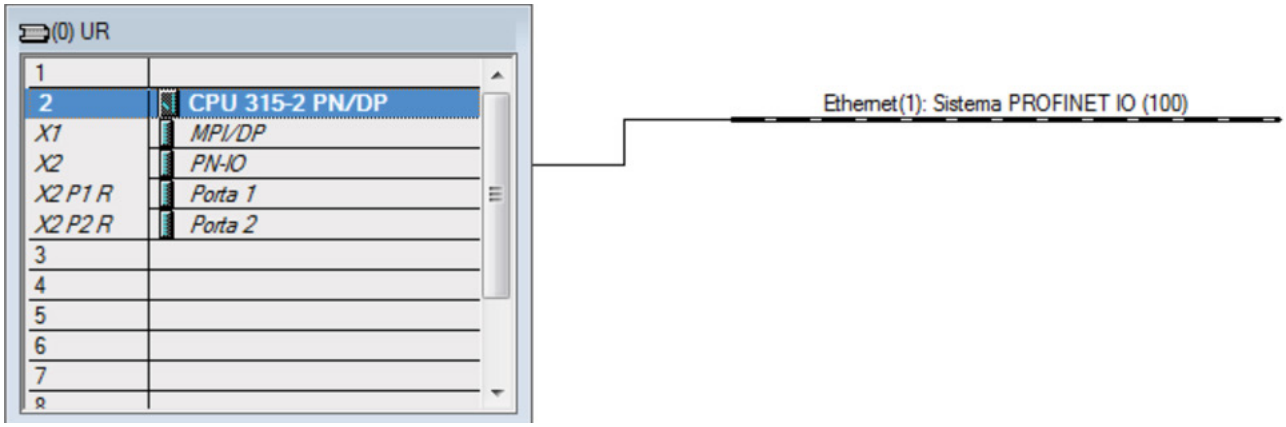
The Gefran ProfinetIo card runs like bridge that passes the information in it. Data flow is

- from profinet Master / Slave and vice versa, through the mechanism of acyclic Mailbox (asynchronous data and parameterizations)
- or through cyclic channels for fast data Io.

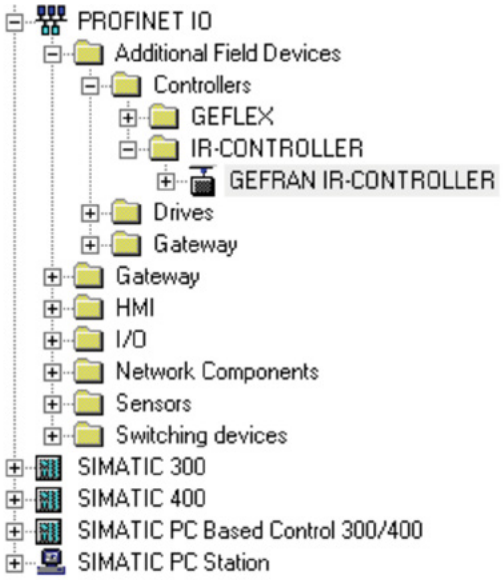
Using a configuration tool is it possible to define cyclic input output data in the startup phase

From the description file GSDML data exchange

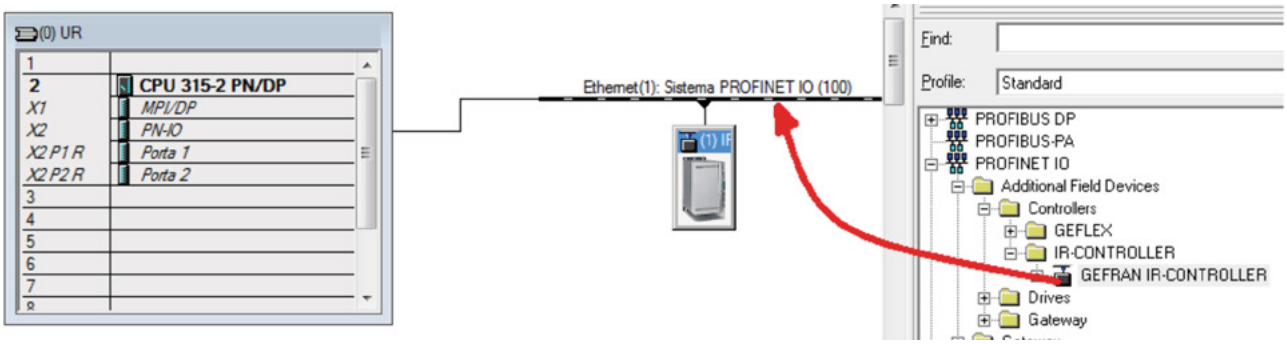
From the configuration tool you can build the network using a IR 12/24 (IR-CONTROLLER)



Open catalog window , select Profinet IO and additional field devices. Open the controllers submenu and the Gefran IR-CONTROLLER



Drag gefran ir-controller in the profinet io system



And then you set the interval for cyclic data exchange device (Minimum 8 ms)

Next step is for on the cyclic data exchanged configuration:

- for **Connection 1 (see AVAILABLES CONFIGURATION paragraph above)**

Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	*IR-CONTROLLER*	*IR-CONTROLL*			*2042**	
X1	*PN-IO*				*2041**	
X1 P1	*Port 1*				*2040**	
X1 P2	*Port 2*				*2039**	
1	IR-CONTROLLER24		256...397	256...331		
2	*Host Module*		*398...405*	*332...339*		

Slot 1 is for IR-CONTROLLER with a rotary equal to 1 . Slot 2 is a virtual modbus channel inside I/o data and is 8 bytes input and 8 bytes data long

5 • THE VIRTUAL MODBUS CHANNEL

The **modbus channel** I/O data let you read or write any MODBUS variable, either in bit format or in word format, present in the IR 12/24 (IR-CONTROLLER) devices connected to the PROFINET node.

Modbus channel output is 8 bytes long

Modbus Output channel						
Byte1 Byte2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Trigger	Modbus Address	Function Code	Data 1	Data 2	Data 3	Data 4

Modbus channel input is 8 bytes long

Modbus Input channel						
Byte1 Byte2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Trigger	Modbus Address	Function Code	Data 1	Data 2	Data 3	Data 4

Description		
BYTE OFFSET	**PARAMETER**	**Description**
0	TriggerWord	TRIGGER BYTE: must be incremented by 1 with each new Request. The Response will be correct only when value is equal.
2	ADD SLAVE	MODBUS address
3	FC	Function code to specify procedure: Bit/Word Read/Write
4	Data 1	Depends on FUNCTION CODE
5	Data 2	Depends on FUNCTION CODE
6	Data 3	Depends on FUNCTION CODE
7	Data 4	Depends on FUNCTION CODE

- The virtual modbus channel :reading a bit

Request						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**NB MSB**	**NB LSB**
trigger	Slave address	1 or 2	Address of Bit to read	Address of Bit to read	Number of bit to read (must be 0)	Number of bit to read

Response						
TRG	**ADD SLAVE**	**FC**	**NB**	**BIT**	**BIT**	**#**
Reply to trigger set	Confirm Slave address	Confirm code	Number of bytes read	Address of Bit to read	Number of bit to read (must be 0)	Dummy

- The virtual modbus channel :reading a word

Request						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**NW MSB**	**NW LSB**
trigger	Slave address	3 or 4	Address of Word to read	Address of Word to read	Number of word to read (must be 0)	Number of word to read (must be 1)

Response						
TRG	**ADD SLAVE**	**FC**	**NB**	**W MSB**	**W LSB**	**#**
Reply to trigger set	Confirm Slave address	Confirm code	Number of Bytes read	Msb word value	Lsb word value)	Dummy

- The virtual modbus channel :writing a bit

Request						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**BIT**	**00**
trigger	Slave address	5	Address of Bite to write	Address of byte to write	value of bit to write. 00=off or hex FF = on)	0

Response						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**BIT**	**00**
Reply to trigger set	Confirm Slave address	Confirm code	Bit address written	Bit address written	Value of bit written (00 or FF)	0

- The virtual modbus channel :writing a word

Request						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**W MSB**	**W LSB**
trigger	Slave address	6	Address of word to write	Address of word to write	Value of word to write	Value of word to write

Response						
TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**W MSB**	**W LSB**
Reply to trigger set	Confirm Slave address	Confirm code	Address of word written	Address of word written	Value of word written	Value of word written

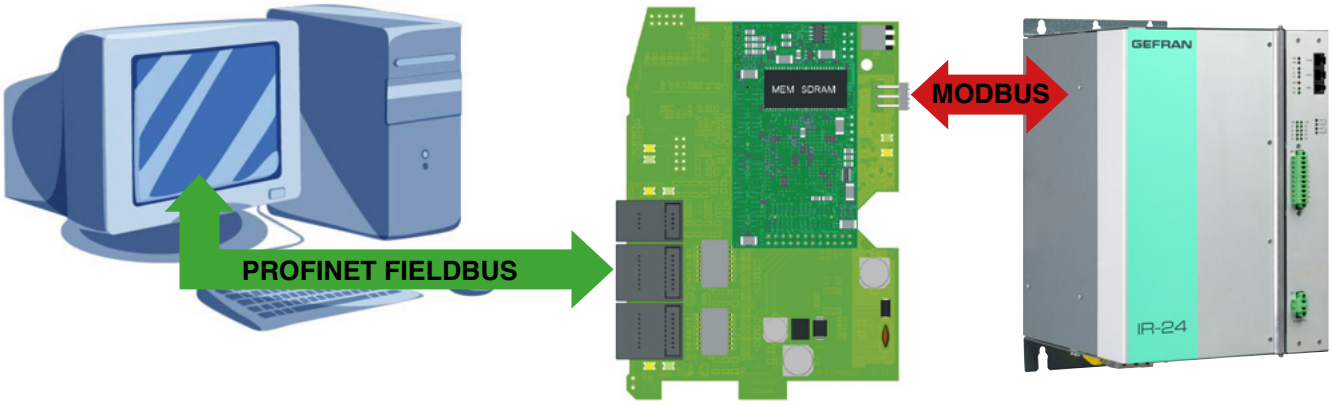
In case of error, 80 hex plus the request procedure code will be returned in place of the procedure code.The errorcode will be shown in the CODE field.

Response						
TRG	**ADD SLAVE**	**FC**	**CODE**	**#**	**#**	**#**
Reply to trigger set	Confirm Slave address	Procedure code + 80hex	Error code	dummy	Dummy	Dummy

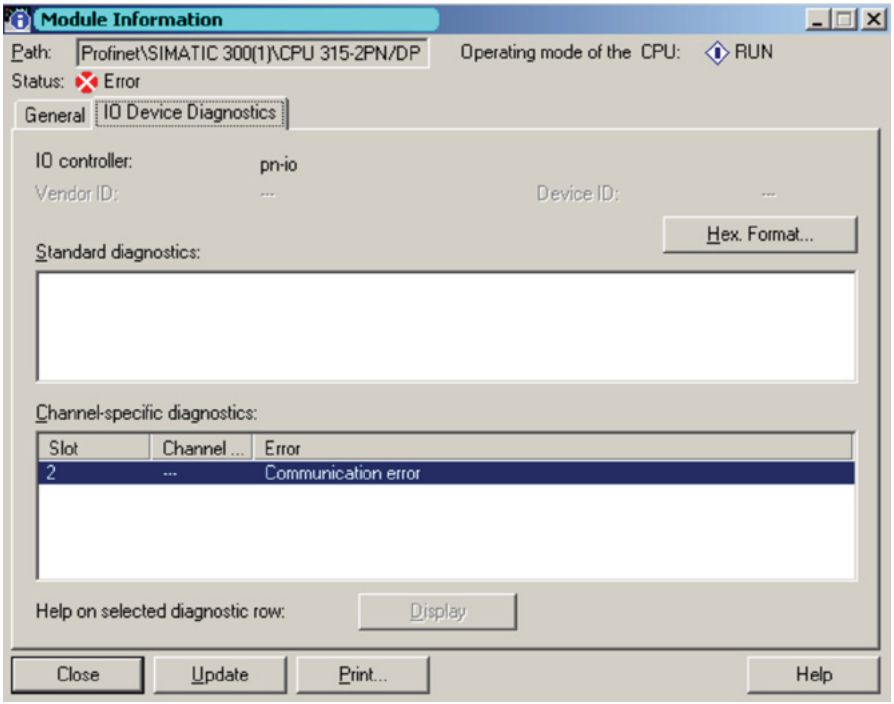
Error Code

1 = illegal FC	**3 = illegal data**	**10 = Only data**
2 = illegal data address	**9 = illegal number of data**	

If a serial communication fault happen



An error is reported as
Slot value is equal to device with serial communication fault



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