GEFRAN

GPC ETHERNET-IP

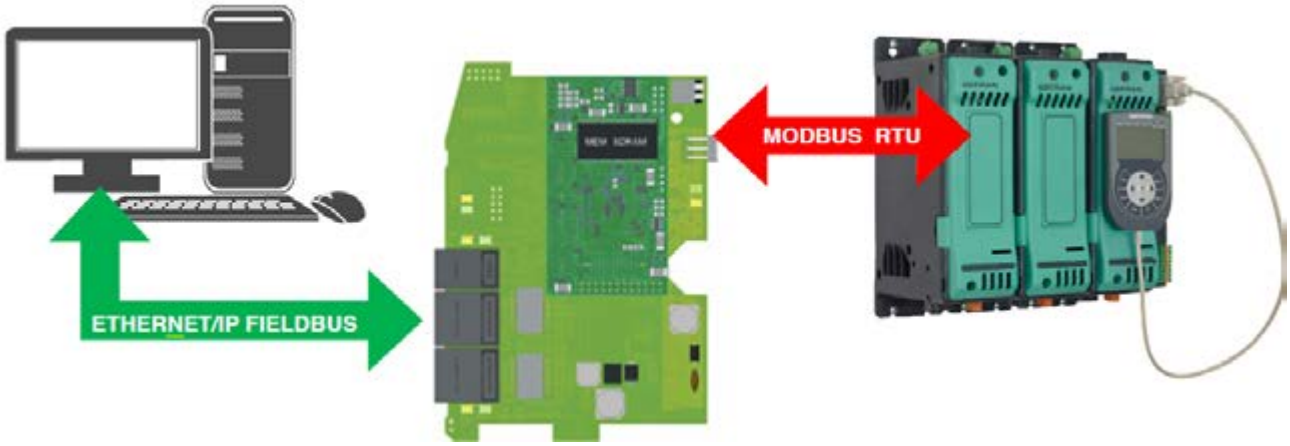
INSTALLATION AND USE MANUAL

code: **81083 - 02/2021 -ENG**

CONTENTS

1 • INTRODUCTION

The RTE (Real Time Ethernet) board is a device permitting connection of slaves for transmitting and receiving data with the Ethernet/Ip protocol.
The connection diagram appears below



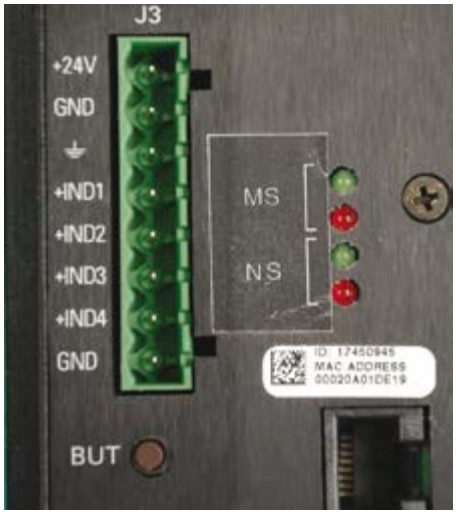
we have:

- An Ethernet/IP scanner connected to an Ethernet/IP adapter (the Bridge Gefran RTE Ethernet/IP board), connected via Ethernet/IP protocol.
- A Master Modbus RTU operating on RTE (the Gefran RTE Ethernet/IP Bridge), connected via serial line with a Modbus RTU slave (GPC)

2 • LED INDICATORS ON THE FIELDBUS BOARD

There are two two-tone LED lights on the front panel of the instrument (NS = Network State and MS = Module State).
Legend:

Network Status indicator = **NS** (Red/Green), Module Status indicator = **MS** (Red/Green)



Behaviour of LEDs on the RTE board when turned on				
Time after boot	Green MS LED	Red MS LED	Green NS LED	Red NS LED
t=0 ms	Off	Off	Off	Off
t = 250 ms	On	Off	Off	Off
t = 500 ms	Off	On	Off	Off
t = 750 ms	Off	Off	On	Off
t = 1000 ms	Off	Off	Off	On
t = 1250 ms	Off	Off	Off	Off

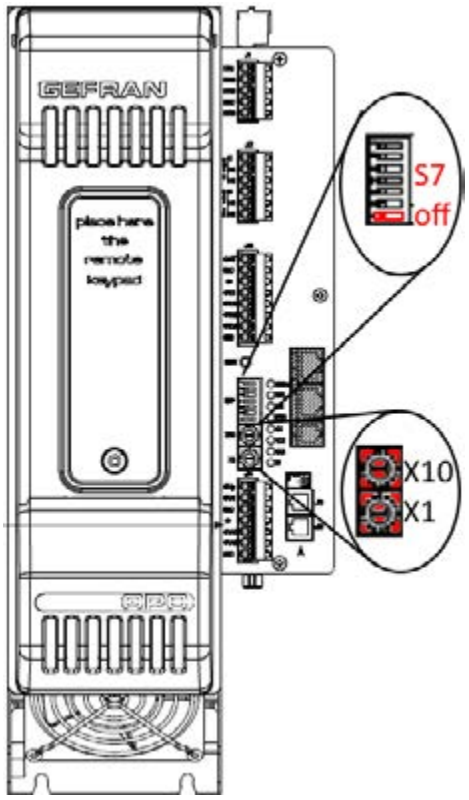
MS LED behaviour during operation			
State	Green MS LED	Red MS LED	NB:
No-power	Off	Off	
Device on standby	On/Off	Off	Flashing Green MS LED (500msec on, 500 msec off)
Device Operational	On	Off	Green MS on
Minor Fault	Off	On/Off	Flashing Red MS LED (500msec on, 500 msec off)
Major Fault	Off	On	
Duplicate ip	Off	On/Off	Flashing Red MS LED (500msec on, 500 msec off) IP address

NS LED behaviour during operation			
State	Green NS LED	Red NS LED	NB:
No-power / No-IP address	Off	Off	
No connection	On/Off	Off	Flashing Green NS LED (500msec on, 500 msec off)
Connected	On	Off	NS green steady on
Connection timeout	Off	On/Off	Flashing Red NS LED (500msec on, 500 msec off)
Duplicate Ip	Off	On	NS Red steady on: device has detected a duplicate IP address in the network

3 • CONFIGURATIONS REQUIRED FOR CORRECT OPERATION

The GPC device in which the board is assembled must have:

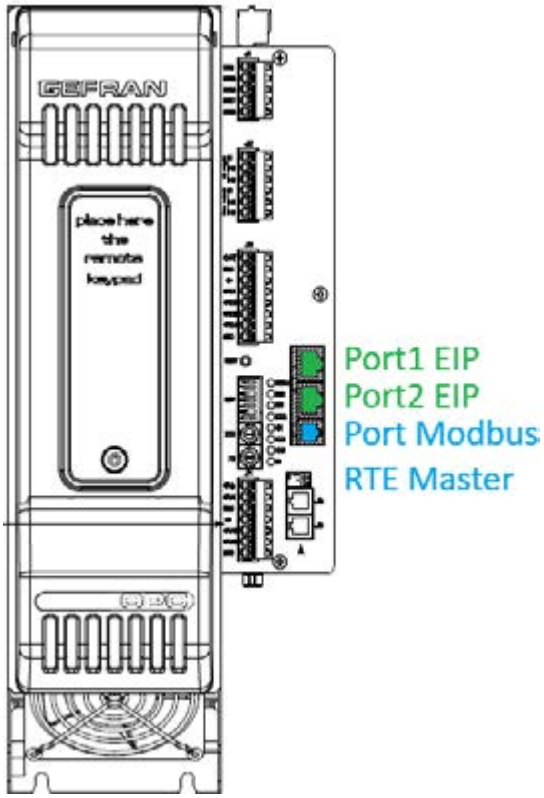
- Dip switch S7 in the off position
- Rotary switch equal to 1



4 • PRINCIPAL CONNECTIONS FOR DIGITAL COMMUNICATION

The device has digital communication interfaces permitting communication of Ethernet packets and RTU Modbus messages.
In the figure we can see:

- Port1 Eip, port 1 on the Ethernet/Ip protocol communication switch
- Port2 Eip, port 2 on the Ethernet/Ip protocol communication switch
- Port modbus, Modbus/Rtu Master port



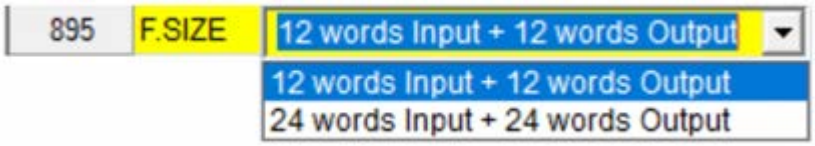
5 • MAIN FEATURES

- Specific Gefran Modbus class (Ethernet/IP adapter for Modbus Master RTU)
- Integrated internal switch
- Device Level Ring Support
- Address Conflict Detection V2 Support (Ring Topology)
- An I/O Exclusive Owner connection, default RPI 2 msec
- Configuration assembly
- Output: 12/24 words (16 bits) for each module GPC selectable by Gf_eXpress (F.SIZE)
- Input: 12/24 words (16 bits) for each module GPC (the number of words in input must be the same as the number in output) selectable by Gf_eXpress (F.SIZE)
- Up to 4 GPC connected with a 19200 baud serial port with the Modbus RTU protocol
- Minimum reading time 50mec for 16 registers
- Maximum writing time for 16 registers if all values have changed 2 seconds
- DHCP/Bootp protocol support
- ACD Address support Conflict Detection supported
- Reset service support
- Default/Reset Ip address 192.168.1.100
- Default/Reset NetMask 255.255.255.0
- Default/Reset Gateway Ip address 192.168.1.1
- Utility SetIp RTE tool for network parameter configuration

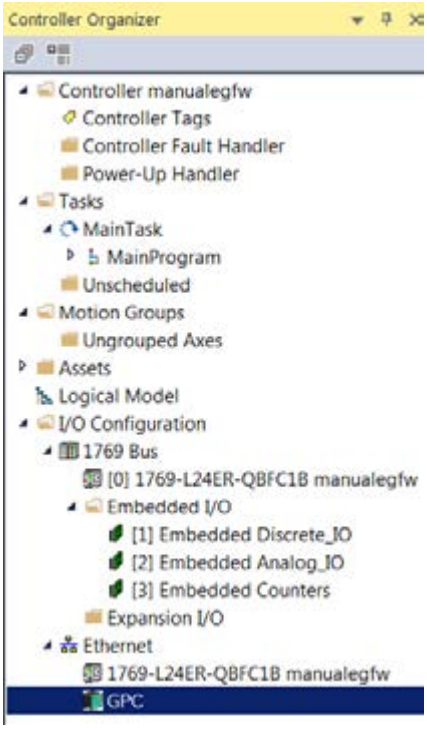
(e.g. with Studio 5000 Logix Designer and PLC CompactLogix environment; for other environments/plcs, consult the corresponding documents)

Each single GPC must have the F.SIZE variable properly configured. This variable indicates the size of the bytes exchanged, and is configurable via the GF_eXpress environment. The two admissible values are:

- 12 words Input + 12 words Output (default value)
- 24 words Input + 24 words Output

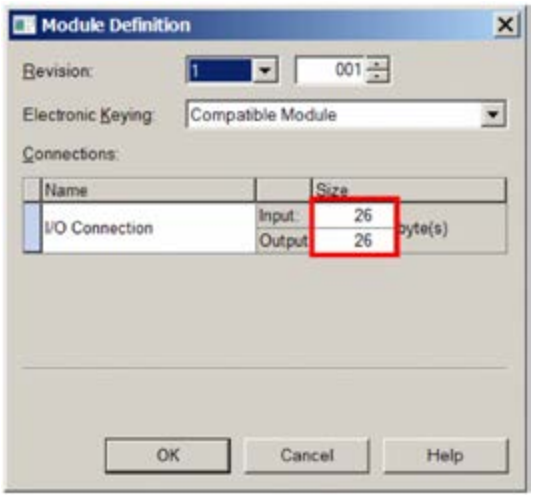


Check that you have registered the eds file of the GPC device, add the desired slave in the project tree under the ethernet leaf as shown in:



The I/O Connection size within the PLC environment must be configured consistently with the F.SIZE setting.
Sequence for accessing the I/O Connection configuration:

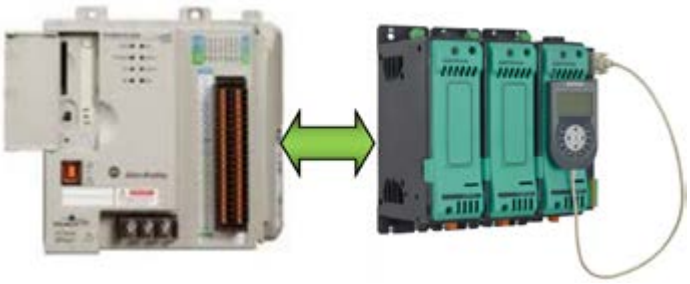
- click on the GPC added in the project tree, and the '*Module Properties Local*' window opens
- from the menu of the new window, click on the '*General*' TAB
- locate the '*Change...*' button and click on it
- in the '*Module definition*' dialog box that appears, you can now set the necessary I/O Connection values (we will see how and which in the following examples) and apply them by clicking on OK.



Note:
from the '*General*' TAB, you may:

- configure the *name* via the '*name*' field (e.g. GPC)
- assign the Ip address (e.g. 192.168.105.249).

Example with 1 GPC
set slave rotaries to value 01 and dip switch S7 in the off position.



In the '*Module definition*' window, set the two values (input and output) of the I/O Connection consistently with the F.SIZE setting.
The 2 input and output values indicated in bytes must be the same.

Case 1: F.SIZE = 12 words Inputs + 12 words Output
Input = Output = (12 * 2) + 2 = 26 bytes

Case 2: F.SIZE = 24 words Inputs + 24 words Output
Input = Output = (24 * 2) + 2 = 50 bytes

The values are:

- the number of words required (12 or 24)
- * 2 because expressed in bytes
- + 2 additional bytes due to the presence of a status variable which is exchanged in any case and is not configurable

In the case of 12, the mappable data are the parameters with ID:

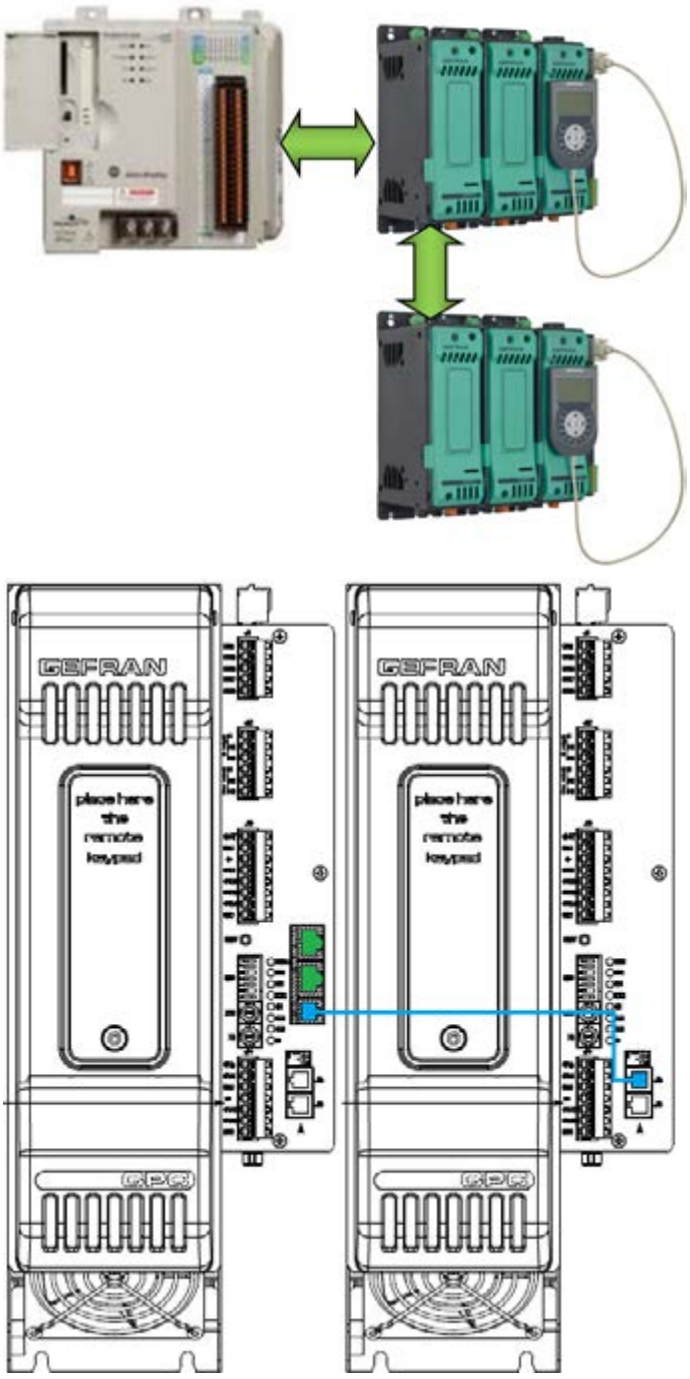
- 400 ÷ 411 for Input values
- 512 ÷ 523 for Output values

In the case of 24, the mappable data are the parameters with ID:

- 400 ÷ 411 e 500 ÷ 511 for Input values
- 512 ÷ 523 e 524 ÷ 535 for Output values

Example with 2 GPC

set slave rotaries to value 01 and 02 and dip switch S7 in the off position



GPC: node 01 e node 02

In the '*Module definition*' window, set the two values (input and output) of the I/O Connection consistently with the F.SIZE setting.

The 2 input and output values indicated in bytes must be the same

Case 1: F.SIZE = 12 words Inputs + 12 words Output

Input = Output = (12 * 2) * 2) + 2 = 50 bytes

Case 2: F.SIZE = 24 words Inputs + 24 words Output

Input = Output = (24 * 2) * 2) + 2 = 98 bytes

The values are:

- the number of words required (12 or 24)
- * 2 because expressed in bytes
- * 2 because required for 2 gpc
- + 2 additional bytes due to the presence of a status variable which is exchanged in any case and is not configurable
-

In the case of 12, the mappable data are the parameters with ID:

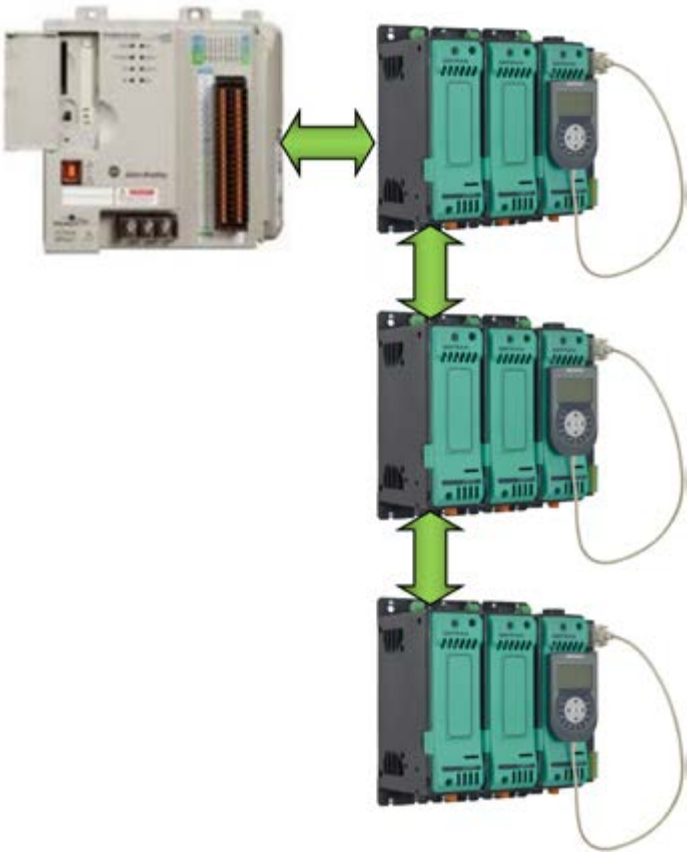
- 400 ÷ 411 l 540 ÷ 552 for Input values
- 512 ÷ 523 l 592 ÷ 603 for Output values

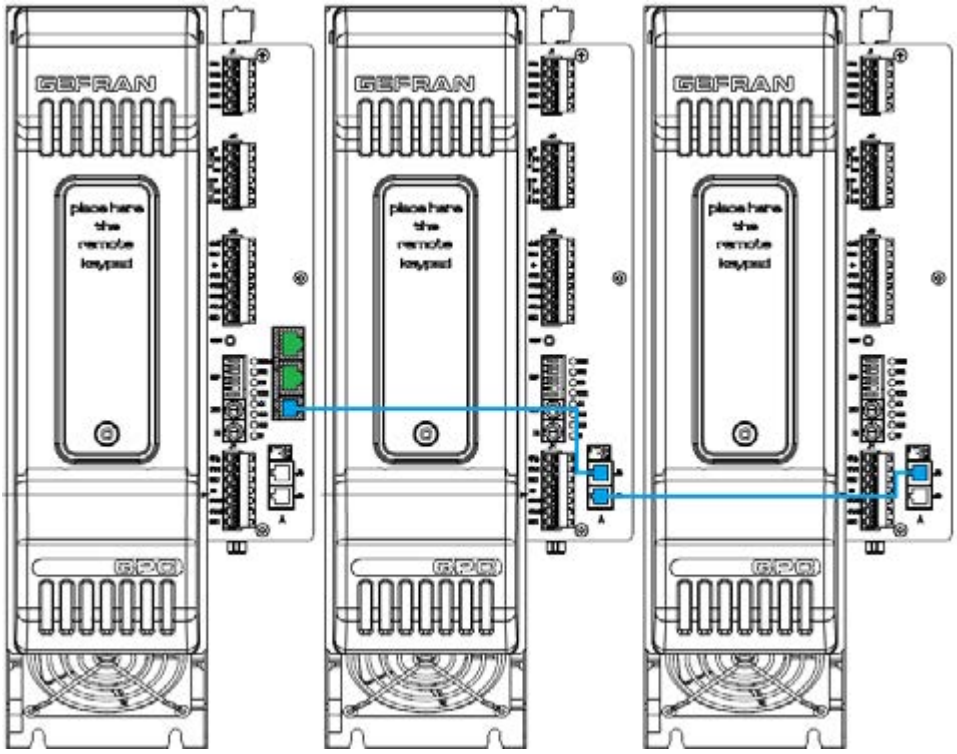
In the case of 24, the mappable data are the parameters with ID:

- 400 ÷ 411 e 500 ÷ 511 l 540 ÷ 552 e 580 ÷ 591 for Input values
- 512 ÷ 523 e 524 ÷ 535 l 592 ÷ 603 e 604 ÷ 615 for Output values

Example with 3 GPC

set slave rotaries to value 01 and 02 and 03 and dip switch S7 in the off position





GPC: node 01, node 02 e node 03

In the '*Module definition*' window, set the two values (input and output) of the I/O Connection consistently with the F.SIZE setting.
The 2 input and output values indicated in bytes must be the same.

Case 1: F.SIZE = 12 words Inputs + 12 words Output
Input = Output = ((12 * 2) * 3) + 2 = 74 bytes

Case 2: F.SIZE = 24 words Inputs + 24 words Output
Input = Output = ((24 * 2) * 3) + 2 = 146 bytes

The values are:

- the number of words required (12 or 24)
- * 2 because expressed in bytes
- * 2 because required for 2 GPC
- + 2 additional bytes due to the presence of a status variable which is exchanged in any case and is not configurable

In the case of 12, the mappable data are the parameters with ID:

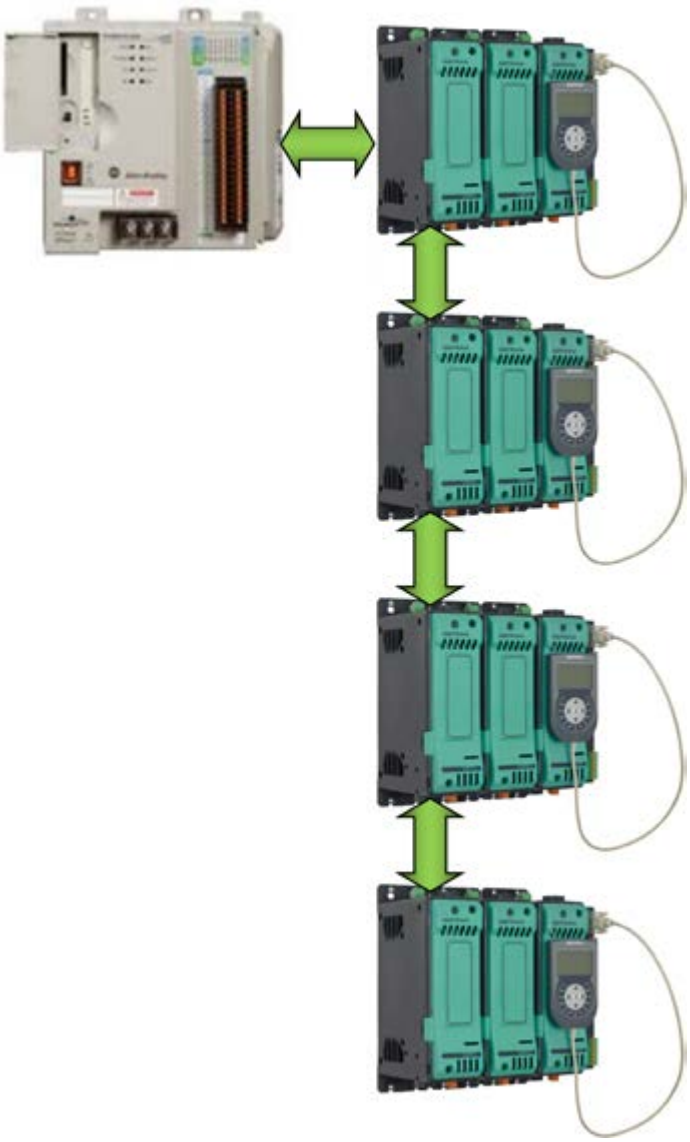
- 400 ÷ 411 I 540 ÷ 552 I 616 ÷ 627 Input values
- 512 ÷ 523 I 592 ÷ 603 I 652 ÷ 663 Output values

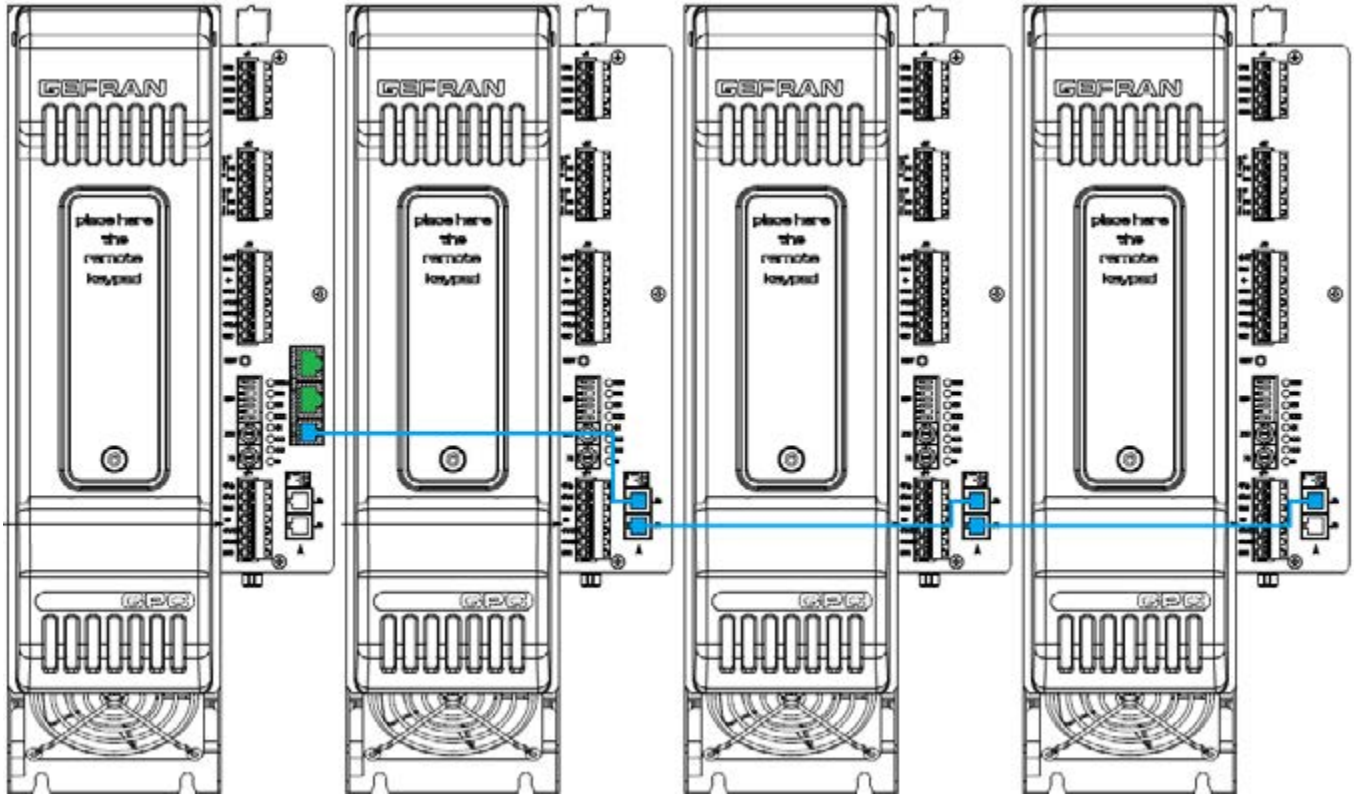
In the case of 24, the mappable data are the parameters with ID:

- 400 ÷ 411 e 500 ÷ 511 I 540 ÷ 552 e 580 ÷ 591 I 616 ÷ 627 e 640 ÷ 651 Input values
- 512 ÷ 523 e 524 ÷ 535 I 592 ÷ 603 e 604 ÷ 615 I 652 ÷ 663 e 664 ÷ 675 Output values

Example with 4 GPC

set slave rotaries to value 01, 02, 03 and 04 and dip switch S7 in the off position.





GPC: node 01, node 02, node 03 e node 04

In the '*Module definition*' window, set the two values (input and output) of the I/O Connection consistently with the F.SIZE setting.
The 2 input and output values indicated in bytes must be the same.

Case 1: F.SIZE = 12 words Inputs + 12 words Output
Input = Output = ((12 * 2) * 4) + 2 = 98 bytes

Case 2: F.SIZE = 24 words Inputs + 24 words Output
Input = Output = ((24 * 2) * 4) + 2 = 194 bytes

The values are:

- the number of words required (12 or 24)
- * 2 because expressed in bytes
- * 2 because required for 2 GPC
- + 2 additional bytes due to the presence of a status variable which is exchanged in any case and is not configurable

In the case of 12, the mappable data are the parameters with ID:

- 400 ÷ 411 I 540 ÷ 552 I 616 ÷ 627 Input values
- 512 ÷ 523 I 592 ÷ 603 I 652 ÷ 663 Output values

In the case of 24, the mappable data are the parameters with ID:

- 400 ÷ 411 e 500 ÷ 511 I 540 ÷ 552 e 580 ÷ 591 I 616 ÷ 627 e 640 ÷ 651 Input values
- 512 ÷ 523 e 524 ÷ 535 I 592 ÷ 603 e 604 ÷ 615 I 652 ÷ 663 e 664 ÷ 675 Output values

6.1. PARAMETERS MAP

Below is a table showing the list of data mapped by default.

Columns ID1, ID2, ID3, ID4 indicate the ID for Device 1, Device 2, Device 3, Device 4

The Name column indicates the name of the configurable channel.

The Value column indicates the default value

ID1	ID2	ID3	ID4	Name	Value for GPC
400	540	616	676	Config Input Parameter 1 for Device 1/2/3/4	(1657) STATUS3_1 Device state STATUS3
401	541	617	677	Config Input Parameter 2 for Device 1/2/3/4	(1658) STATUS4_1 Device state STATUS4
402	542	618	678	Config Input Parameter 3 for Device 1/2/3/4	(1487) STATUS_W_RO_1 Device state (STATUS_W Read Only)
403	543	619	679	Config Input Parameter 4 for Device 1/2/3/4	(1775) Ld.V_1 Load voltage
404	544	620	680	Config Input Parameter 5 for Device 1/2/3/4	(1777) Ld.A_1 Load current
405	545	621	681	Config Input Parameter 6 for Device 1/2/3/4	(1904) Ld.P_1 Load power 1 Low Word
406	546	622	682	Config Input Parameter 7 for Device 1/2/3/4	(1026) Ou.P_1 Control output value
407	547	623	683	Config Input Parameter 8 for Device 1/2/3/4	(1596) In.A1 Analog input 1
408	548	624	684	Config Input Parameter 9 for Device 1/2/3/4	End of Record
409	549	625	685	Config Input Parameter 10 for Device 1/2/3/4	(2682) STATUS4_2 Device state STATUS4
410	550	626	686	Config Input Parameter 11 for Device 1/2/3/4	(2511) STATUS_W_RO_2 Device state (STATUS_W Read Only)
411	551	627	687	Config Input Parameter 12 for Device 1/2/3/4	(2799) Ld.V_2 Load voltage
500	580	640	740	Config Input Parameter 13 for Device 1/2/3/4	(2801) Ld.A_2 Load current
501	581	641	741	Config Input Parameter 14 for Device 1/2/3/4	(2928) Ld.P_2 Load power 2 Low Word
502	582	642	742	Config Input Parameter 15 for Device 1/2/3/4	(2050) Ou.P_2 Control output value
503	583	643	743	Config Input Parameter 16 for Device 1/2/3/4	(1860) In.A2 Analog input 2
504	584	644	744	Config Input Parameter 17 for Device 1/2/3/4	(4729) STATUS3_3 Device state STATUS3
505	585	645	745	Config Input Parameter 18 for Device 1/2/3/4	(4730) STATUS4_3 Device state STATUS4
506	586	646	746	Config Input Parameter 19 for Device 1/2/3/4	(4559) STATUS_W_RO_3 Device state (STATUS_W Read Only)
507	587	647	747	Config Input Parameter 20 for Device 1/2/3/4	(4847) Ld.V_3 Load voltage
508	588	648	748	Config Input Parameter 21 for Device 1/2/3/4	(4849) Ld.A_3 Load current
509	589	649	749	Config Input Parameter 22 for Device 1/2/3/4	(4976) Ld.P_3 Load power 3 Low Word
510	590	650	750	Config Input Parameter 23 for Device 1/2/3/4	(4098) Ou.P_3 Control output value
511	591	651	751	Config Input Parameter 24 for Device 1/2/3/4	(1867) In.A3 Analog input 3
512	592	652	760	Config Output Parameter 1 for Device 1/2/3/4	(1329) STATUS_W_1 Device state
513	593	653	761	Config Output Parameter 2 for Device 1/2/3/4	(1276) MANUAL_POWER_1 Output control power in manual
514	594	654	762	Config Output Parameter 3 for Device 1/2/3/4	End of Record
515	595	655	763	Config Output Parameter 4 for Device 1/2/3/4	(2300) MANUAL_POWER_2 Output control power in manual
516	596	656	764	Config Output Parameter 5 for Device 1/2/3/4	(4401) STATUS_W_3 Device state
517	597	657	765	Config Output Parameter 6 for Device 1/2/3/4	End of Record
518	598	658	766	Config Output Parameter 7 for Device 1/2/3/4	End of Record
519	599	659	767	Config Output Parameter 8 for Device 1/2/3/4	End of Record
520	600	660	768	Config Output Parameter 9 for Device 1/2/3/4	End of Record
521	601	661	769	Config Output Parameter 10 for Device 1/2/3/4	End of Record
522	602	662	770	Config Output Parameter 11 for Device 1/2/3/4	End of Record
523	603	663	771	Config Output Parameter 12 for Device 1/2/3/4	End of Record

524	604	664	860	Config Output Parameter 13 for Device 1/2/3/4	(4348) MANUAL_POWER_3 Output control power in manual
525	605	665	861	Config Output Parameter 14 for Device 1/2/3/4	End of Record
526	606	666	862	Config Output Parameter 15 for Device 1/2/3/4	End of Record
527	607	667	863	Config Output Parameter 16 for Device 1/2/3/4	End of Record
528	608	668	864	Config Output Parameter 17 for Device 1/2/3/4	End of Record
529	609	669	865	Config Output Parameter 18 for Device 1/2/3/4	End of Record
530	610	670	866	Config Output Parameter 19 for Device 1/2/3/4	End of Record
531	611	671	867	Config Output Parameter 20 for Device 1/2/3/4	End of Record
532	612	672	868	Config Output Parameter 21 for Device 1/2/3/4	End of Record
533	613	673	869	Config Output Parameter 22 for Device 1/2/3/4	End of Record
534	614	674	870	Config Output Parameter 23 for Device 1/2/3/4	End of Record
535	615	675	871	Config Output Parameter 24 for Device 1/2/3/4	End of Record

Below is a description of the 2 fixed bytes that make up the AdapterStatus variable. It is a variable (of 16 bits) with meaning in bits (0=ok, 1=error):

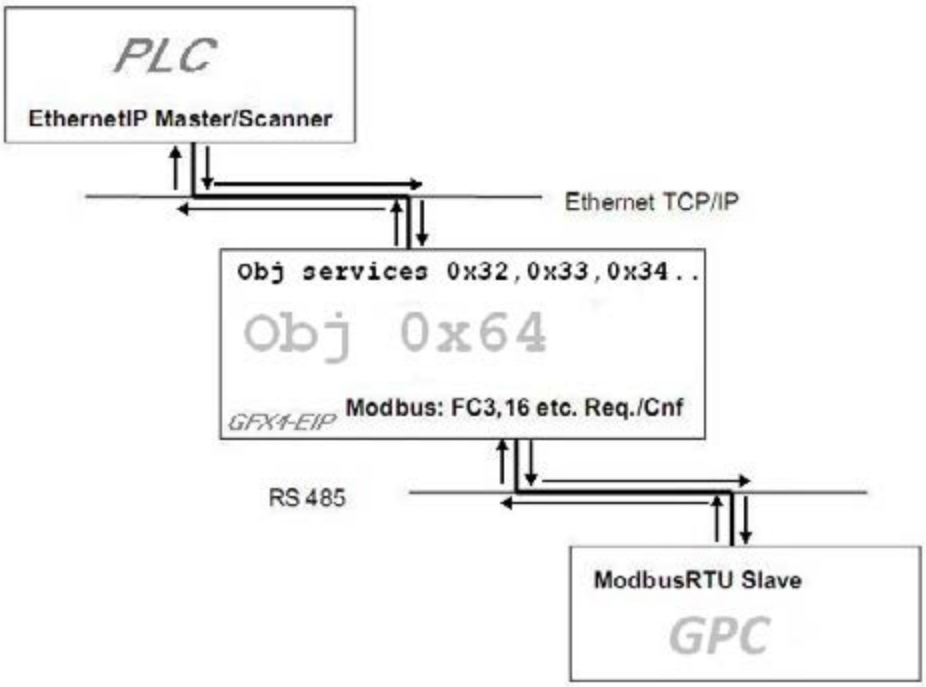
Adapter Status (INT 16 bit)

bit # 0 Base (Device 1) Unit Status
bit # 1 Expansion 1 (Device 2) Unit Status
bit # 2 Expansion 2 (Device 3) Unit Status
bit # 3 Expansion 3 (Device 4) Unit Status
bit # 4 Base (Device 1) Unit Write Word 1_12
bit # 5 Expansion 1 (Device 2) Unit Write Word 1_12
bit # 6 Expansion 2 (Device 3) Unit Write Word 1_12
bit # 7 Expansion 3 (Device 4) Unit Write Word 1_12
bit # 8 Base (Device 1) Unit Write Word 13_24
bit # 9 Expansion 1 (Device 2) Unit Write Word 13_24
bit # 10 Expansion 2 (Device 3) Unit Write Word 13_24
bit # 11 Expansion 3 (Device 4) Unit Write Word 13_24

6.2. Accessing data via gefran_modbus class (100)

Gefran_modbus Class 100, (0x64 hex) is a class permitting access to data on GPC/GFW/GFX4/GFXTERMO4/ GFX4-IR devices by the explicit messages method. The figure shows that:

- The PLC makes a request, invoking class 0x64
- The request is received by the Ethernet/ip interface of the GPC/GFW/GFX4/GFXTERMO4/GFX4-IR
- The request is converted from the Ethernet/ip protocol to the Modbus/RTU master protocol
- The Modus/RTU slave sends the data to the Modbus/RTU master
- The data is received by the Modbus/RTU master and converted into a frame of Ethernet/Ip response to the PLC



Class 0x64 implements the following service codes:

Service Code	Class	Service Name	Description of Service
0x32	0x64	Read Discrete Inputs	Reads one or more contiguous discrete input(s)
0x33		Read Coils	Reads one or more contiguous coil(s)
0x34		Read Input Registers	Reads one or more contiguous input register(s)
0x35		Read Holding Registers	Reads one or more contiguous holding register(s)
0x36		Write Coils	Write one or more contiguous coil(s)
0x37		Write Holding Registers	Write one or more contiguous holding register(s)

The service codes listed above correspond to the modbus services listed below

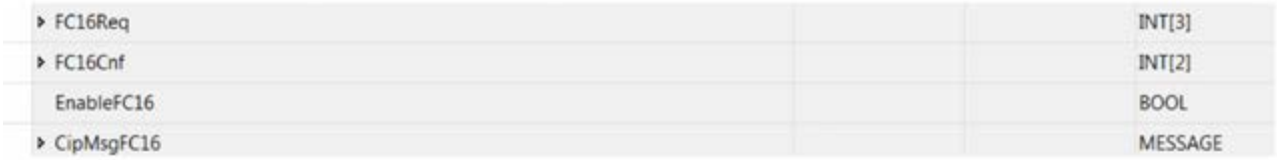
Vendor Service	Corresponding Modbus Fuction Code	Supported	Note
0x32	FC 2	Yes	FC 1/2 comandi equivalenti per GPC/GFW/GFX4/GFXTERMO4/ GFX4-IR
0x33	FC 1	Yes	
0x34	FC 4	Yes	FC 3/4 comandi equivalenti per GPC/GFW/GFX4/GFXTERMO4/ GFX4-IR
0x35	FC 3	Yes	
0x36	FC 15	Yes	
0x37	FC 16	Yes	

Example for Service Code37/ Modbus Function Code 16: Preset Multiple Register

In the example below, we wish to write the value = 20 of SetPoint SP_1 for zone 1 of a GPC device. The modbus address of the datum is 1040.

We add tags in the controller

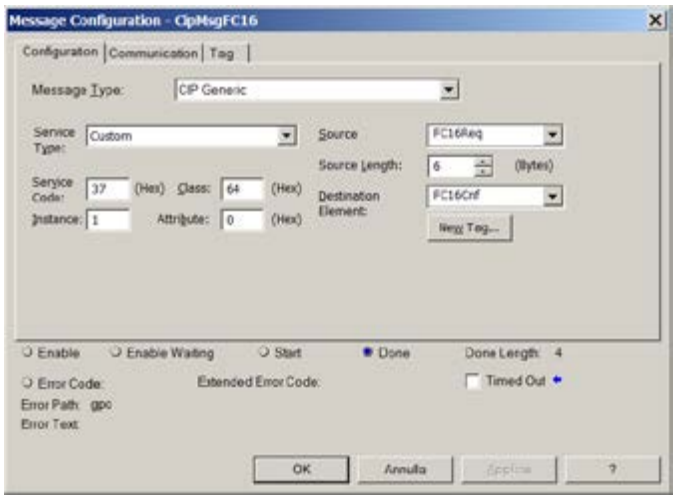
- FC16Req type INT[3], destined to contain the data to be written, and specifically:
  - FC16Req[0] = 1040, modbus address of the datum
  - FC16Req[1] = 1, number of registers to be written
  - FC16Req[2] = 20, value to be written
  -
- FC16Cnf of type INT[2], destined to contain the response to the command
- EnableFC16 type BOOL to enable writing on command once only
- CipMsgFC16 type MESSAGE supervising sending/receiving of communications

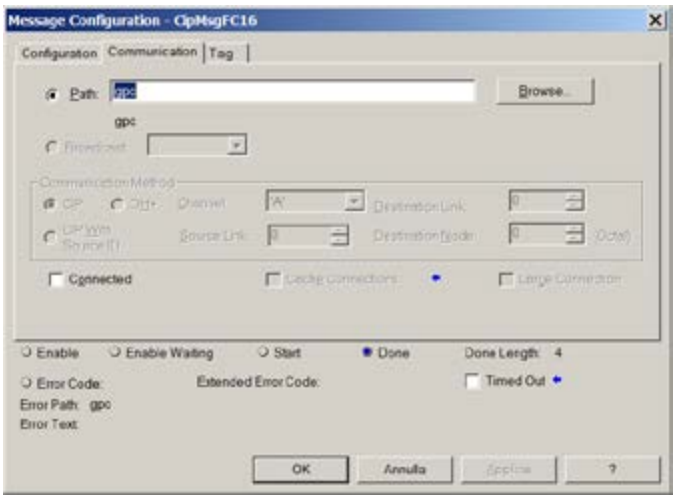


We add the following row of code, using:

- XIC Examine If Closed (EnableFC16)
- MSG Message (CipMsgFC16)

The CipMsgFC16 component must be set as shown in the figure:





Esempio per Service Code34/ Modbus Function Code 04: Read Multiple register

In the example below, we wish to write the value = 20 of SetPoint SP_1 for zone 1 of a GPC device. The modbus address of the datum is 1040.

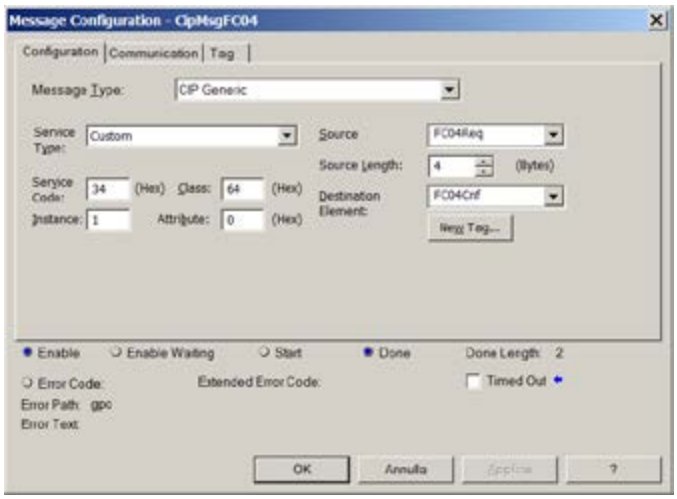
We add tags in the controller

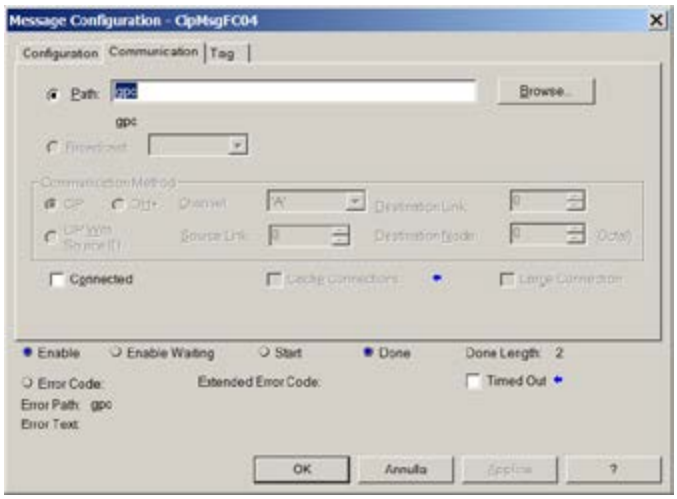
- FC04Req type INT[2], destined to contain the data to be written, and specifically:
  - FC04Req[0] = 1040, modbus address of the datum
  - FC04Req[1] = 1, number of registries to be read
  -
- FC04Cnf type INT[0], destined to contain the reading of the register, which is in our case equal to 20
- EnableFC04 type BOOL to enable writing on command once only
- CipMsgFC04 type MESSAGE supervising sending/receiving of communications

We add the following row of code, using:

- XIC Examine If Closed (EnableFC04)
- MSG Message (CipMsgFC04)

The CipMsgFC04 component must be set as shown in the figure:





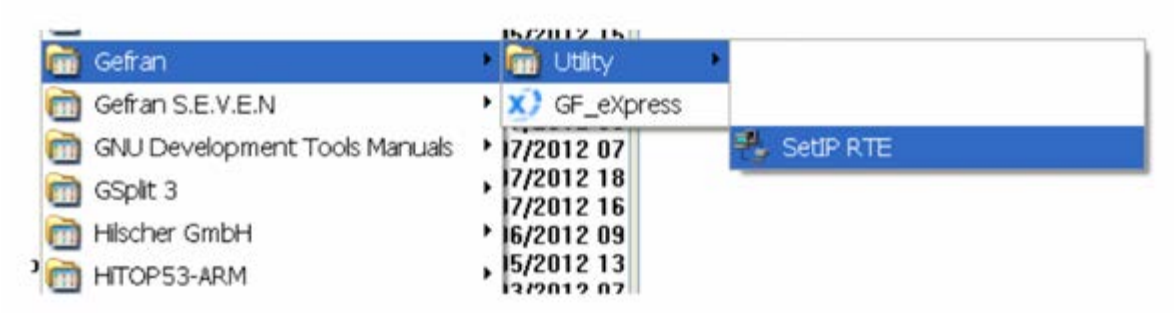
6.3. Setiptools 1.3 Configuration tool setup

This tool can be used to set:

- Ip address
- Netmask
- Gateway
- DHCP / BOOTP / Fixed IP mode

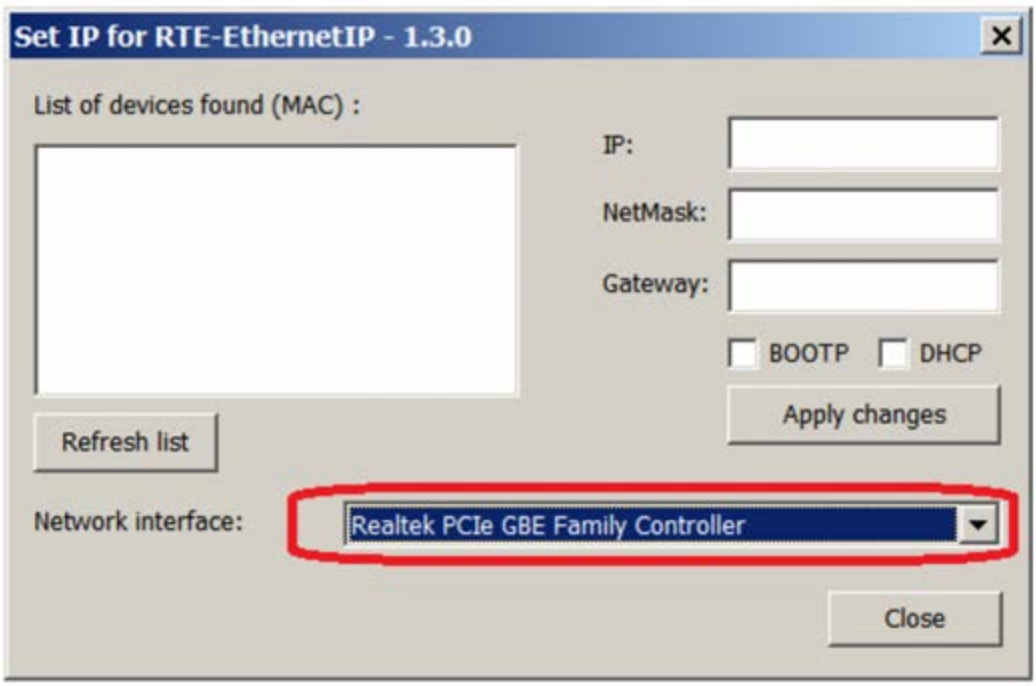
Note: UDP broadcast traffic must not be blocked

After installation, we will have:



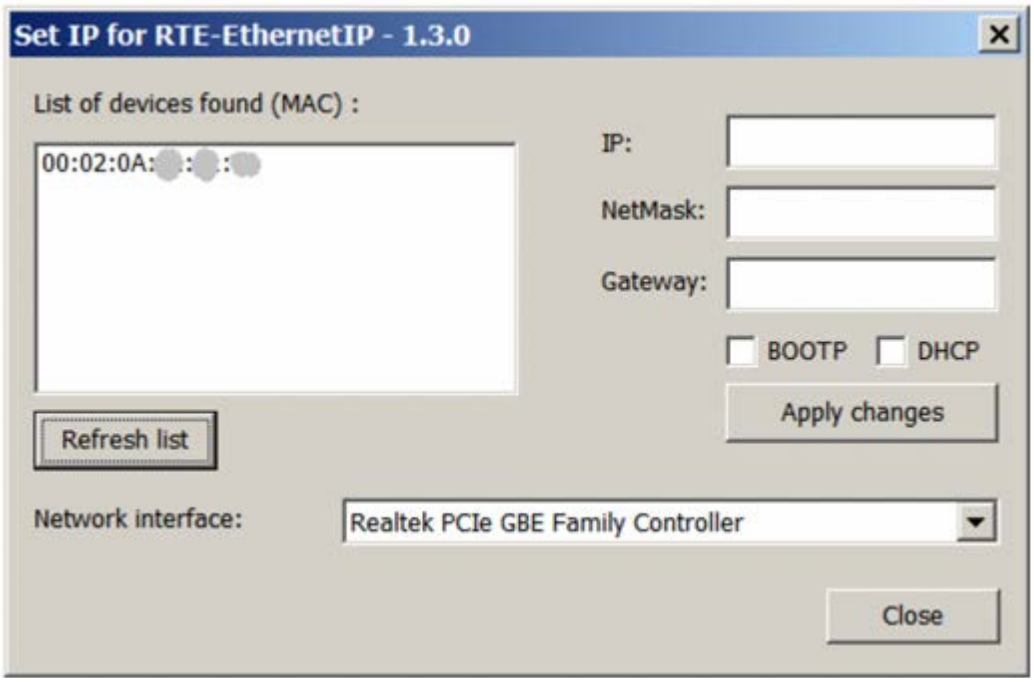
Step 1:

Select the network board used to physically connect the devices and click on **Refresh list**



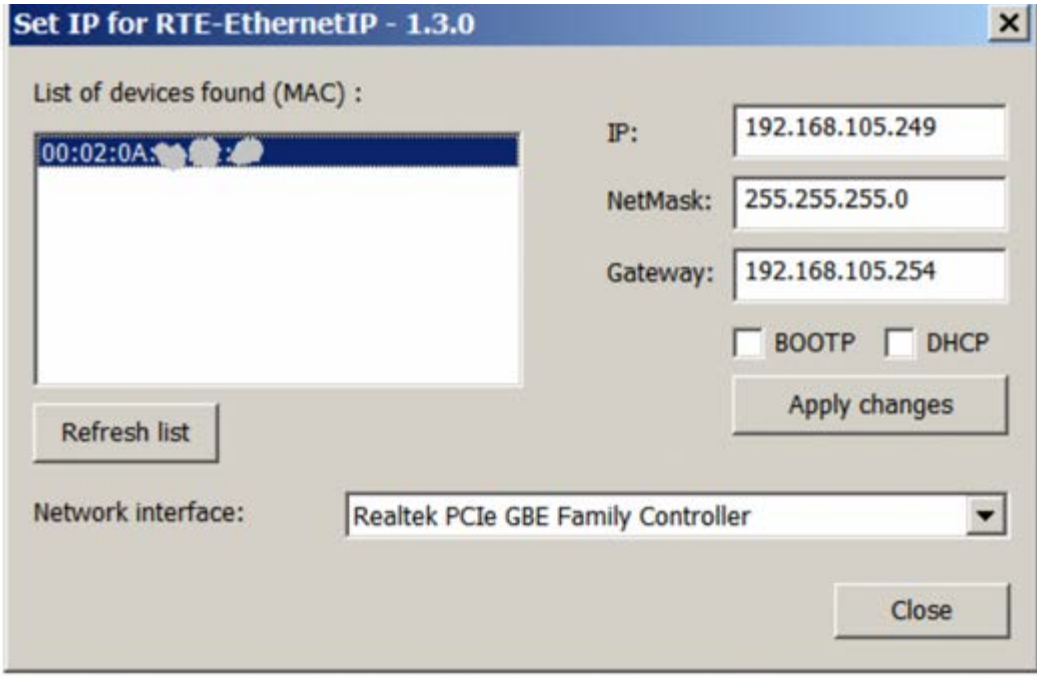
Step 2 :

List of devices found



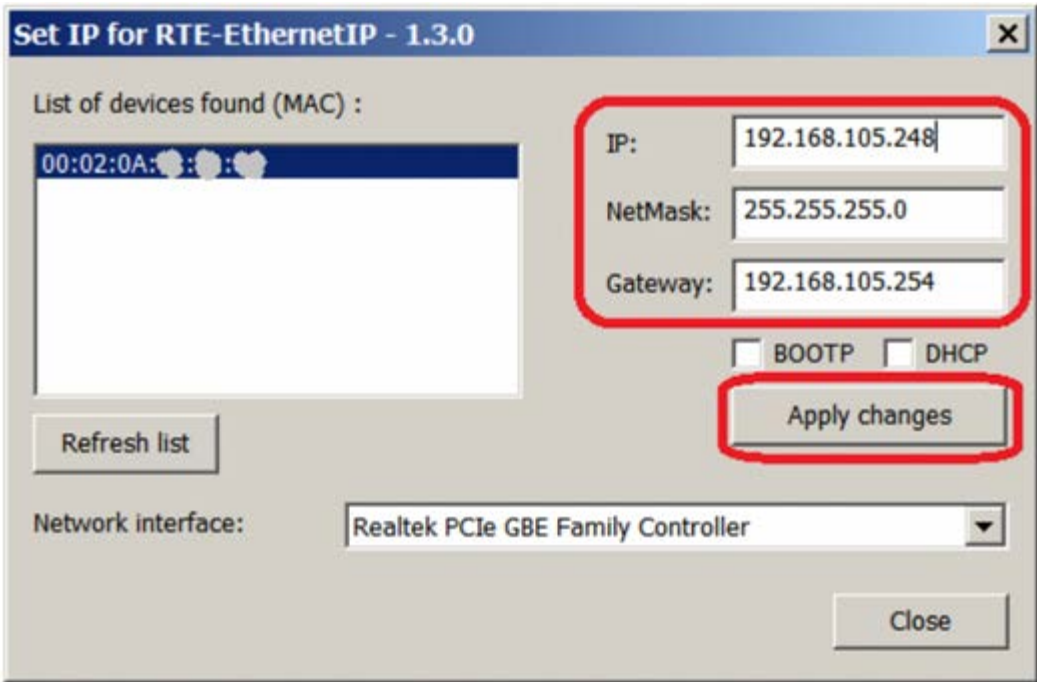
Step 3 :

Click on the mac address of the device



Step 4:

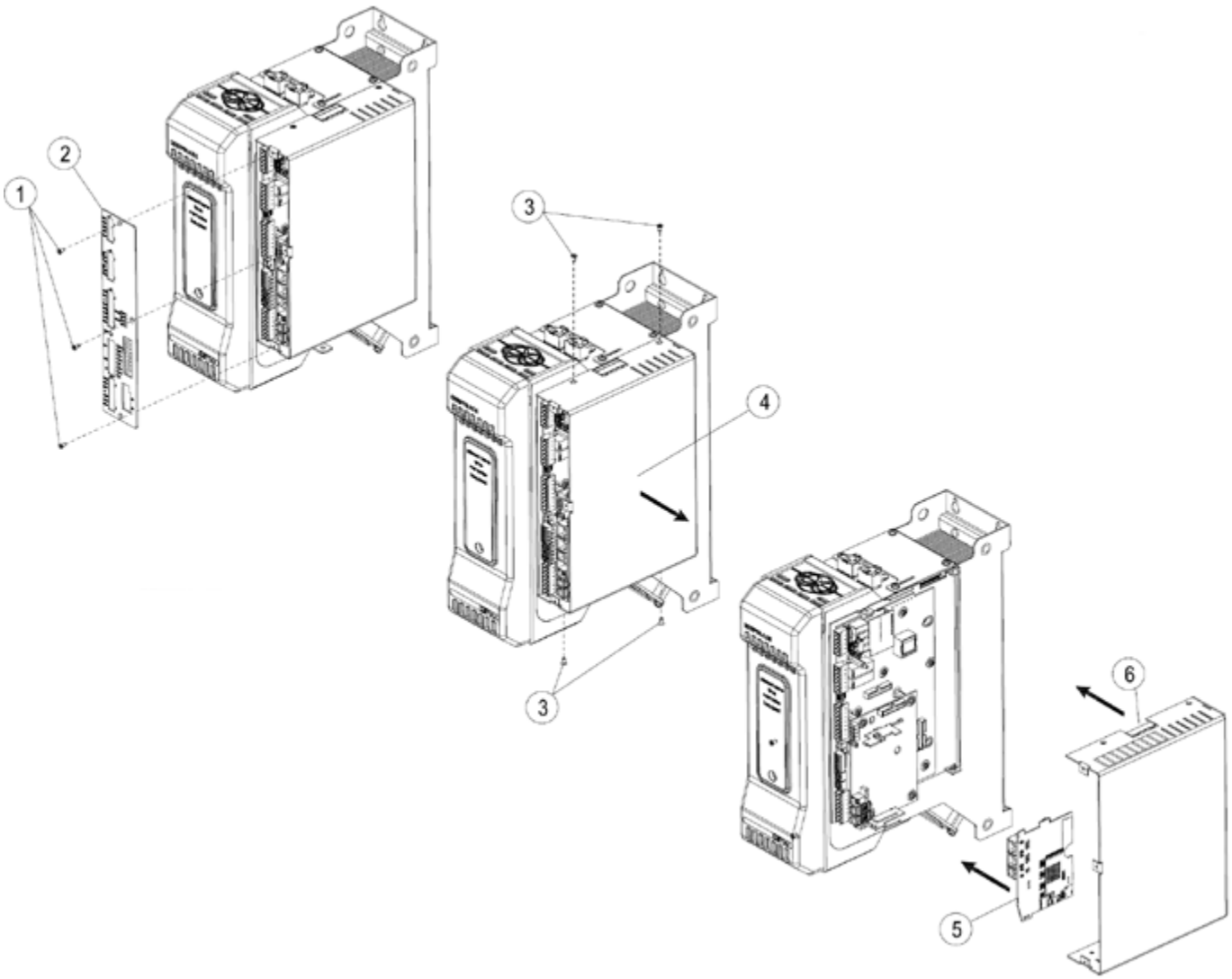
Set the desired addresses and then click on **Apply changes**



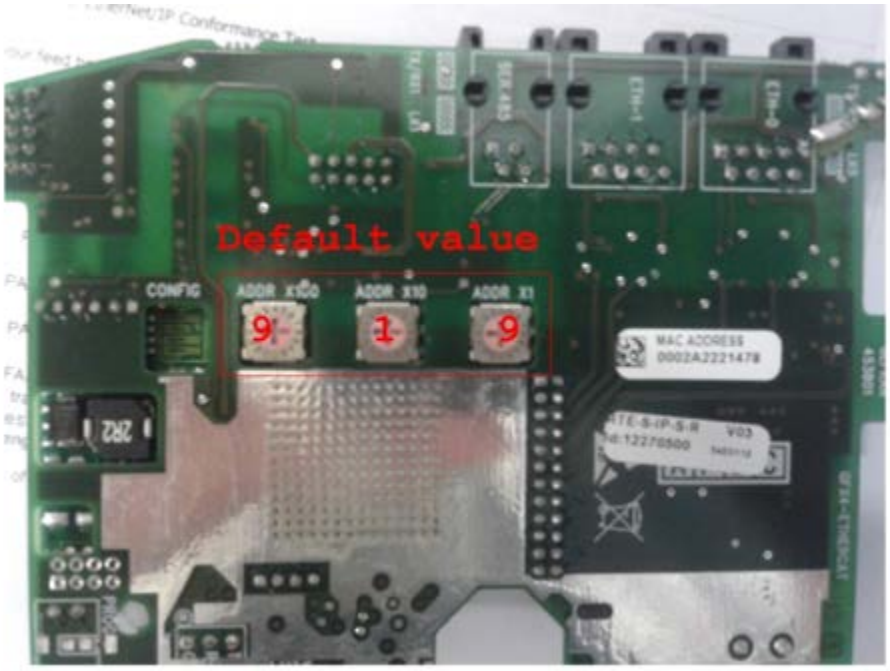
6.4. Resetting parameters to factory default values

If necessary, you can reset the default IP address of the device at any time. Follow these steps:

1. **Turn off the** GPC
2. **Unscrew** the 3 screws of the CPU front panel (1).
3. **Remove** the CPU front panel (2).
4. **Unscrew** the 4 screws of the CPU cover (3).
5. **Remove** the CPU cover



6. **Set** the Rotary Switch addr X100 = 9 and the Rotary Switch addr X10 = 1 and the Rotary Switch addr X1 = 9



7. **Turn** the device on again, being careful not to touch the electric parts of the board. Wait 30 seconds
8. **Turn off the** GPC
9. **Set** the Rotary Switch addr X100 other than 9 and the Rotary Switch addr X10 other than 1 and the Rotary Switch addr X1 other than 9
10. **Put** the cover back on, and turn on the device. The default values will be: ip address 192.168.1.100 net mask 255.255.255.0

Note

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