User Manual

Human machine interface
PROFINET IO Slave

UMPNIOB
Rev 2.0, 01/2012

GRAPHIC SYMBOLS

INFORMATION, It helps users with more details about the topic and failure to follow may lead to unpredictable results.

WARNING, Failure to follow may lead to minor injury or damage / malfunctioning of equipment

DANGER, Failure to follow may lead to injury or fatal accident to operating personal or damage/malfunctioning of equipment

CAUTION, Failure to follow may lead to malfunctioning of equipment, damage or repair

Protective Earth

DC Supply

PREFACE

Original equipment manufacturer reserves the right to change information available in this document without notice. Original Equipment manufacturer is not liable for any damages incurred to equipment/personal during installation or use of equipment as explained in this document. User must acquire sufficient knowledge & skills prior to use the equipment in the application and follow all the local standards & regulations to meet safety requirements

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Simatic manager®, is registered trade mark of SIEMENS
Anybus-CC®, is registered trade mark of HMS

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1. OVERVIEW

1.1 Introduction

PROFINET is the open industrial Ethernet standard of PROFIBUS & PROFINET International (PI) for automation. PROFINET uses TCP/IP and IT standards, and is, in effect, real-time Ethernet. The PROFINET concept features a modular structure.

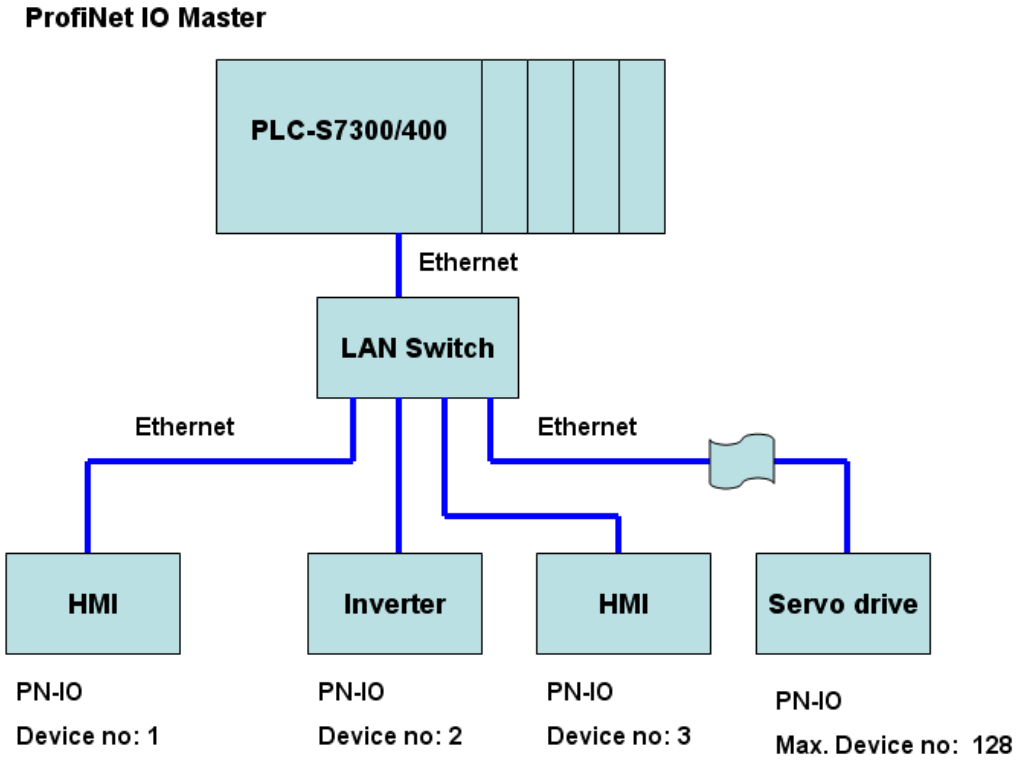


Fig: Typical configuration

HMI supports ProfiNet IO communication via optional extension card.
Check HMI ordering code for Network extension card availability

ProfiNet IO slave interface file will be supplied

1.2 Communication

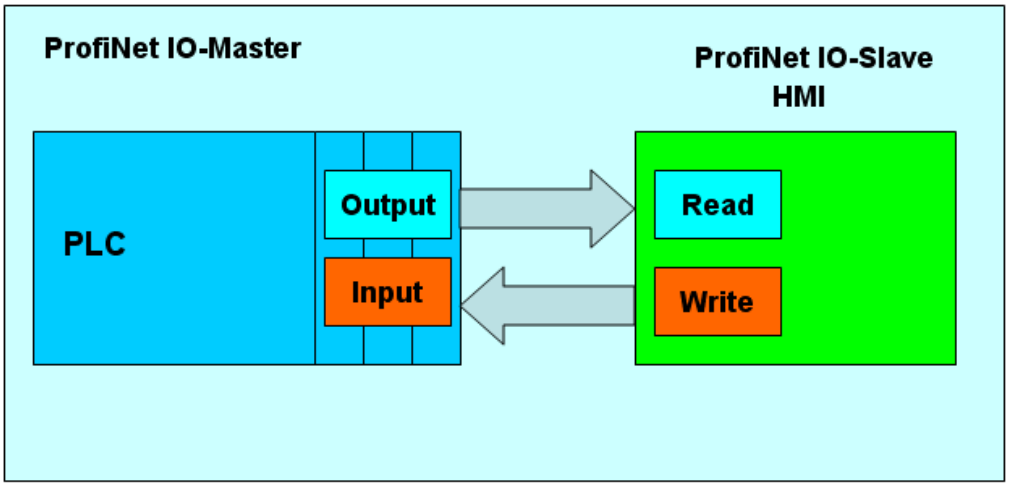


Fig: Data exchange between master and slave

2. SPECIFICATIONS

Item	Description
COM port number in HMI	COM3 (for network option, extension card)
ProfiNet IO extension card name (Device Name)	ABCC-PRT
Master to Slave, maximum bytes	256
Slave to Master, maximum bytes	256
Total bytes	512
Supported data types	byte, Int16 & Int32
Device number	128 maximum, set from Master
XML file name	GSDML-V2.2-HMS-ABCC-PRT-20100329
Maximum distance between Master and Slave on Ethernet 100BASE-TX	100 meters
Number of Ethernet Ports	1

3. EXTENSION CARD INSTALLTION

COM3 is dedicated for extension card. It is clearly marked on rear side of HMI.

Check HMI ordering code for Network extension card availability

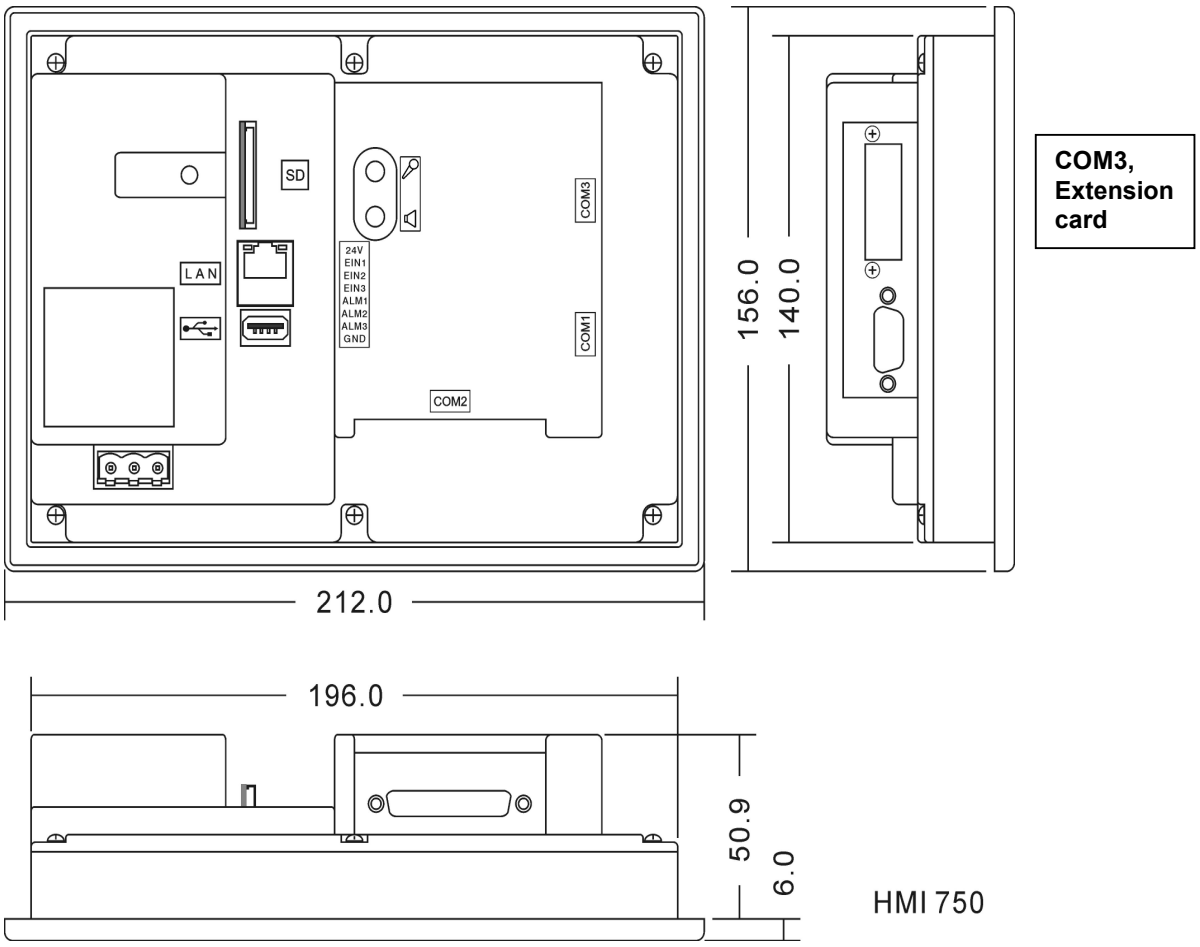


Fig: Typical dimensional drawing of HMI 7”

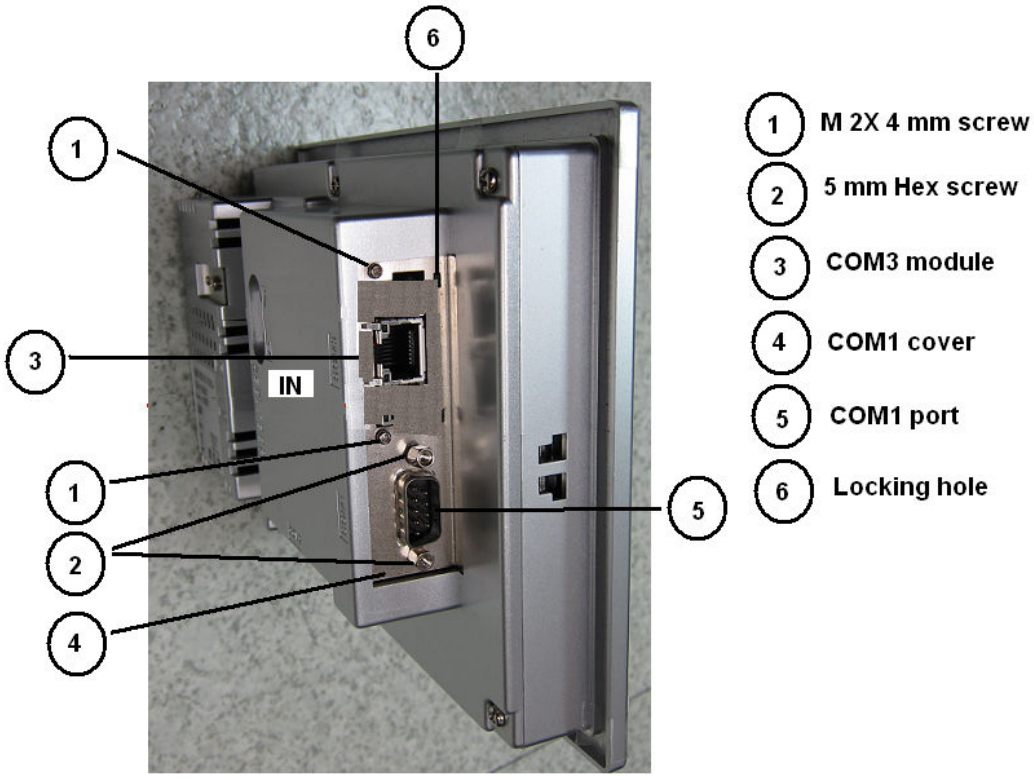


Fig: Typical HMI 7” with ProfiNet IO module

1. Open HMI rear cover by removing all the screws
2. Remove M2 X 4 mm screws (2 nos.) and open network module blank cover
3. Remove 5 mm hex screws (2 nos.) for COM1 port using tool 5mm Hex nut screwdriver
4. Remove COM1 cover. At this time, COM1 enclosure will be opened. Note down the direction of enclosure carefully as it need to fit in same direction later
5. Remove 5 mm hex screws for network extension card
6. Now, insert network extension card into main board and make sure it is properly inserted with in guider pins

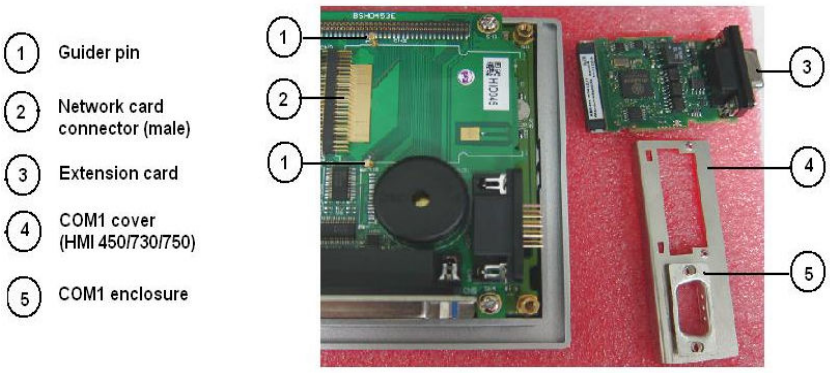


Fig: Extension card connector and guider

7. Fix COM1 cover properly and make sure that PCB is locked with in locking holes

8. Fix 5 mm hex screws (2 nos.) for COM1 port

9. Fix network module cover. Remember, these covers are different for different network extension modules. You will receive specific network module cover along with network extension card

10. Fix 5 mm hex screws (2 nos.) for network extension card. If required gently push network extension card downside to allow screws go inside properly

11. Fix M2 X 4 mm screws (2 nos.) on network module cover. If required gently push network extension card downside to allow screws go inside properly

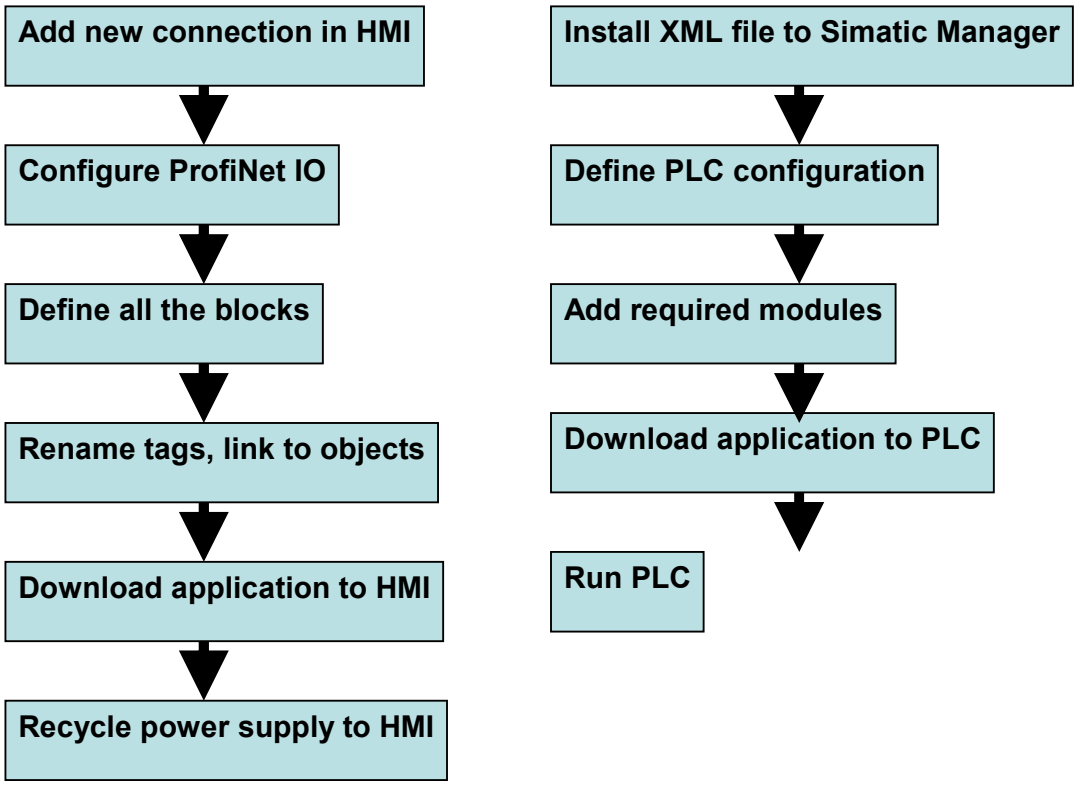
12. Close the HMI rear cover

4. WIRING

Standard Ethernet cable can be used for ProfiNet IO communication. Please refer ProfiNet IO website for more details about physical media and topologies

http://www.profibus.com/technology/profinet/

5. QUICK SETUP



Tips

Steps

1. First decide how much data to be exchanged between Master and Slave.

2. In HMI configuration, create required Read blocks (Maser to Slave) first, then, write blocks (Slave to Master).

3. Open Tag data base from Project explorer. It is possible to modify blocks to Tag names at Tag database here. Once block name is changed to Tag name, never attempt to delete the ProfiNet IO setup from connection as you will loose all the Tag names.

4. Link tags with Objects like Label, Text box etc... Once Tag is linked with objects, never attempt to delete ProfiNet IO configuration from Connections.

5. Make sure HMI is connected to PC on Ethernet network. Download application from PC to HMI

6. Switch OFF power supply to HMI. Press your finger on HMI active screen area and then switch ON the power. On Control center, press “Run”.

7. Now, in Simatic Manager software, scan for Profinet devices. Slave should be detected by Simatic manager.

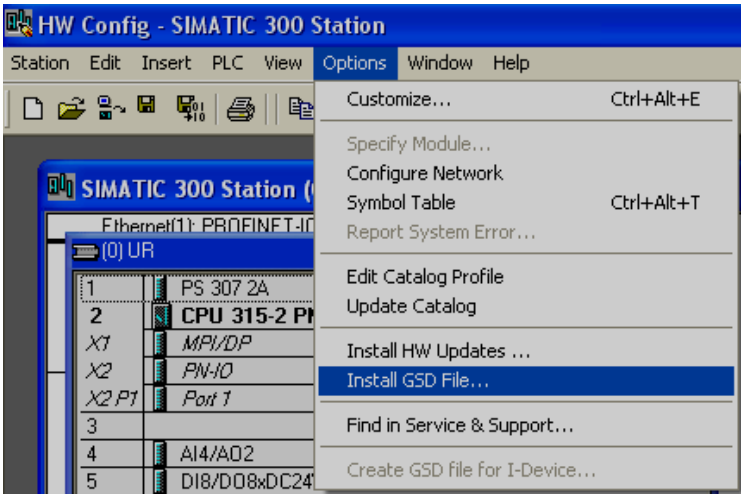
6. PLC CONFIGURATION

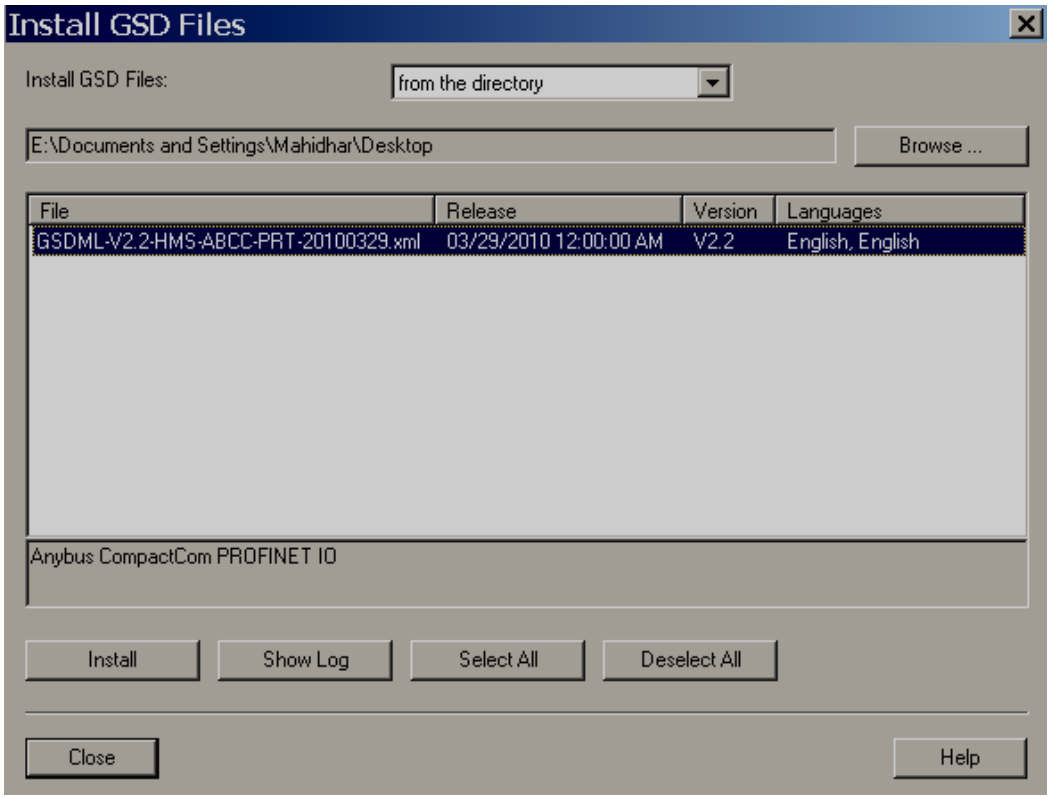
How to configure ProfiNet IO slave in Simatic Manager

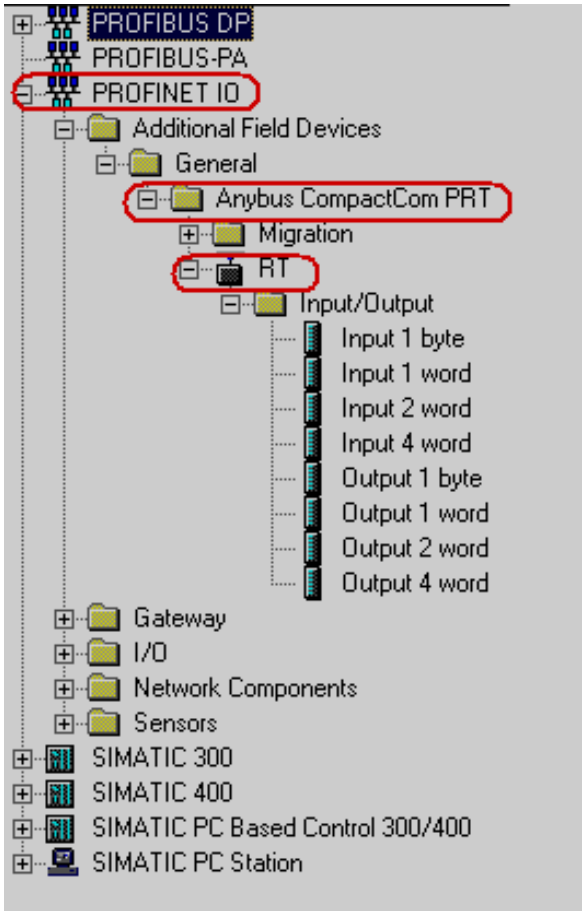
1. Obtain GSDML-V2.2-HMS-ABCC-PRT-20100329 file from factory. Store the file in desktop

2. Open Simatic Manager software, preferably the latest version V5.4 or above

3. Install XML file into Simatic Manager

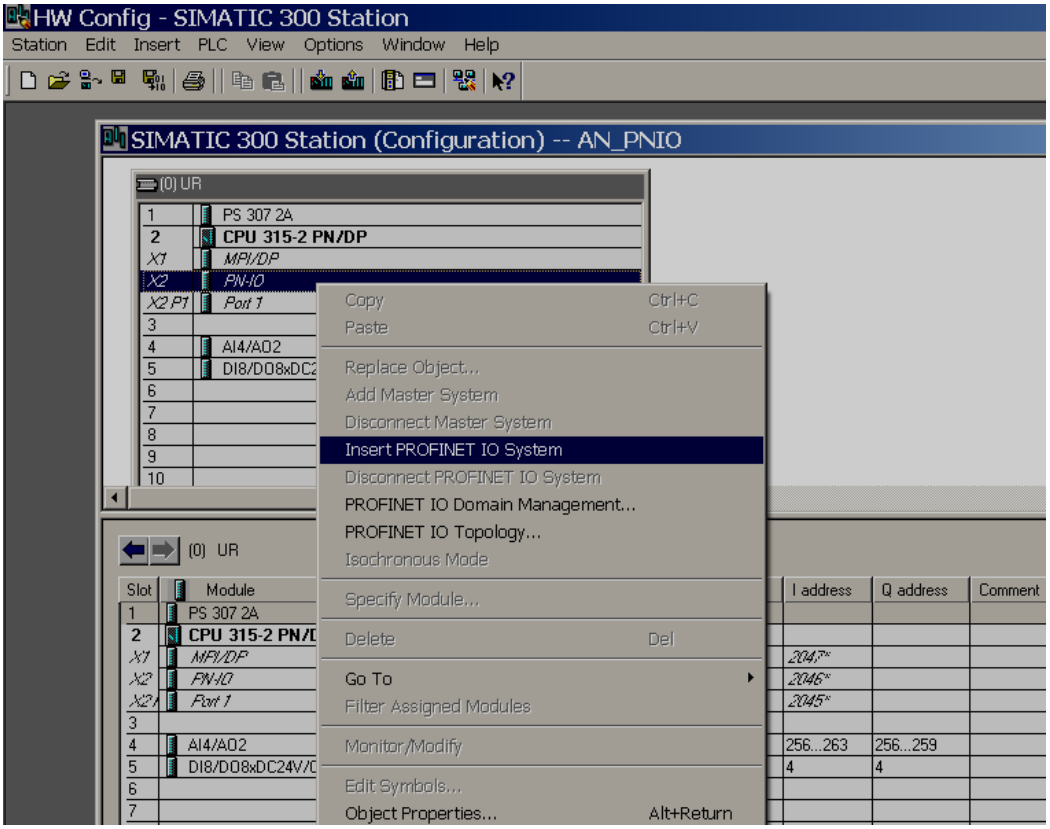


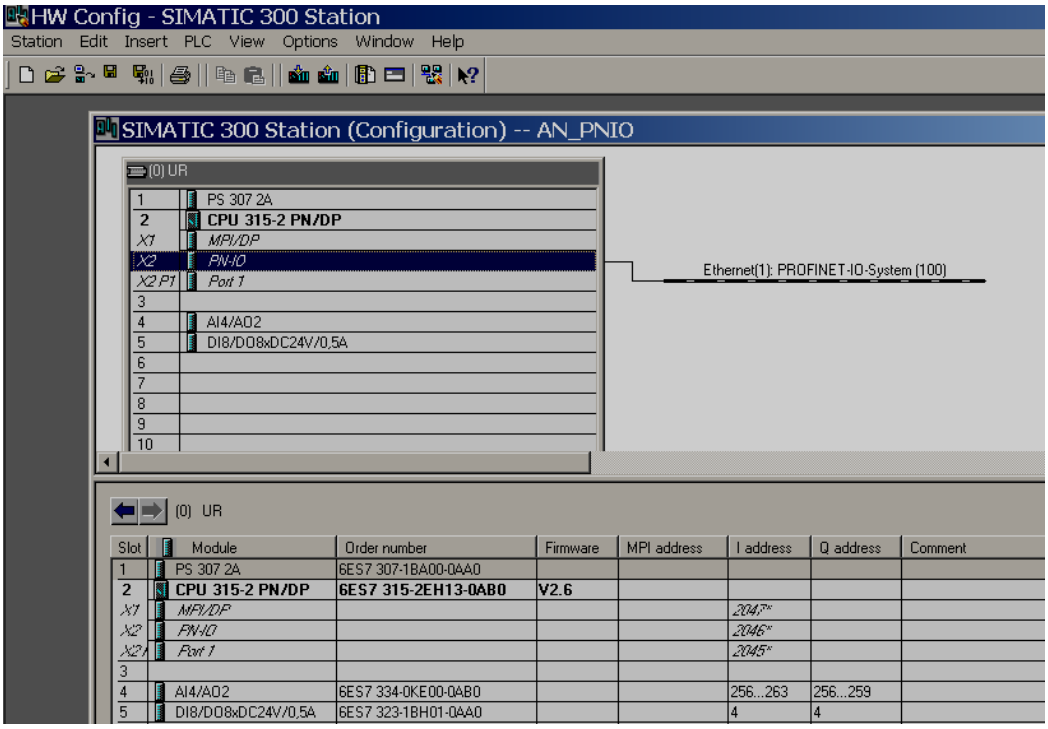

Install GSD Files
Install GSD Files:
from the directory
E:\Documents and Settings\Mahidhar\Desktop
Browse ...
File
Release
Version
Languages
GSDML-V2.2-HMS-ABCC-PRT-20100329.xml
03/29/2010 12:00:00 AM
V2.2
English, English
Anybus CompactCom PROFINET IO
Install
Show Log
Select All
Deselect All
Close
Help


PROFIBUS DP
PROFIBUS-PA
PROFINET IO
Additional Field Devices
General
Anybus CompactCom PRT
Migration
RT
Input/Output
Input 1 byte
Input 1 word
Input 2 word
Input 4 word
Output 1 byte
Output 1 word
Output 2 word
Output 4 word
Gateway
I/O
Network Components
Sensors
SIMATIC 300
SIMATIC 400
SIMATIC PC Based Control 300/400
SIMATIC PC Station

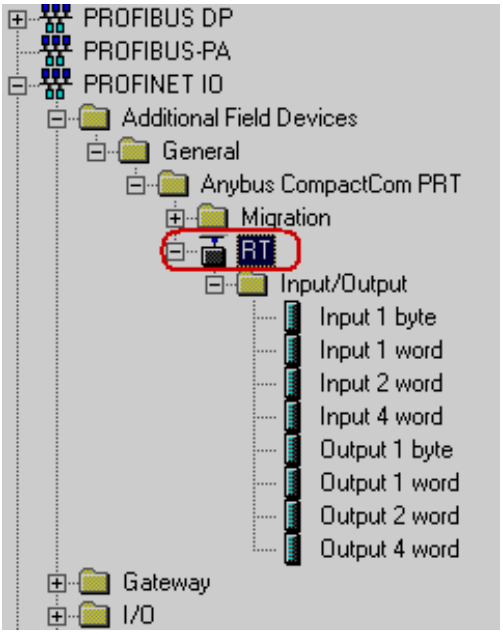
ABCC-PRT should be visible at above location

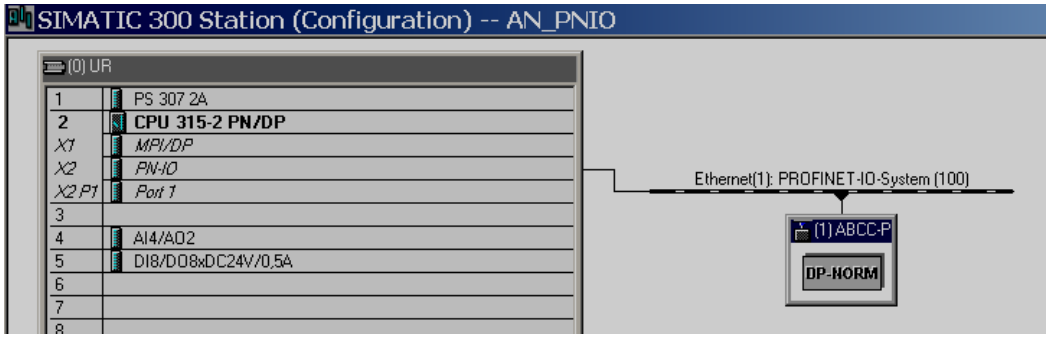
4. Add ProfiNet IO system



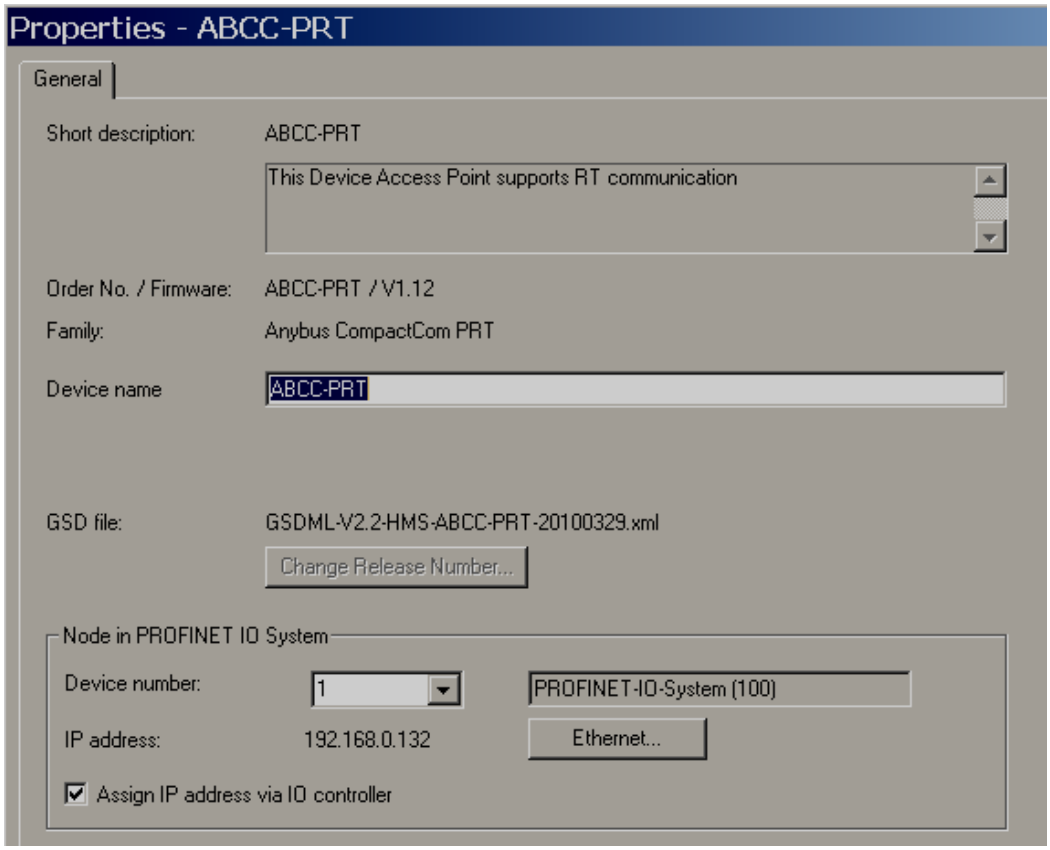


5. Select “RT” icon as shown below, drag and drop on ProfiNet IO system line





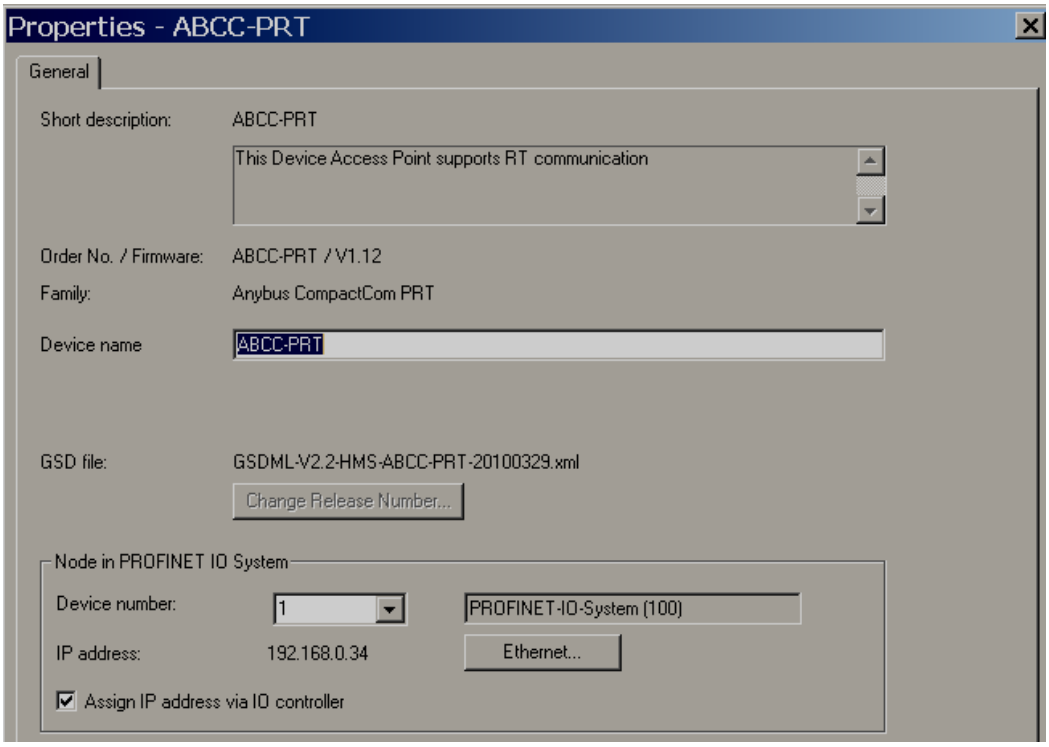
Double click at ABCC-PRT slave



Note: Please do not change Device name here. Other wise, communication will not work

Enter Slave device number here.

Click “Ethernet” and enter unique IP address for the ProfiNet slave device. Please note down this IP address, you must enter the same address at HMI during ProfiNet slave configuration

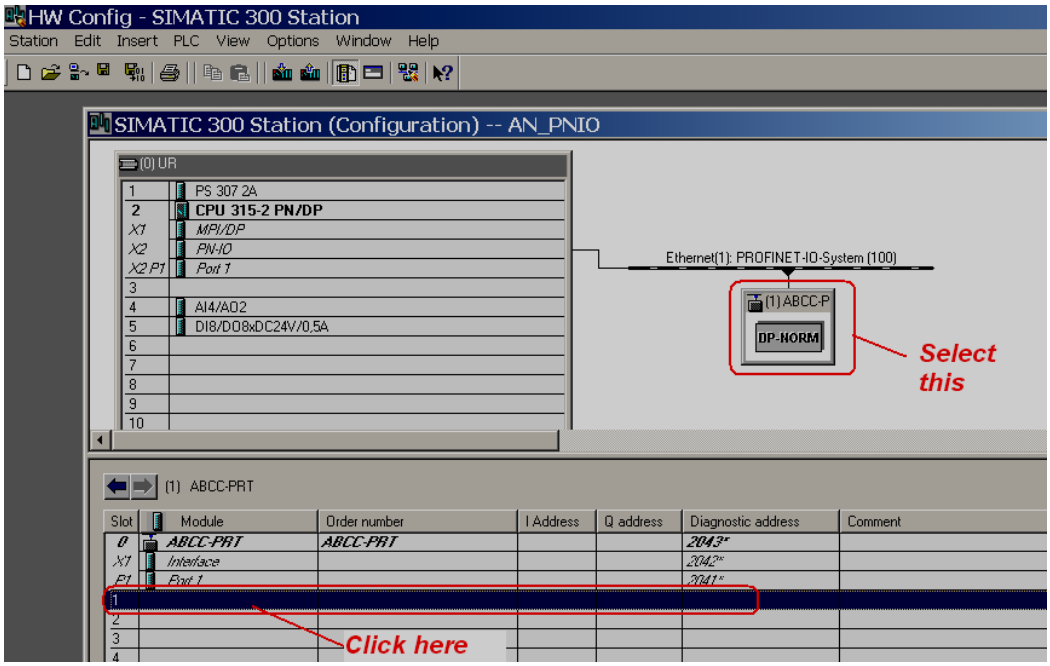


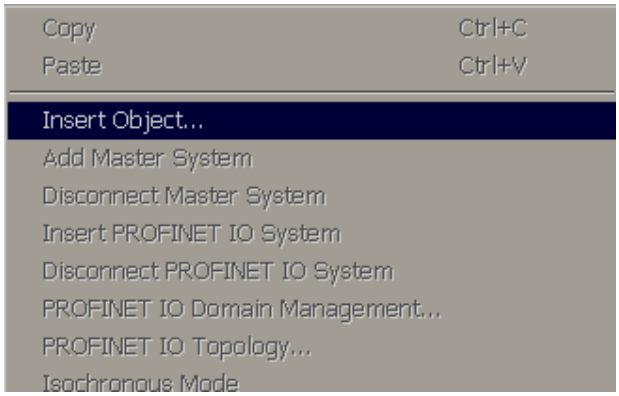
6. Add IO modules for data exchange.

   Various types of IO modules available are as follows.

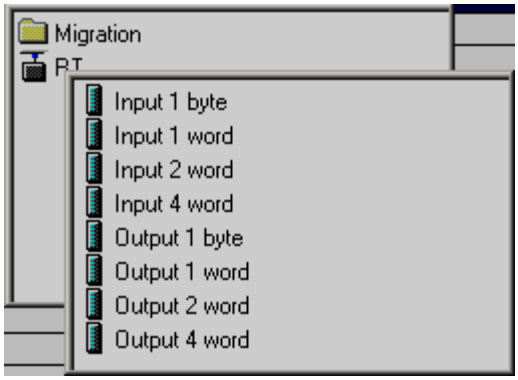
Slave to Master (Input)	Master to Slave (Output)	Input/Output
I byte in	I byte out	Nill
1 word in	1 word out	Nill
2 words in	2 words out	Nill
4 words in	4 words out	Nill

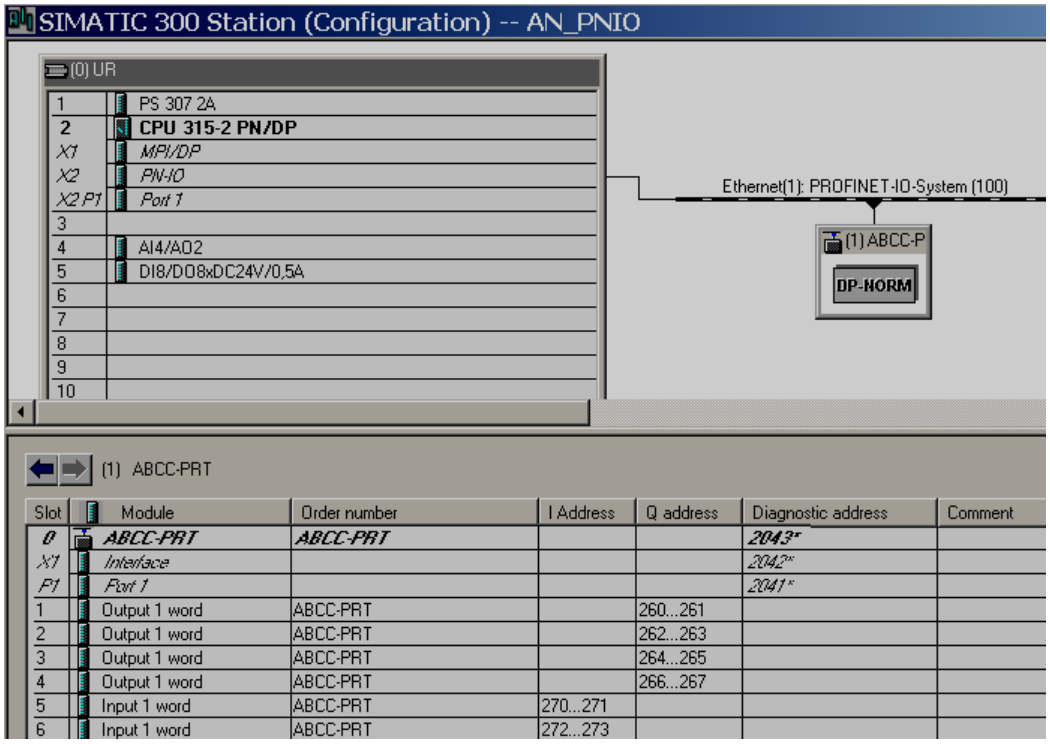
   Select APCC-PRT slave, then, click “Slot1”, right clock mouse to Insert objects


HW Config - SIMATIC 300 Station
Station Edit Insert PLC View Options Window Help
SIMATIC 300 Station (Configuration) -- AN_PNIO
(0) UR
1 PS 307 2A
2 CPU 315-2 PN/DP
X1 MPI/DP
X2 PN-IO
X2 P1 Port 1
3
4 AI4/AO2
5 DI8/DO8xDC24V/0,5A
6
7
8
9
10
Ethernet(1): PROFINET-IO-System (100)
(1) ABCC-P
DP-NORM
Select this
(1) ABCC-PRT
Slot Module Order number I Address Q address Diagnostic address Comment
0 ABCC-PRT ABCC-PRT 2043*
X1 Interface 2042*
P1 Port 1 2041*
1
2
3
4
Click here

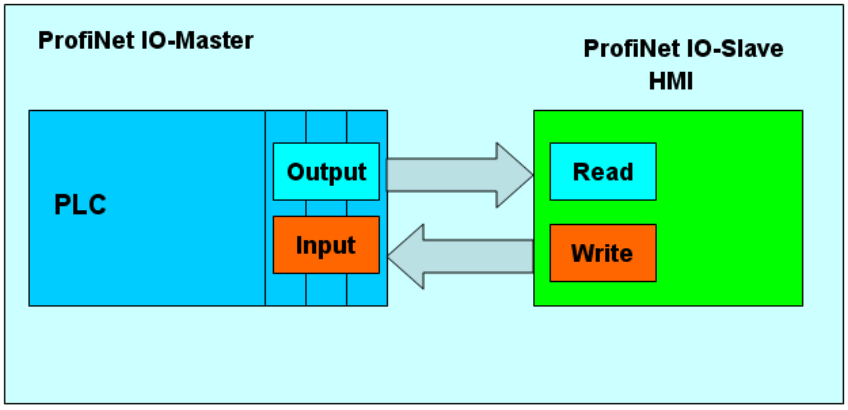

Copy Ctrl+C
Paste Ctrl+V
Insert Object...
Add Master System
Disconnect Master System
Insert PROFINET IO System
Disconnect PROFINET IO System
PROFINET IO Domain Management...
PROFINET IO Topology...
Isochronous Mode

Migration
RT

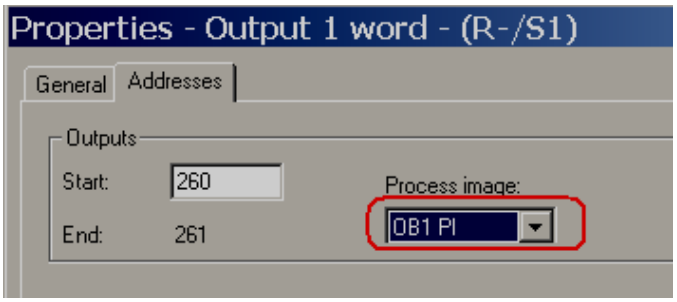

Migration
RT
Input 1 byte
Input 1 word
Input 2 word
Input 4 word
Output 1 byte
Output 1 word
Output 2 word
Output 4 word



Ex: 4 * 1 word Output, 2 *1 word Input configuration

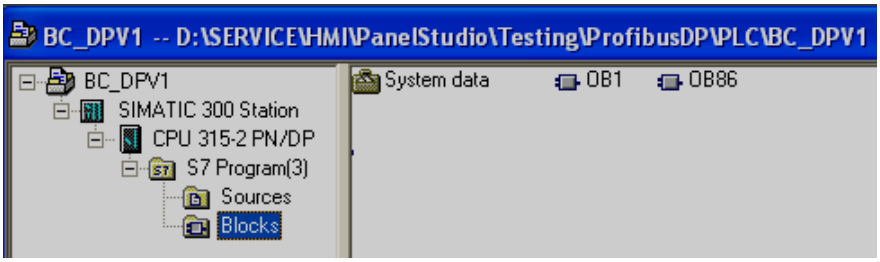


The sequence of IO module type in Master and blocks in Slave should be same. Recommend to define all Output modules first (Master to Slave) and then all input modules (Slave to Master) in sequence to minimize confusions in addressing. Make sure that continuous address used among Output modules and also among input modules.

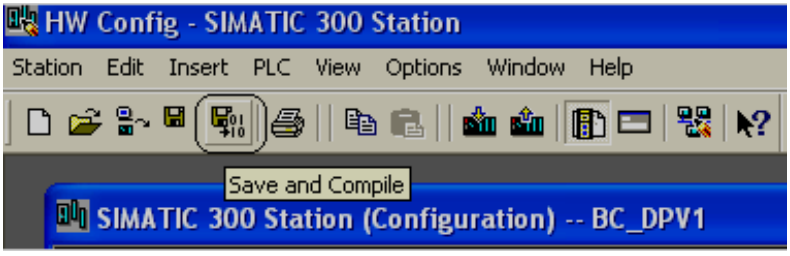


Make sure that address selected is with in Process image OB1 P1

7. You may need to create OB86 (Rack failure) in blocks during commissioning for testing purpose. If you do not program OB86, the CPU changes to STOP mode when a rack failure is detected. (When slave is not active or power on). Please refer Simatic Manager documentation for more information about OB86 and configure the same as per your application requirements



8. Compile PLC program, Save and download from PC to PLC



At this time, Bus failure LED will blink in S7-300 PLC because DP Slave is not available yet. If OB86 is not available in PLC, it may go to STOP mode. Once ProfiNet IO Slave configuration is completed in HMI and running properly, then, BF LED should stop blinking in Master

In ProfiNet IO module at Master side, Output4 word means, it is Int64/Uint64 type. This kind of data type is not supported in HMI at this time, so, please do not use. It is reserved for future use

In ProfiNet IO module at Master side, Output2 word means, it is Int32/Unit type. So, the valid block configuration for this kind of setup at HMI side is Blockn, Int32/Unit32 type, L=1, where n is block number

In ProfiNet IO module at Master side, Output1 word means, it is Int16/Unit16 type. So, the valid block configuration for this kind of setup at HMI side is Blockn, Int16/Unit16 type, L=1, where n is block number

Sample mapping between Master and Slave

Master to Slave

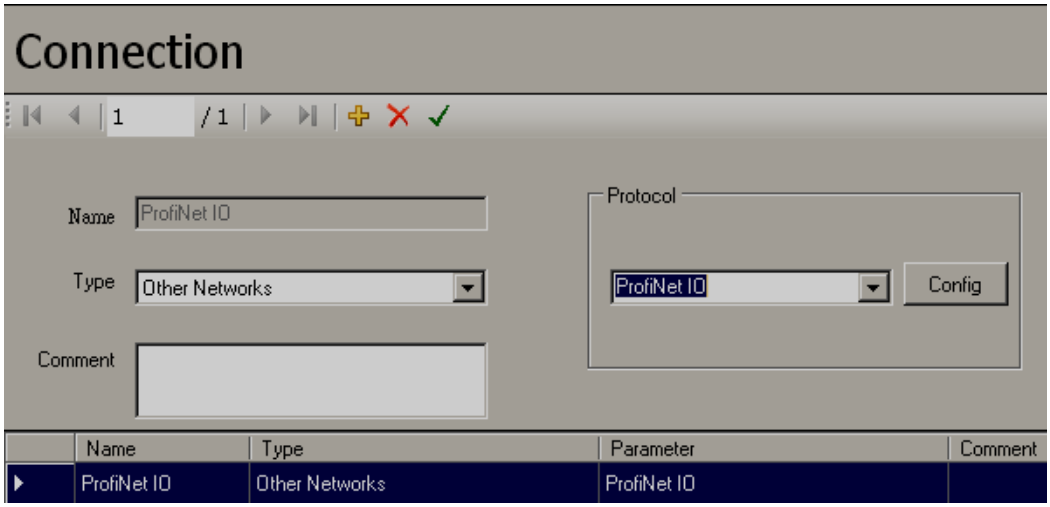
HMI side	PLC side	PLC address	Valid
Option-01 Block1, Int16 type, L=4, Read	Output 1 word Output 1 word Output 1 word Output 1 word	QB 260-261 or QW260 QB 262-263 or QW262 QB 264-265 or QW264 QB 266-267 or QW266	OK
Option-2 Block1, Int16 type, L=1, Read Block2, Int16 type, L=1, Read Block3, Int16 type, L=1, Read Block4, Int16 type, L=1, Read	 Output 1 word Output 1 word Output 1 word Output 1 word	 QB 260-261 or QW260 QB 262-263 or QW262 QB 264-265 or QW264 QB 266-267 or QW266	OK
Option-3 Block1, Int16 type, L=4, Read	Output 4 word	QB 260-267	Not valid

Slave to Master

HMI side	PLC side	PLC address	Valid
Option-1 Block1, Int16 type, L=4, Write	Input 1 word Input 1 word Input 1 word Input 1 word	IB 260-261 or QW260 IB 262-263 or QW262 IB 264-265 or QW264 IB 266-267 or QW266	OK
Option-2 Block1, Int16 type, L=1, Write Block2, Int16 type, L=1, Write Block3, Int16 type, L=1, Write Block4, Int16 type, L=1, Write	 Input 1 word Input 1 word Input 1 word Input 1 word	 IB 260-261 or QW260 IB 262-263 or QW262 IB 264-265 or QW264 IB 266-267 or QW266	OK
Option-3 Block1, Int16 type, L=4, Write	Input 4 word	IB 270-267	Not valid

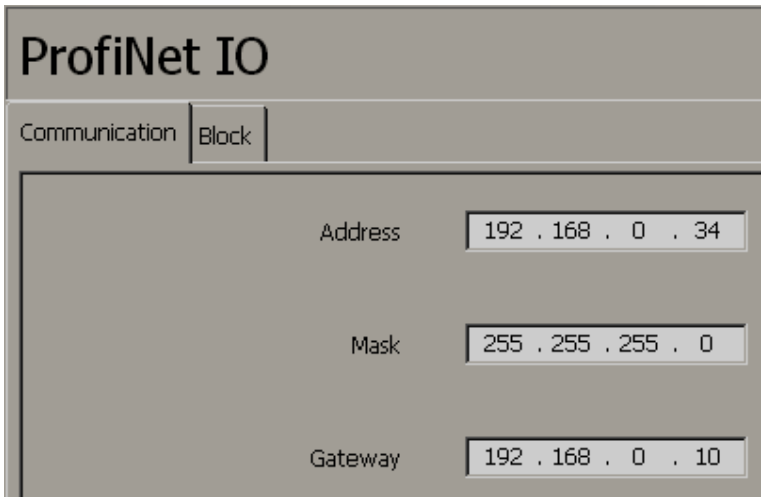
7. HMI CONFIGURATION

1. In project explorer, double click at “Connections”
2. Click to add a new connection.
3. Select Type= Other Network. Select Protocol = ProfiNet IO. Then click apply icon to save this setup



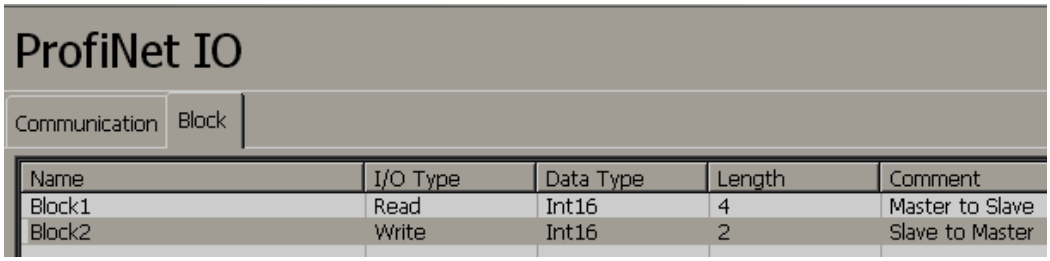
4. Click “Config” to open ProfiNet IO slave configuration

5. Enter IP address for the ProfiNet IO slave device (HMI). It should be unique in network. Please note that this IP address is for plug in module inserted in HMI to support ProfiNet IO slave functionality. The location is marked as COM3 in HMI. This IP address is not for standard Ethernet port in HMI’s. It is also required to enter the same IP address in Simatic manager after adding slave as explained in section “PLC configuration”



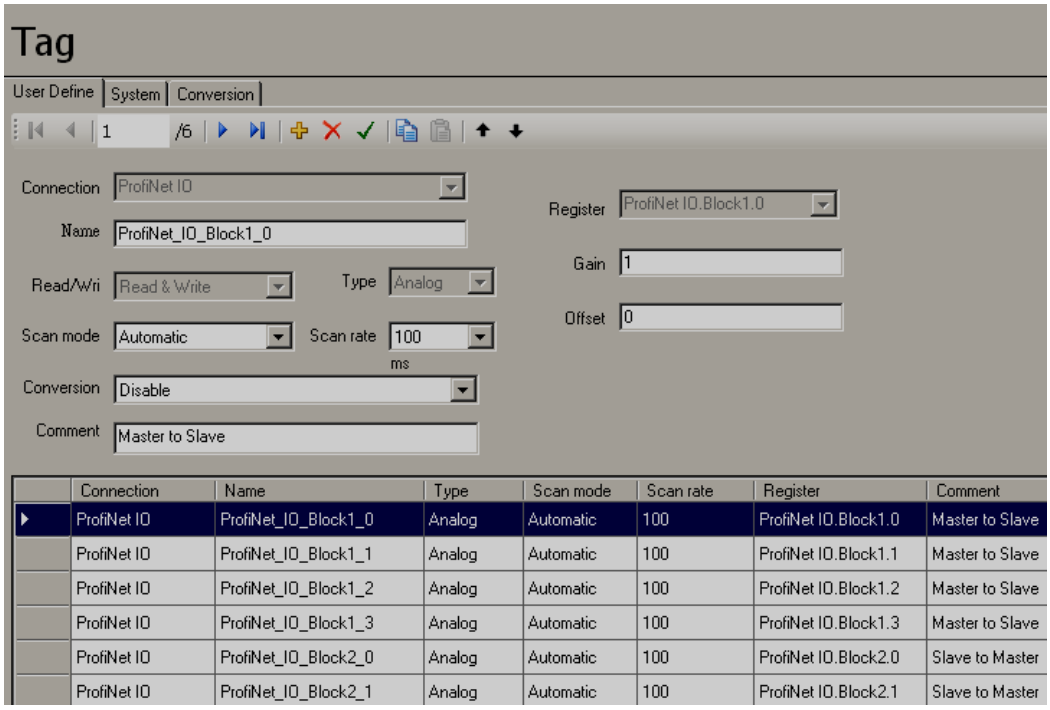
6. Select “Block”. Add virtual IO modules as per requirement. Click “Apply” after completing the entries

   The blocks defined here should be in same sequence as defined at PLC configuration, other wise, communication will not be succesful



   In above example, 4 nos. Int16 data will read from PLC to HMI and 2 nos. Int16 data will write from HMI to PLC

7. Make sure that all the required IO modules are entered here completely as per the project requirements. Then, click “OK” to finish block configuration.



   Ex: 4 words Read and 2 words Write

8. In project explorer, double click “Tags” and check all the network tags. If required, it is possible to modify Tag names here. Once tag names are modified and linked with objects, do not attempt to modify configuration of blocks again at connections in Project explorer. Before modification of tag names in tag data base, make sure block settings are completely finished at Connections

After application download to HMI, it is a must to recycle power to HMI.

Switch OFF power supply to HMI and switch ON power supply to HMI. Then only networking application works properly. At power on, it might show message “Extension card fail” in HMI. Press “OK”. If tags are linked with text boxes, it may show “Error” while reading data from Master to Slave. Once Master is started, communication will be established with slave and “Error” message disappears in objects and show real time data

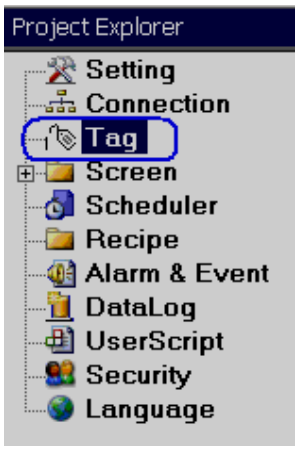
8. CONVERTER

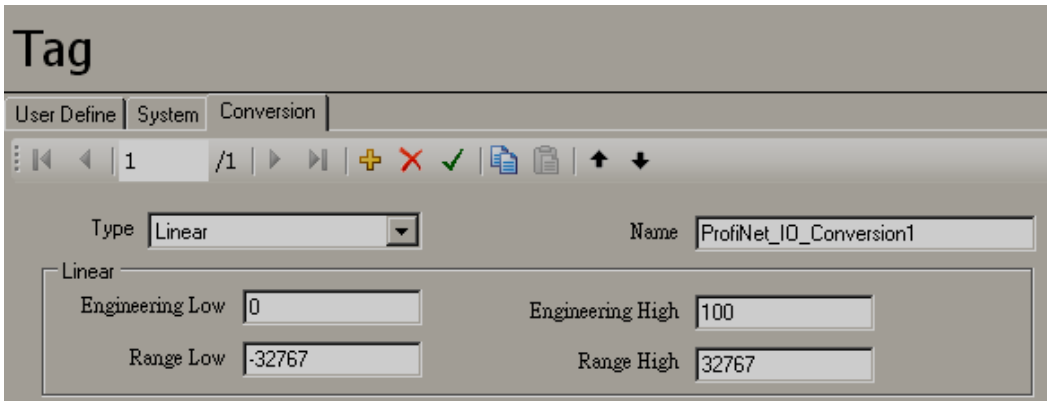
It is possible to do scaling in HMI application for Read/Write blocks

Task1: Read (Master to Slave)
PLC Value range=-32767 to 32767.
Convert this to 0 to 100 and display in HMI
Use Block1, Signed integer 16 type in HMI configuration

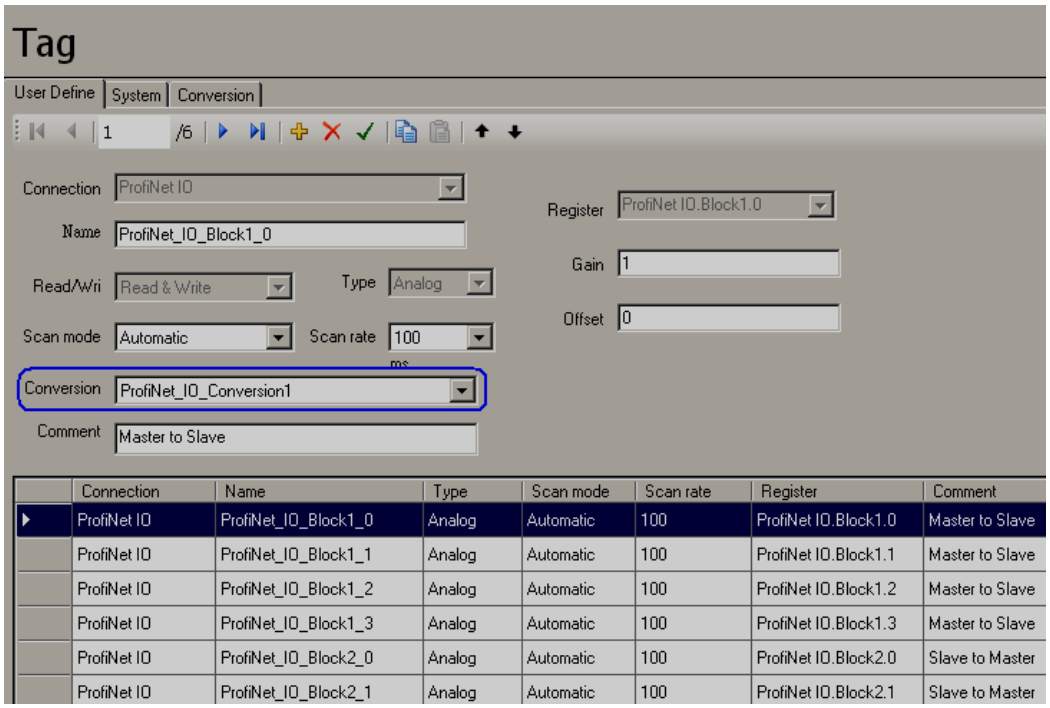
Task2: Write (Slave to Master)
Write 0 to 100 in HMI. Convert this to -32767 to 32767 and send to PLC
Use Block2, Signed integer 16 type in HMI configuration

Read, Block1_0		**Write, Block2_0**	
Value at PLC	**Value Read in HMI**	**Value write in HMI**	**Value at PLC**
-32767	0	0	-32767
0	50	50	0
32767	100	100	32767





Enter Scaling equation at “Conversion” tab



Select required Conversion equation for the networking tags as shown above

9. EXAMPLES

9.1.1 4 words Read, 2 words write

Word data type addressing

IO module type at PLC	PLC address	HMI block address	HMI tag name	HMI IO type	Description
Output 1 word	QW260	Block1, length=4	Block1_0	Read	Master to Slave
Output 1 word	QW262		Block1_1	Read	Master to Slave
Output 1 word	QW264		Block1_2	Read	Master to Slave
Output 1 word	QW266		Block1_3	Read	Master to Slave
Input 1 word	IW270	Block2, Length=2	Block2_0	Write	Slave to Master
Input 1 word	IW272		Block 2_1	Write	Slave to Master

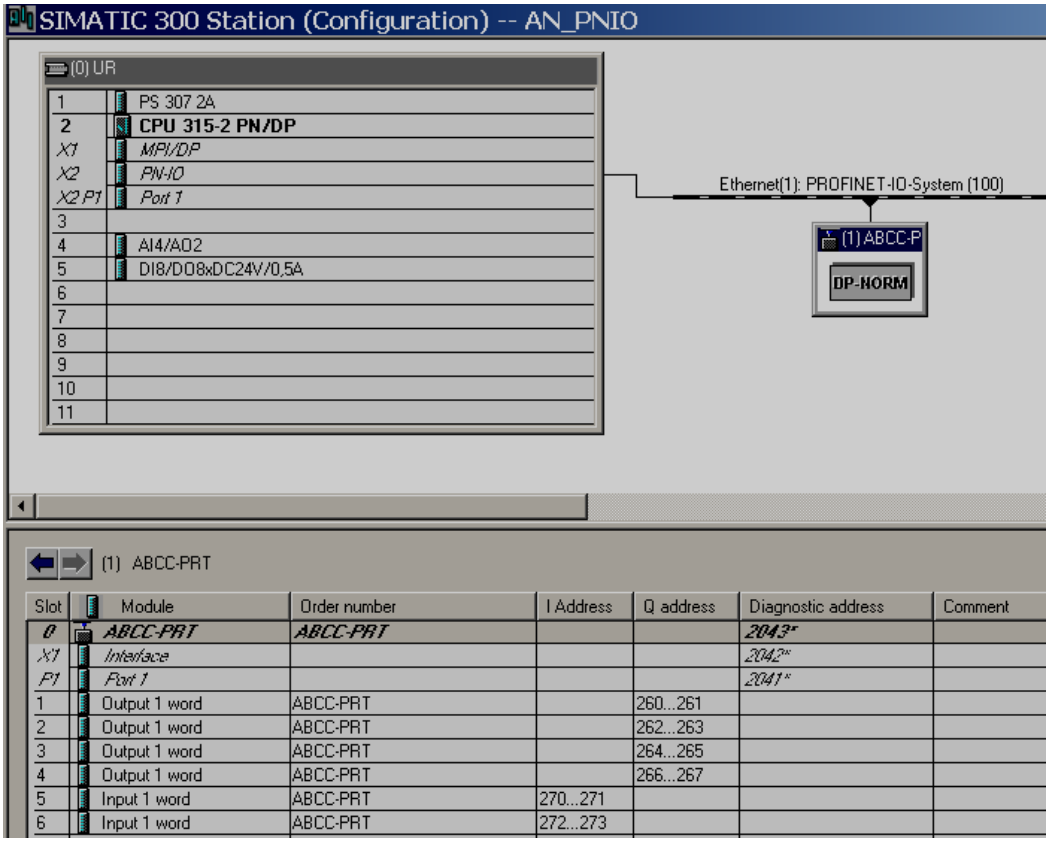


Fig: Master configuration

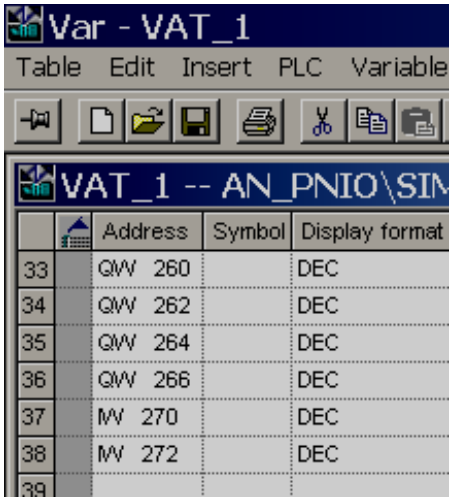


Fig: Variable table in S7-300 PLC

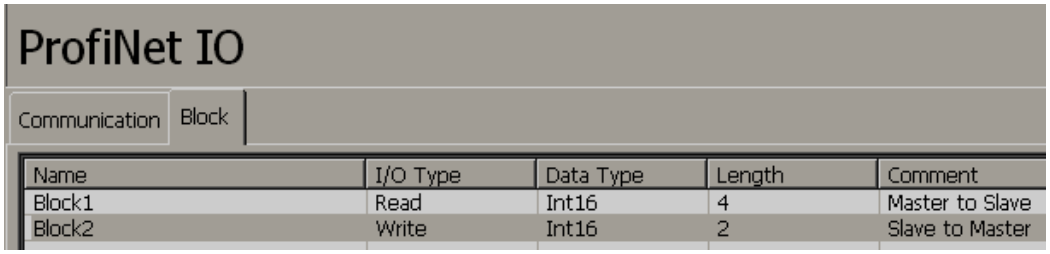


Fig: HMI configuration

Note: Check length of block = 4 and data type = Int16 which is signed integer type to accept values between -32767 to + 32767

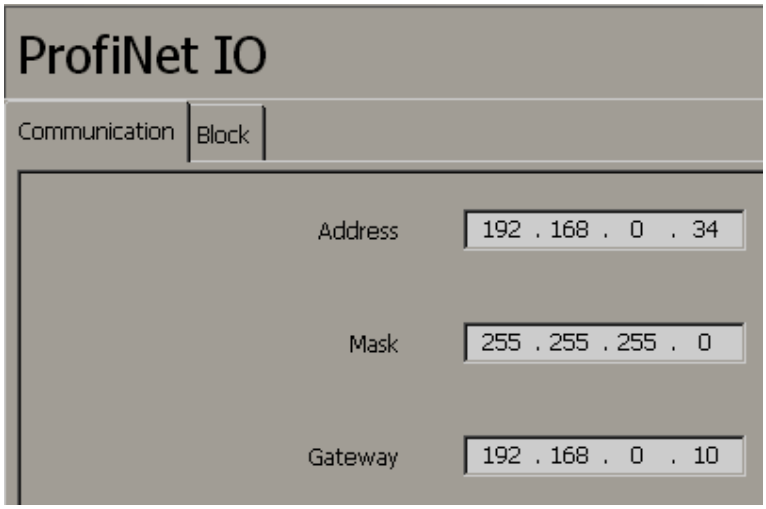


Fig: Typical slave configuration

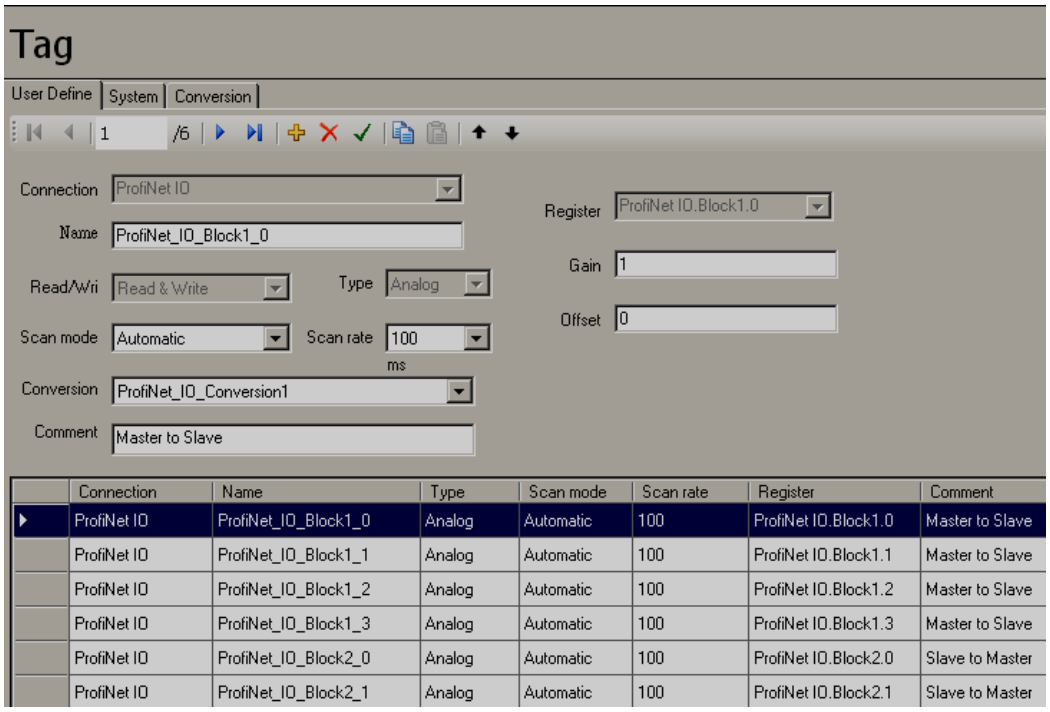


Fig: Tags list in HMI software

9.1.2 8 bits Read, 8 bits write

Read, bytes = 1
Write, bytes = 1
Read + Write, bytes = 1+1=2< maximum limit of 512 bytes, so it is possible.

IO module type	PLC address	HMI block address	HMI tag name	HMI IO type	Description
Output 1 byte	QB300	Block1	Block1	Read	Master to Slave
Input 1 byte	IB400	Block2	Block2	Write	Slave to Master

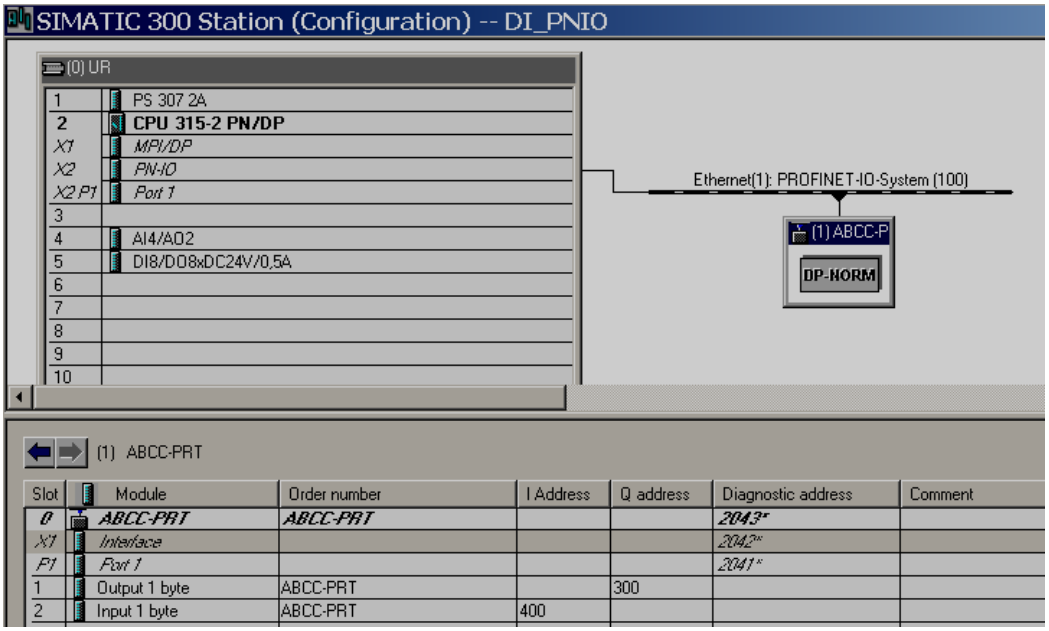


Fig: Master configuration

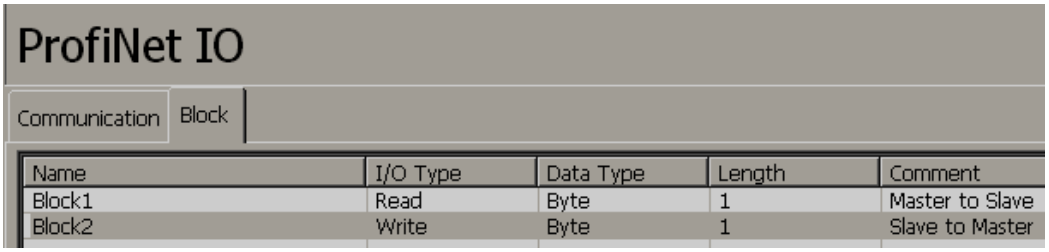


Fig: HMI configuration

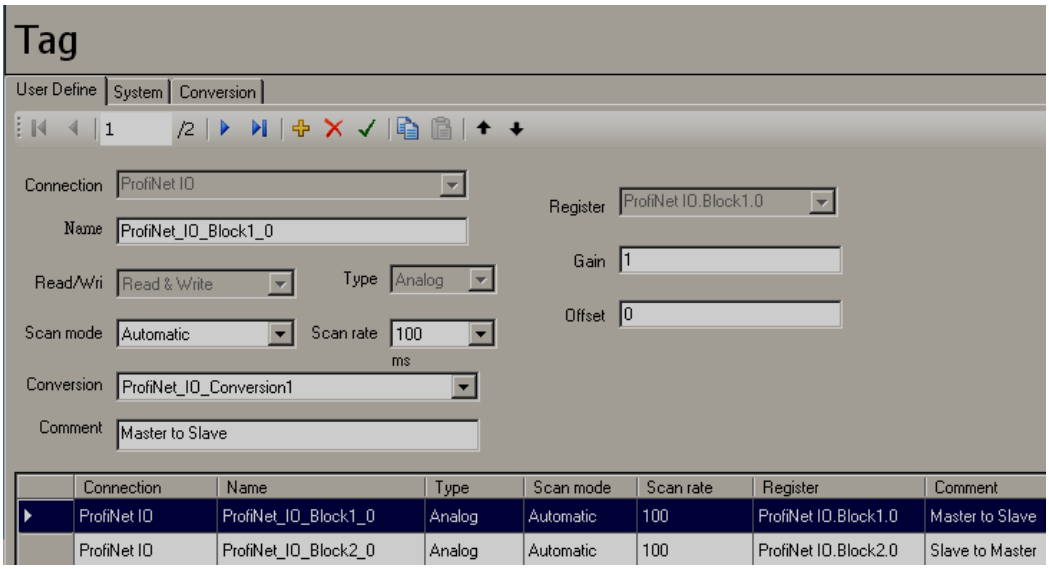


Fig: Tags in HMI

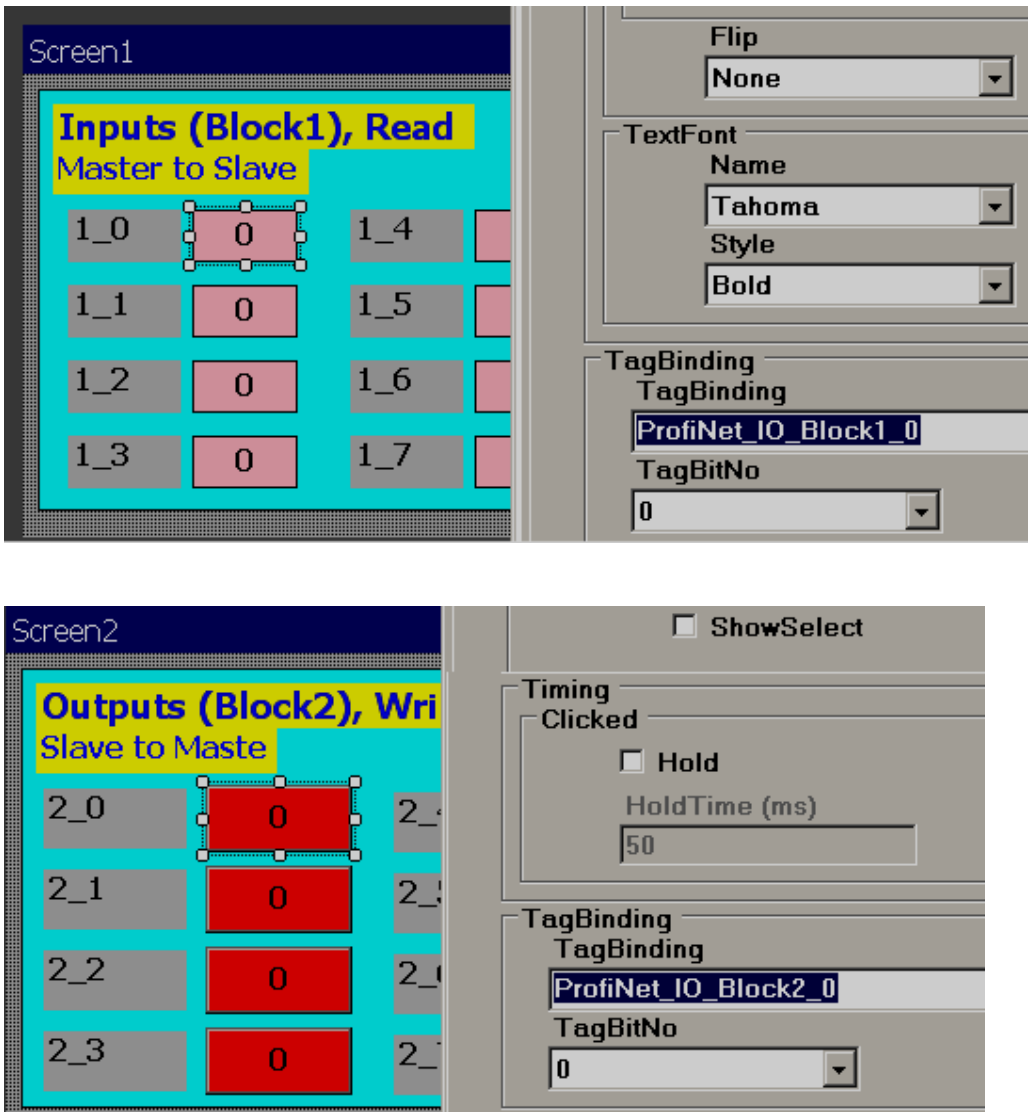


Fig: HMI screen for testing digital I/O's

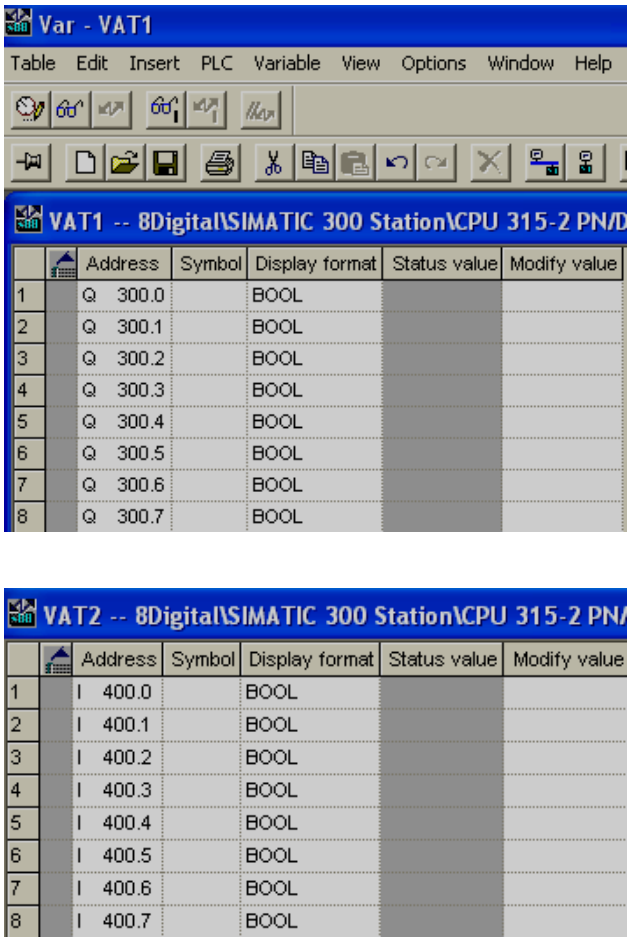


Fig: Variable table monitoring in PLC online

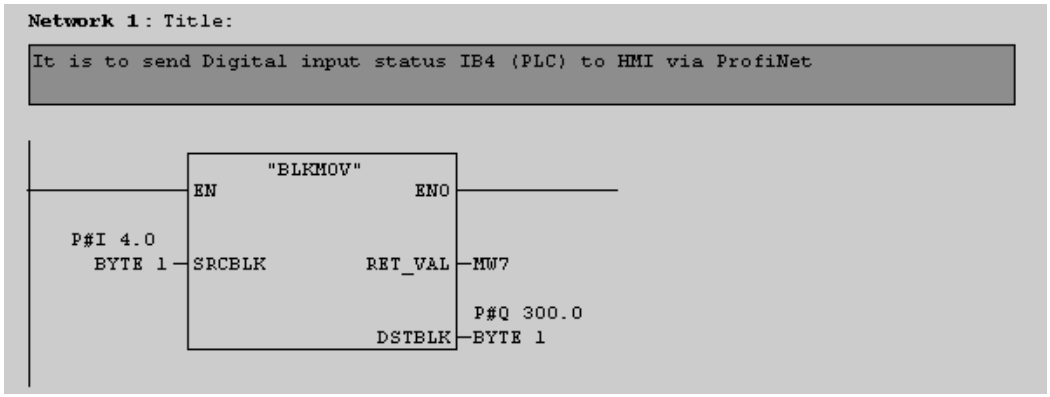


Fig: Indirect addressing to copy location IB4 to QB300

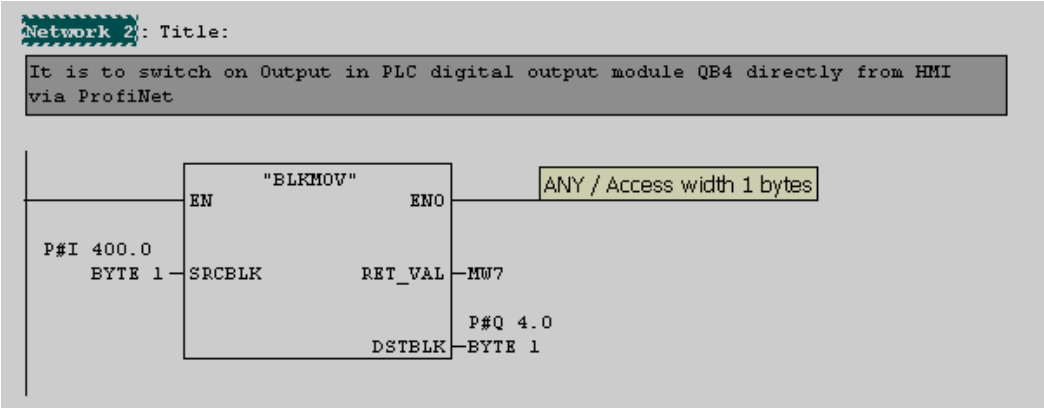


Fig: Indirect addressing to copy location IB400 to QB4

10. FAQ

1. Can we order HMI first and then network extension card later? Can I fix network extension card my self?
   Yes, it is possible.

2. All HMI support network extension card
   Check HMI ordering code for Network extension card availability

3. After inserting network extension card, HMI is Master or Slave on specific network?
   Slave

4. Is it possible to have more than 1 HMI in ProfiNet network
   Yes, it is possible.

5. Is it possible to connect 1 HMI to 2 Masters on ProfiNet IO?
   No, it is not possible.

6. Can I access Siemens PLC addressing areas directly in HMI software
   No, it is not possible

7. What is the maximum data I can exchange between Master and Slave
   Master to Slave: 256 bytes
   Slave to Master: 256 bytes
   Total: 512 bytes

8. Is GSDML Slave interface file is required to configure ProfiNet IO slave
   Yes, Contact factory for GSDML file

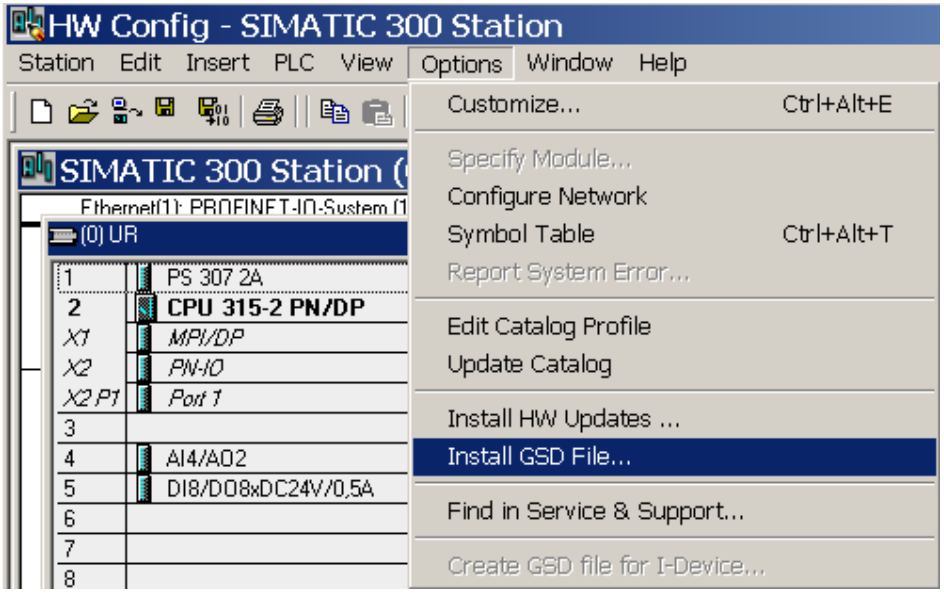
9. What are the settings required in ProfiNet IO slave
   You need to enter IP address for the ProfiNet IO slave in HMI configuration. Then, you need to define blocks as per your data exchange requirements.

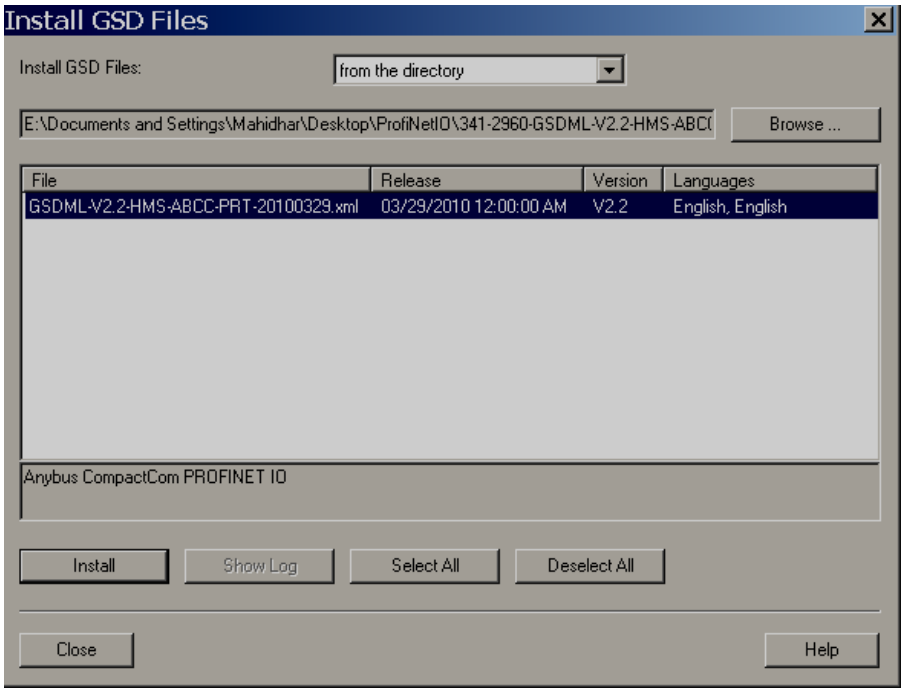
10. How many blocks I can add in ProfiNet IO slave at HMI configuration?
    It depends on block length. By default, each block length = 1, Uint16 type. In above case, you can add 128 blocks of Read type and 128 blocks of Write type which occupies 256 bytes in each direction. This is equivalent to total 512 bytes.

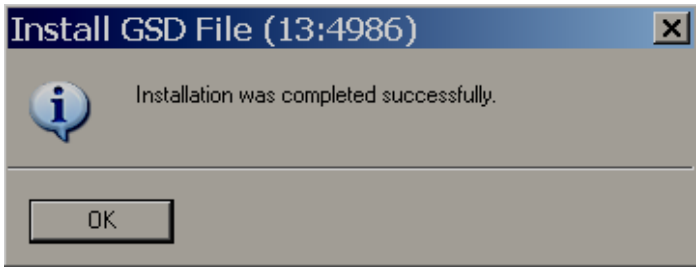
11. I am getting message “Extension card fail” in HMI after power on.
    Please switch OFF power supply to HMI and Power ON again after downloading application from PC to HMI.

12. How Can I exchange data between two slaves directly with out Master?
    No, it is not possible. You must do this via Master only

13. How Can I install GSDML file into Simatic Manager?

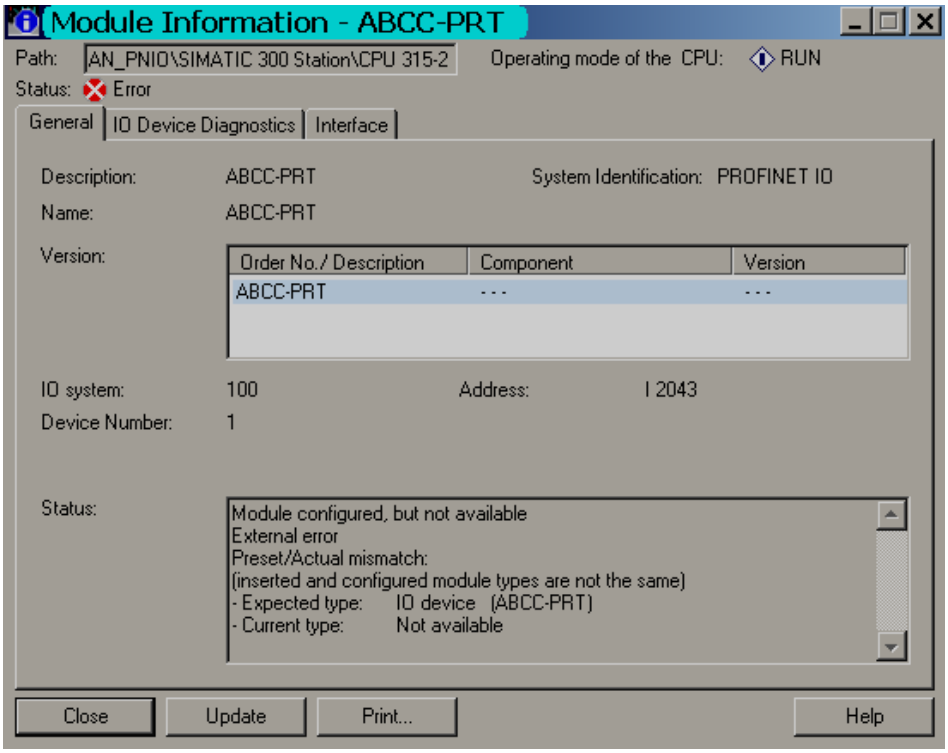




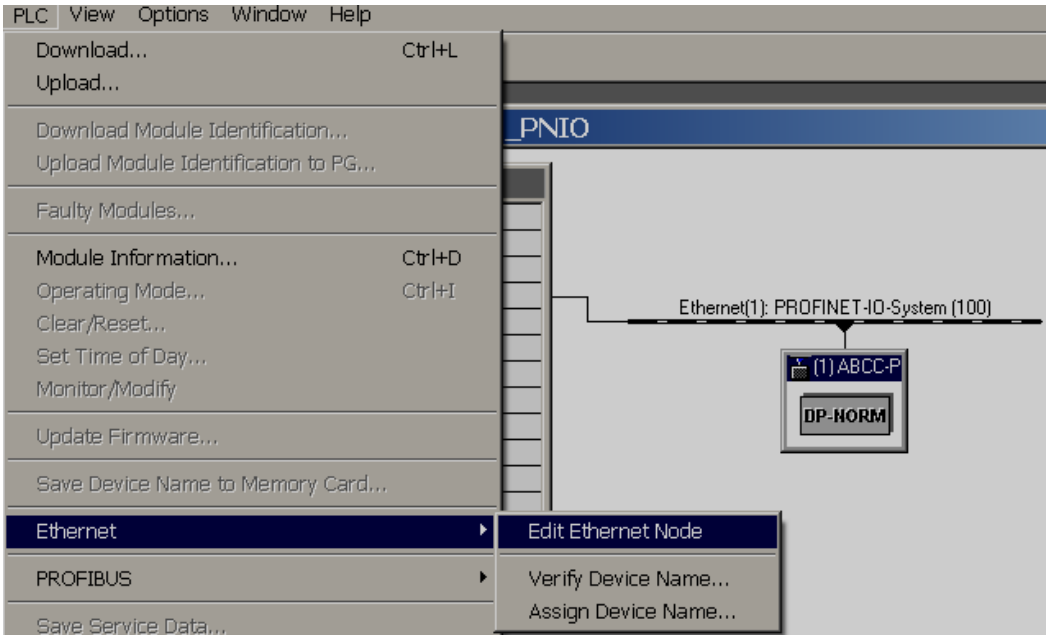


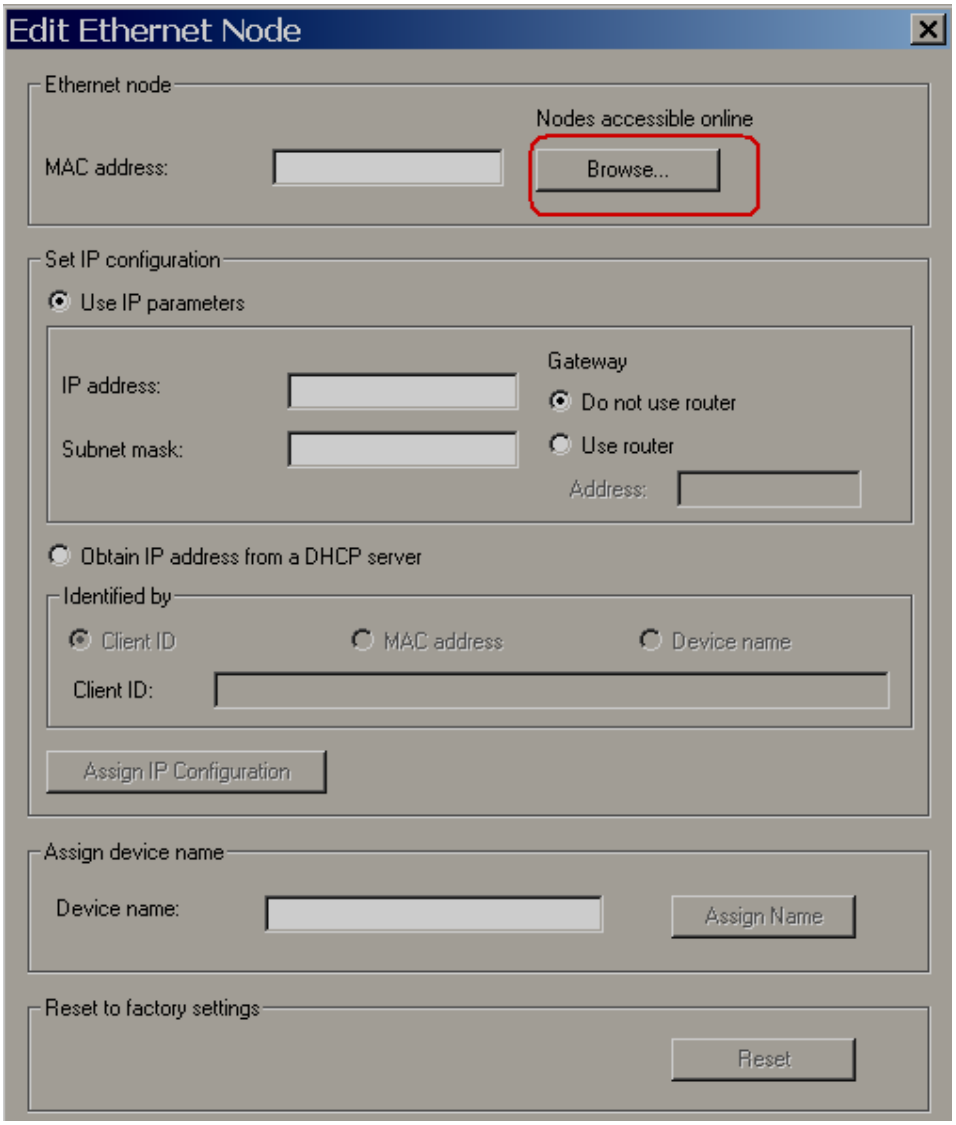
14. I download application to PLC and HMI. But, in PLC, it is showing “BF” LED.

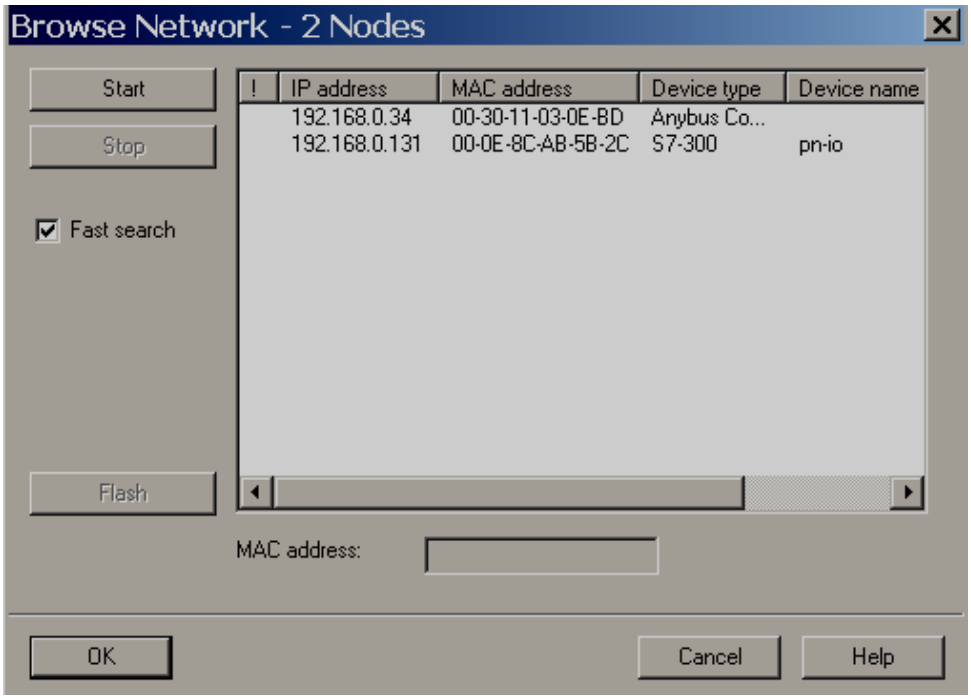
Please remove Ethernet cable from standard Ethernet port and connect to Ethernet port available at COM3 location. ProfiNet IO (Slave functionality) is supported at COM3 via Plug in module and not via standard Ethernet port



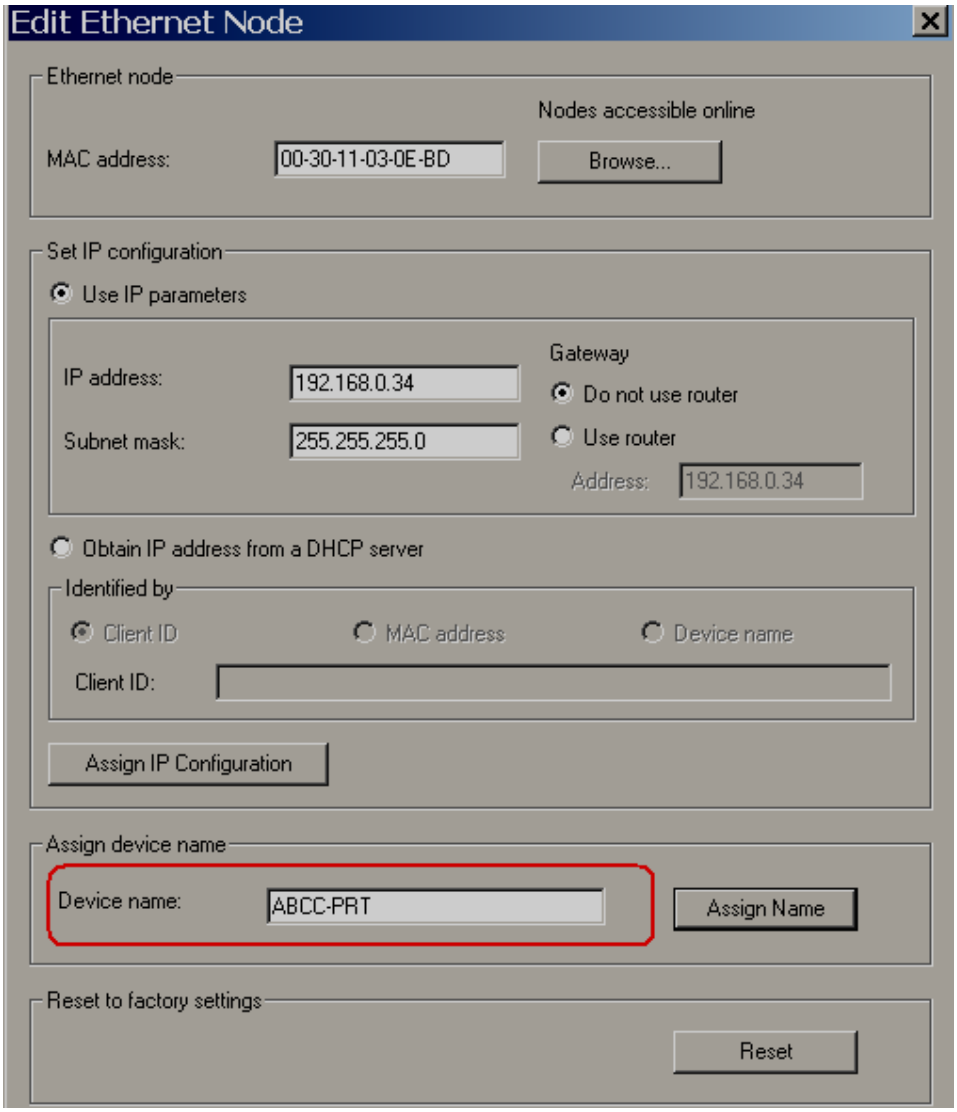
15. Simatic manager did not find ProfiNet IO slave device
    Make sure ProfiNet IO network module is properly inserted in HMI. Download demo program (Analog) to HMI, Now, make sure Ethernet cable is connected at Ethernet port with location COM3, not at standard Ethernet port. Now press “RUN” at HMI from Control center. At this time, create a new project in Simatic manager and scan for Ethernet devices


PLC
View
Options
Window
Help
Download... Ctrl+L
Upload...
Download Module Identification...
Upload Module Identification to PG...
Faulty Modules...
Module Information... Ctrl+D
Operating Mode... Ctrl+I
Clear/Reset...
Set Time of Day...
Monitor/Modify
Update Firmware...
Save Device Name to Memory Card...
Ethernet
PROFIBUS
Save Service Data...
Edit Ethernet Node
Verify Device Name...
Assign Device Name...
_PNIO
Ethernet(1): PROFINET-IO-System (100)
(1) ABCC-P
DP-NORM


Edit Ethernet Node
Ethernet node
Nodes accessible online
MAC address:
Browse...
Set IP configuration
Use IP parameters
Gateway
IP address:
Do not use router
Subnet mask:
Use router
Address:
Obtain IP address from a DHCP server
Identified by
Client ID
MAC address
Device name
Client ID:
Assign IP Configuration
Assign device name
Device name:
Assign Name
Reset to factory settings
Reset



Note: If you download demo program to HMI, Plug in ProfiNet IO module, connect Ethernet cable at COM3, then, if you scan Ethernet devices, HMI should be detected as shown above. If not detected, then, there might be some issue in HMI configuration or Ethernet cable not properly connected at Plug in Module (Location: COM3) or some issues with Simatic manager itself



Note: Please do not change Device name here. Other wise, communication will not work

If you Reset the slave, then, device name may become empty. In this case, you need to enter this manually