USER'S MANUAL

Profibus Option Card For Toshiba VF-S11 Inverter

Thank you for purchasing Profibus Option Card. This manual gives you a quick overview of the Profibus Option Card model. ***Read this manual thoroughly before installing and operating the unit.***

This document is based on information available at the time of it's publication and may not cover all the details or variations in hardware or software. Renu Electronics reserves the right to update information in this publication without prior notice.

Manual Revisions

If you contact us in reference to this manual, please include the following name and revision number
Name: Profibus User's Manual
Doc. No.: UMAN\GWY\1005
Rev. No.: 3.00B
Part Code: URML203

We hope that you find this manual informative. If additional information or technical assistance is needed please contact:

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Rev is changed from 1 to 2: Setup of profibus option card with Siemens Profibus Master is revised.

Rev is changed from 2 to 3: Setup of profibus option card with Gateway setup software is added & overall manual is revised.

Rev is changed from 3 to 3.00A: EMC-EMI standards are revised.

Rev is changed from 3.00A to 3.00B: system requirement for gateway setup software revised.

(i)

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Safety Precautions:

⚠️ **DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

➢ Apply appropriate personal protective equipment(PPE) and follow safe electrical work practices. Follow local Electrical Codes and Standards.
➢ Turn OFF all power before working on or inside equipment.
➢ Always use a properly rated voltage sensing device to confirm that power is OFF.
➢ Failure to follow these instruction will result in death or serious injuries.

1. OVERVIEW
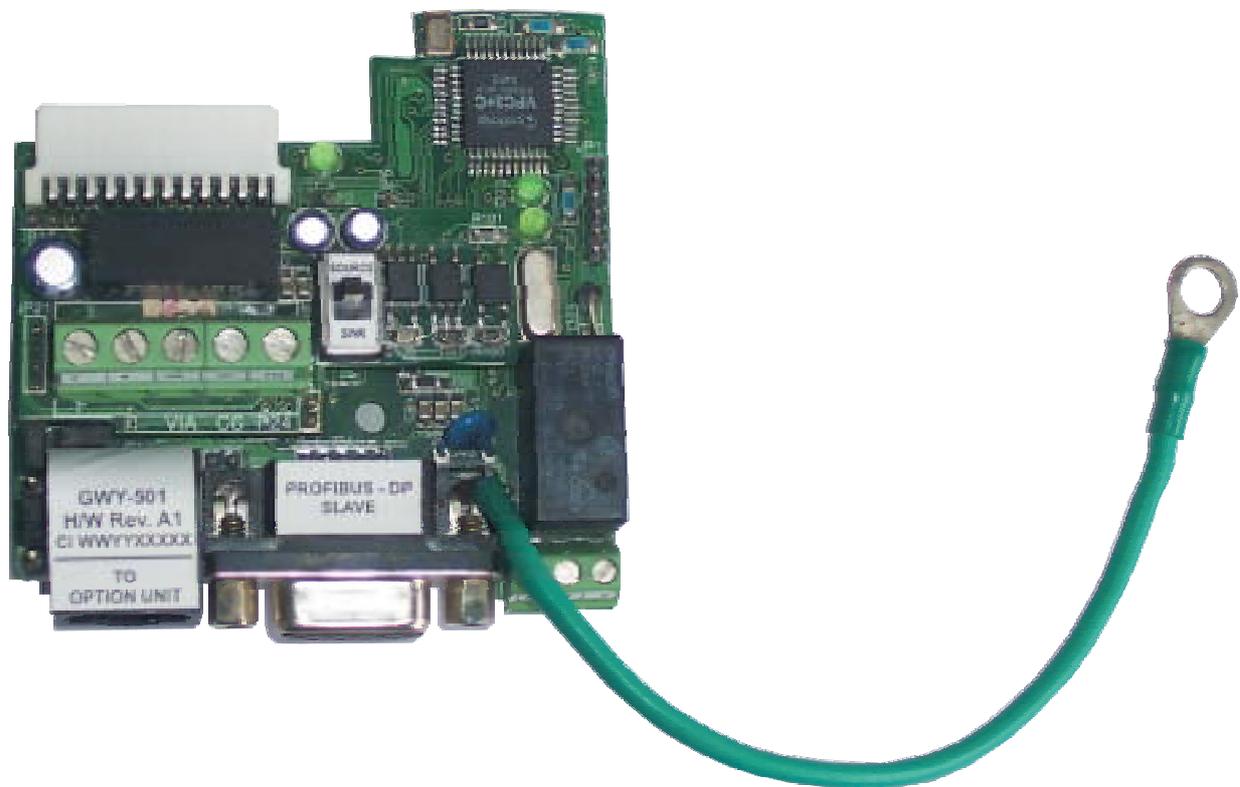
Profibus Option Card allows Toshiba VF-S11 Inverter to act as Profibus DP- Slave on Profibus network. It connects on a control PCB of VF-S11 Inverter using 24pin connector and provides Profibus DP- Slave port [9 pin D Sub] along with the standard serial communication port [8 Pin RJ45 for Option Unit], Contact Input (F, R), Analog Input (VIA) , 24 VDC Power supply and CC [5 Pin Terminal Block]. It also provides relay Output (FLA, FLB, FLC) that can be assigned as fault output [3 Pin Terminal Block].

This Option Card communicates with the VF-S11 Inverter (Control Card) and fetches various parameters and makes them available on Profibus DP- Slave port. Control actions such as, RUN/STOP, Frequency Direction (FORWARD/REVERSE), Frequency Command, Emergency Off, Reset etc. can also be issued by Profibus master PLC or any Profibus master Device to VF-S11 Inverter through Profibus Option Card.

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2. SPECIFICATIONS

2.1 Specifications

Power   : 24V , 100mA from VF-S11 Control Card.
LEDS   : 3 LEDs for status indication
Communication Ports   : 2 communication ports as
    COM1 : RJ-45 for Option Unit [TYPE-FORM : RKP001Z-0] Or
      for Project Download and Firmware Up gradation
      (Using CMOS-232-01-00, Renu Electronics Make)
    COM2 : 9 Pin D-Sub (2 wire RS485) Profibus – DP slave
      DPV0 (Cyclic Communication)
Profibus Baud Rate   : 9.6k, 19.2k, 45.45k, 93.75k, 187.5k, 500k, 1.5M, 3M,
      6M, 12M Bit/s (Autodetect)
GSD File   : Supplied in the Installable Software CD.

> **Note** : Once You install Gateway Setup Software, you will find GSD file at:
> "**C:\Program Files**\Gateway 3.11\GWY-500(Profibus Gateway)\GSD".
> This is the default path. The actual path is where the user has installed GatewaySetup Software.

**GSD File Name   : RENU0A0E.GSD
I/O data   : 100 Word Input, 100 Word Output
*Inverter Addresses   : 1 - 99
Operating Temperature   : $0^{O}C$ to $60^{O}C$
Storage temperature   : -20_{o} C to 80_{o}C
Humidity   : 10% to 90% (Non condensing)
Certifications   : CE
Immunity to ESD   : IEC61000-4-2
Immunity to Fast Transients : IEC61000-4-4
Immunity to Radiated RF   : IEC61000-4-3
Immunity to CF   : IEC61000-4-6
Surge   : IEC61000-4-5
Radiated emission   : EN61000-6-4

Isolation between communication ports and Power supply, throughDC-DC coupler is 1 KV. Isolation between communication ports (Option Port and Profibus Port), through opto-isolation is 1KVfor 1 min.

***Note 1:** Inverter ID should be unique, when there are multiple inverters connected in the network.*

****Note 2** : Previously the model name in GSD file was GWY-500-B. Now it is changed to **GWY-XXXXX** to support all the products having Profibus port.*

2.2 S11 Inverter settings required for option card

The following is a list of the parameter settings that are required during setup to enable Profibus communications:

Parameter	Parameter Name	Required Value
F800	Baud rate of S11 Inverter	3
F801	Parity Bit	1
F802	S11 Inverter address	1

If drive control (frequency command input, RUN/STOP, etc.) is to be performed via the Profibus network, the following drive parameters must also be set as shown:

Parameter	Required Value
Fnod	4
Cnod	1

As is the same with all other communication configuration parameters, the drive must be reset after making the parameter changes described above in order for the changed settings to be enabled.

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2.3   Port Details

Profibus - DP Slave

A(+) DATA

+5VDC*
Supply voltage for terminator resistance)

DATA Ground
RTS (TTL Direction Control for repeaters)
B (+) Data Line
Shield / Functional Ground

DB9 Female
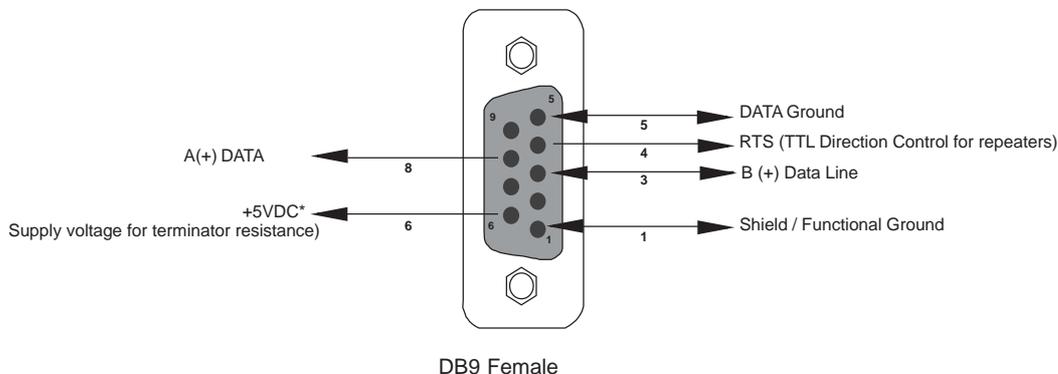
Data Line: The Profibus user group recommends the following colour coding for the data signal lines:

A-Data Line = Green   B-Data Line = Red

These data signal lines must be connected to the corresponding signal terminals or pins at the master unit and other stations (i.e.A to A, B to B).

RTS: The signal RTS (TTL signal relative to Data Ground) is meant for the direction control of repeaters in case repeaters without self control capability are used.

+5V DC, Data Ground: The signals +5V DC and Data Ground are meant to power an externally mounted bus terminator.

The powering of the 220 © termination resistor ensures a defined idle state potential on the data lines. To ensure proper functioning up to the highest baud rate, each bus segment has to be terminated at both ends of the cable.

+5V DC

300 Ohm

B - Data Line

220 Ohm

A - Data Line

300 Ohm

Data Ground
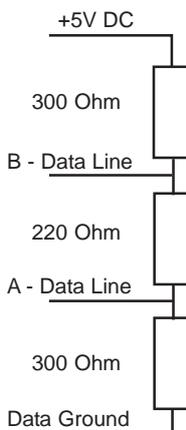
3.   OPERATION

3.1   Operation of profibus option card

At Power-ON Option card does not have the S11 Inverter station address and also does not have Profibus slave address in order to communicate on Profibus network. So, it starts scanning node connected on Serial (S11) port. For this, option card sends read request to S11 Inverter starting from station address **01 up to 99***.
S11 Inverter connected to Serial (S11) port responds when it receive query with its own station address. Normally, option card requires less than 5 seconds to discover the node connected on its controller port. Time require to discover the node is less if S11 Inverter station address is small (e.g. 01,02,03 etc.). Time require to discover the node is more (maximum 5 seconds) if S11 Inverter station address is big (e.g. 99). Once S11 Inverter is discovered by Option card, S11 Inverter station address of S11 Inverter is assigned as profibus slave station address.

Data execution is started after successful initialization of profibus.
When profibus option card detects that profibus master is not present it stops the data exchange & continuously waits for it.
When profibus option card detects that profibus master is connected the communication is resumed.

If user connects Toshiba Option Unit (eg. TYPE-FORM: RKP001Z-0) to standard serial communication port [8 Pin RJ45] while Profibus slave port is active, Processor on Option Card detects the Option Unit (Using CD line) and stop Profibus communication and allows Option Unit to communicate with the VFS11 Inverter. As soon as the Option unit is removed, Profibus communication is restored again.

* *Note:* We support 16-bit ASCII protocol for Toshiba VF-S11 so the range for station addresses is 1 to 99.

3.2   LED Indication

On Profibus option card, there are 3 LED's.
One is for S11 Inverter indication, second one is for OK indication and the third one is for Profibus indication.

S11 Inverter indication LED

OK LED
Profibus indication LED
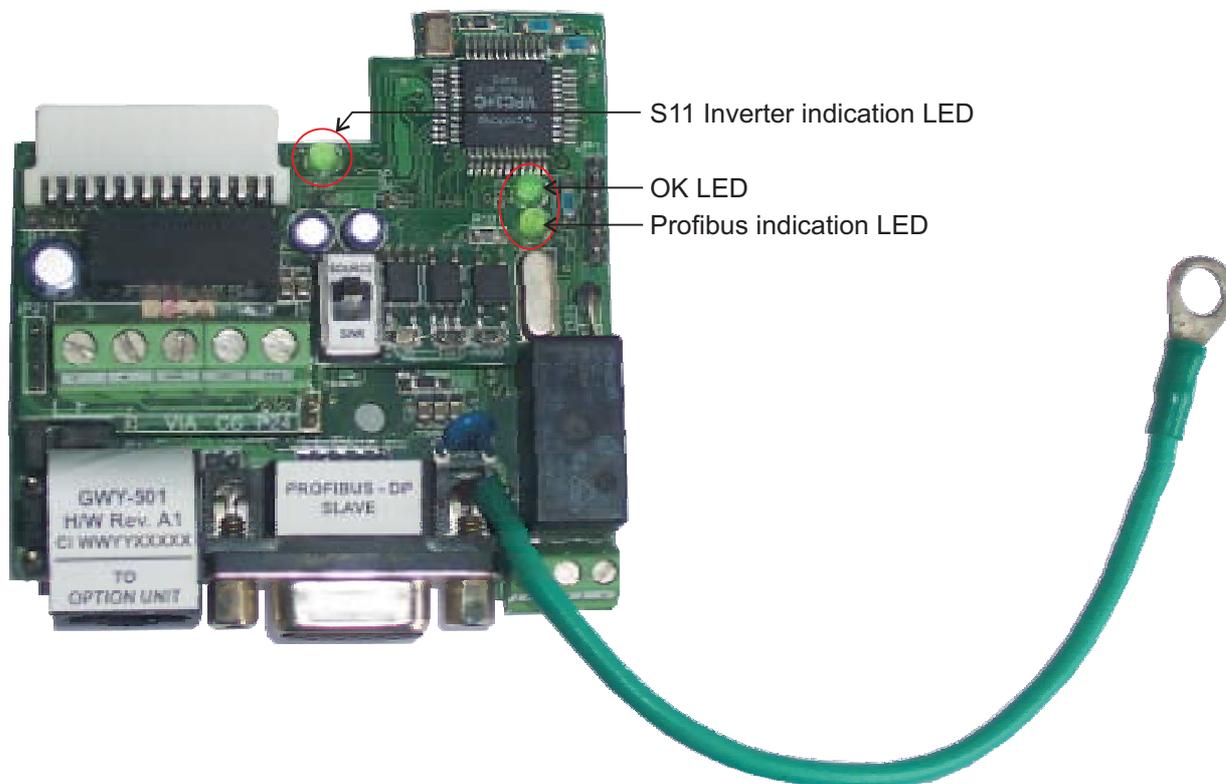
At power on , OK LED is steady ON for approximately 5 seconds. Here it sends requests to S11 Inverter.

If S11 Inverter is not detected , OK LED blinks for 10 seconds and again steady for approximately 5 seconds as Profibus Option card sends requests to S11 Inverter.

This process is continued until S11 Inverter is detected.

If S11 Inverter is detected, Profibus port is initialised.

After successful Profibus initialisation, Profibus Option Card starts executing the project blocks.

At this point , Ok LED is steady ON. S11 and Profibus LED are blinking.

Now , if the Profibus Option card detects that Profibus master is not present then it stops the block execution and continuously waits for Profibus Master.

At this time OK LED is steady on and S11 and Profibus LEDs are off.

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3.3   Gateway Project Window:

For monitoring and controlling the parameters of VF-S11 Inverter you have to download the project through Gateway Setup software.

The Gateway project is as follows-

Block No.	# Words/Bits	Source PLC	Source ID	Source Add	Destination PLC	Destination ID	Destination Addr	Repeat...	Comment
1	01	Toshiba ASDs	1	FD00	Profibus-DPV0	1	I000	1	Output Frequency
2	01	Toshiba ASDs	1	FE30	Profibus-DPV0	1	I001	1	Output Power
3	01	Toshiba ASDs	1	0009	Profibus-DPV0	1	I002	1	Acceleration time 1 monitor
4	01	Toshiba ASDs	1	0010	Profibus-DPV0	1	I003	1	Deceleration time 1 monitor
5	01	Toshiba ASDs	1	FE05	Profibus-DPV0	1	I004	1	Voltage
6	01	Toshiba ASDs	1	FE03	Profibus-DPV0	1	I005	1	Current
7	01	Profibus-DPV0	1	O000	Toshiba ASDs	1	FA01	1	Command Frequency
8	01	Profibus-DPV0	1	O001	Toshiba ASDs	1	FA0R	1	Run/Stop
9	01	Profibus-DPV0	1	O002	Toshiba ASDs	1	0009	1	Acceleration time 1 setting
10	01	Profibus-DPV0	1	O003	Toshiba ASDs	1	0010	1	Deceleration time 1 setting
11	01	Profibus-DPV0	1	O004	Toshiba ASDs	1	FA0D	1	Direction

Using Profibus Option Card You can monitor and control following parameters but not limited to

Monitoring Parameters:

Inverter Parameter	Profibus Input Dataword
Output Frequency	I000
Output Power	I001
Acceleration Time1 Monitoring	I002
Decelaration Time1 Monitoring	I003
Output Voltage	I004
Output Current	I005

Controlling Parameters:

Inverter Parameter	Profibus Output Dataword
Command Frequency	O000
Run / Stop	O001
Accelaration Time1 Setting	O002
Decelaration Time1 Setting	O003
Frequency Direction	O004

Note: Using Gateway Configurator User can add, map and download required parameters into Option Card.

I000 represents the first word of the Input Area and accordingly the remaining.
O000 represents the first word of the Output Area and accordingly the remaining.

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3.4   How to upgrade the firmware and Download the project?

For upgrading the firmware and downloading the project You need
1. Gateway Setup Software

System Requirement for Gateway setup software are:

|	
Windows Version:	Microsoft Windows XP / 2000, Windows 7 / VISTA (32/64 bits)
Processor:	PENTIUM or higher
Hard disk Space:	5 MB or more
Serial Mouse:	Required
RAM:	64 MB or more
Display resolution:	800 X 600 (VGA) or better
Display colors:	16 bit color

2. CMOS-232-01-00 cable
3. VF-S11 Inverter
4 Pofibus Option Card

Procedure:

1. Connect short link between 2 And 3 of JP13 and Jp14.
2. Remove short link on JP15 as per following picture.
3. Connect CMOS-232-01-00 cable between COM port of PC and Option port of Profibus Option Card.
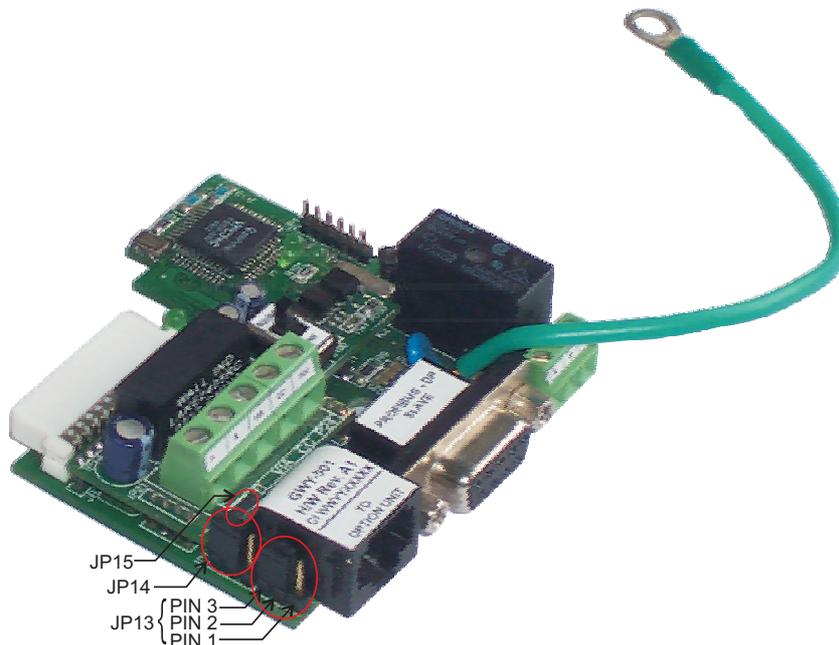
You can download the firmware and project with Gateway Setup software.

NOTE: At runtime, connect short link between 1 and 2 of JP13 and JP14. Also connect the short link on JP15 as per following picture.

At Run Time:

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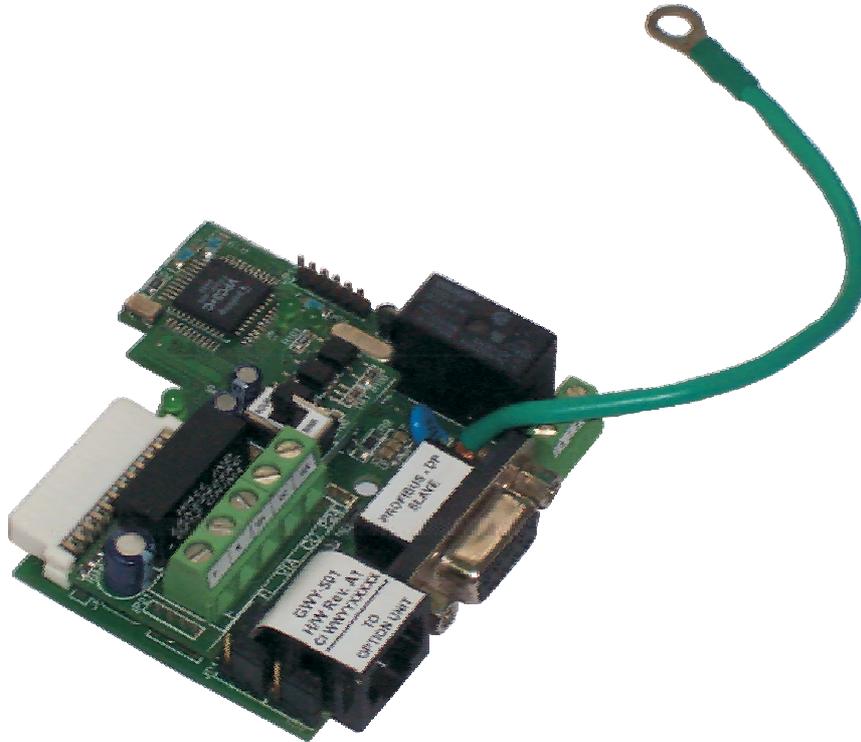
3.3 Configuration and Setup of Profibus Option Card

3.3.1 Configuration of Profibus Option Card with Gateway Setup Software:

1. Go to the Gateway 3.11 Software
2. Select the GWY-500 (Profibus Gateway)
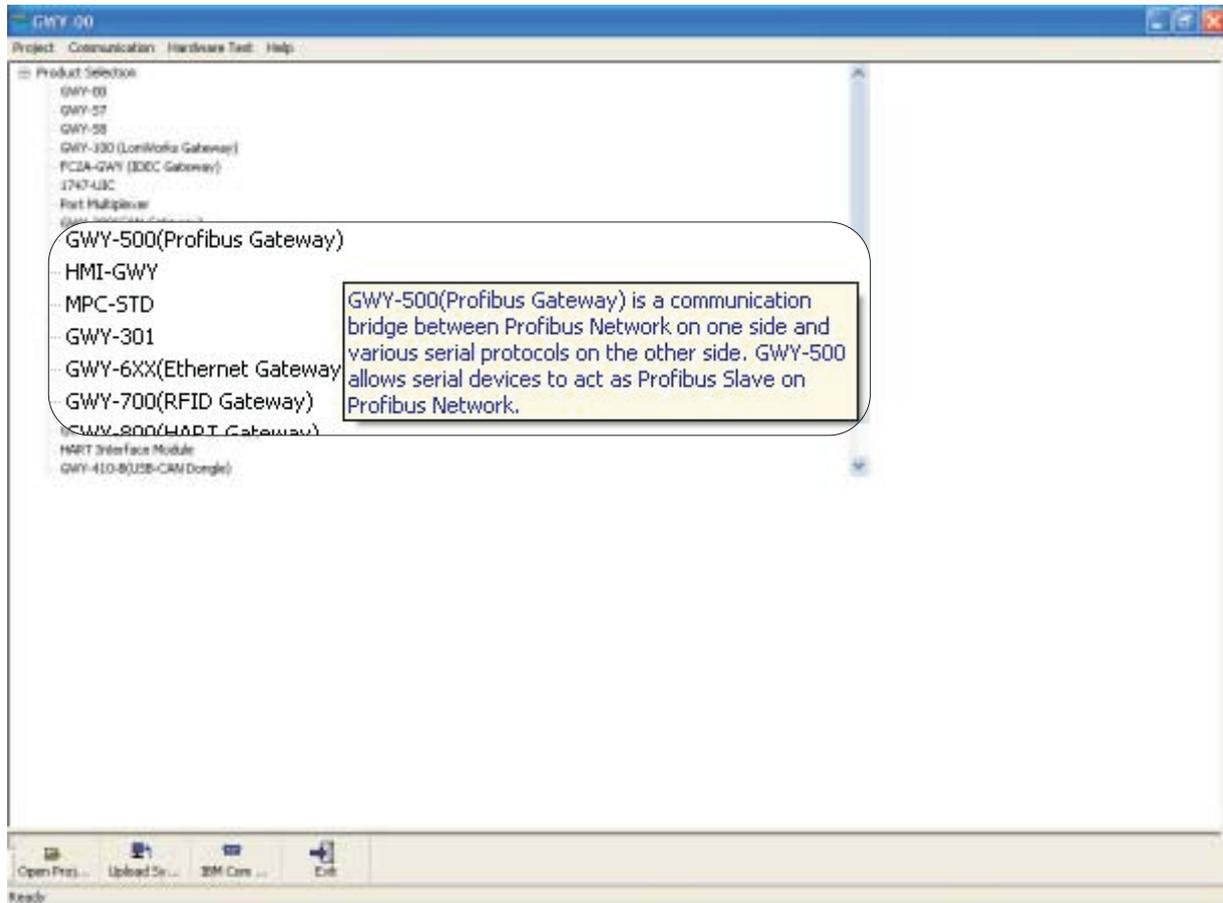
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3.   Selection of Com1 protocol and Com2 protocol.
        Com1 ⟶ Toshiba ASDs ⟶ Option Card &
        Com2 ⟶ Profibus ⟶ DPV0-Slave.

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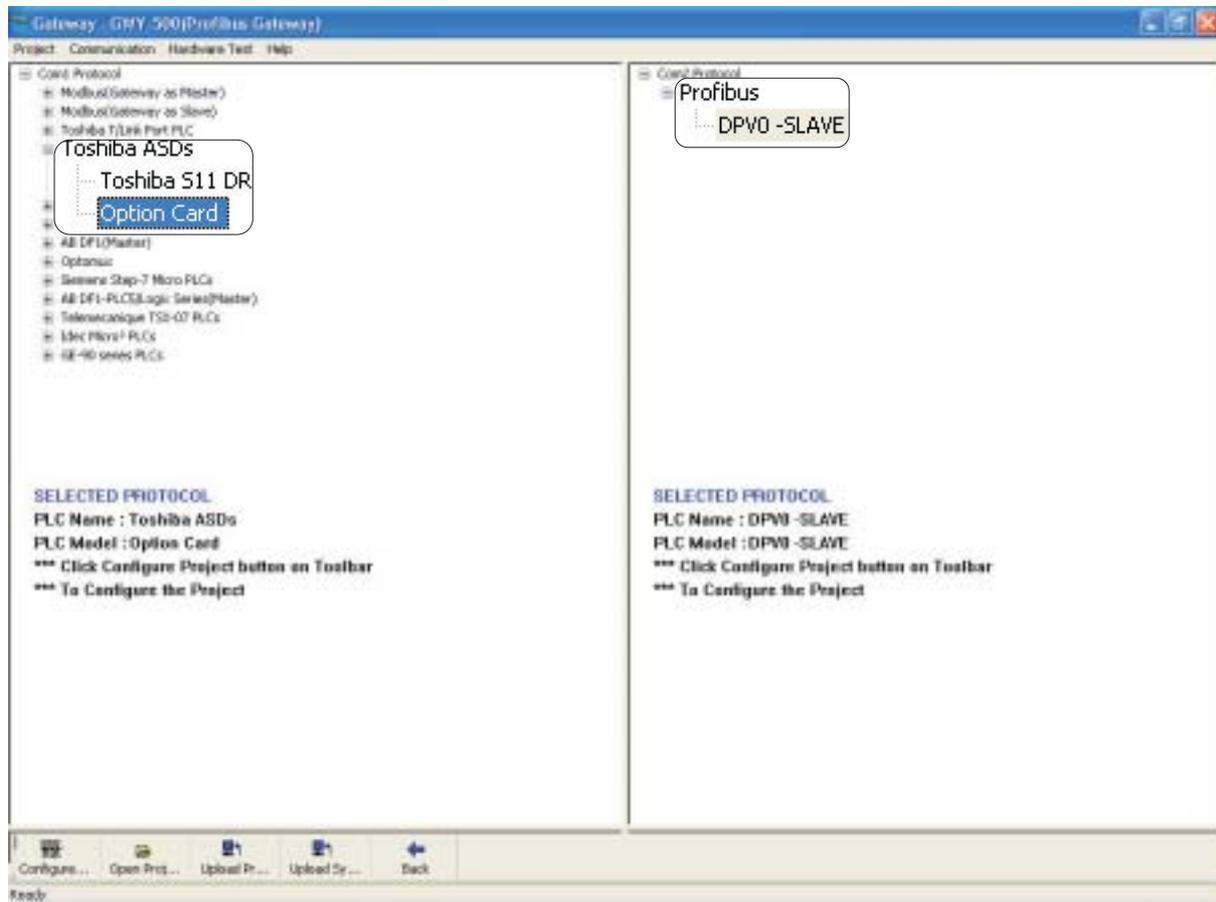
4.   Now say configure & then you get a window shown below

5.   Create a project in it.
   a) If you want to read data from Toshiba ASD then you have to select source PLC and Destination PLC as selected in Row1 or Block1 &
   b) If you want to read data from Profibus then you have to select source PLC and Destination PLC as selected in Row7 or Block7 and it goes on cyclic order.

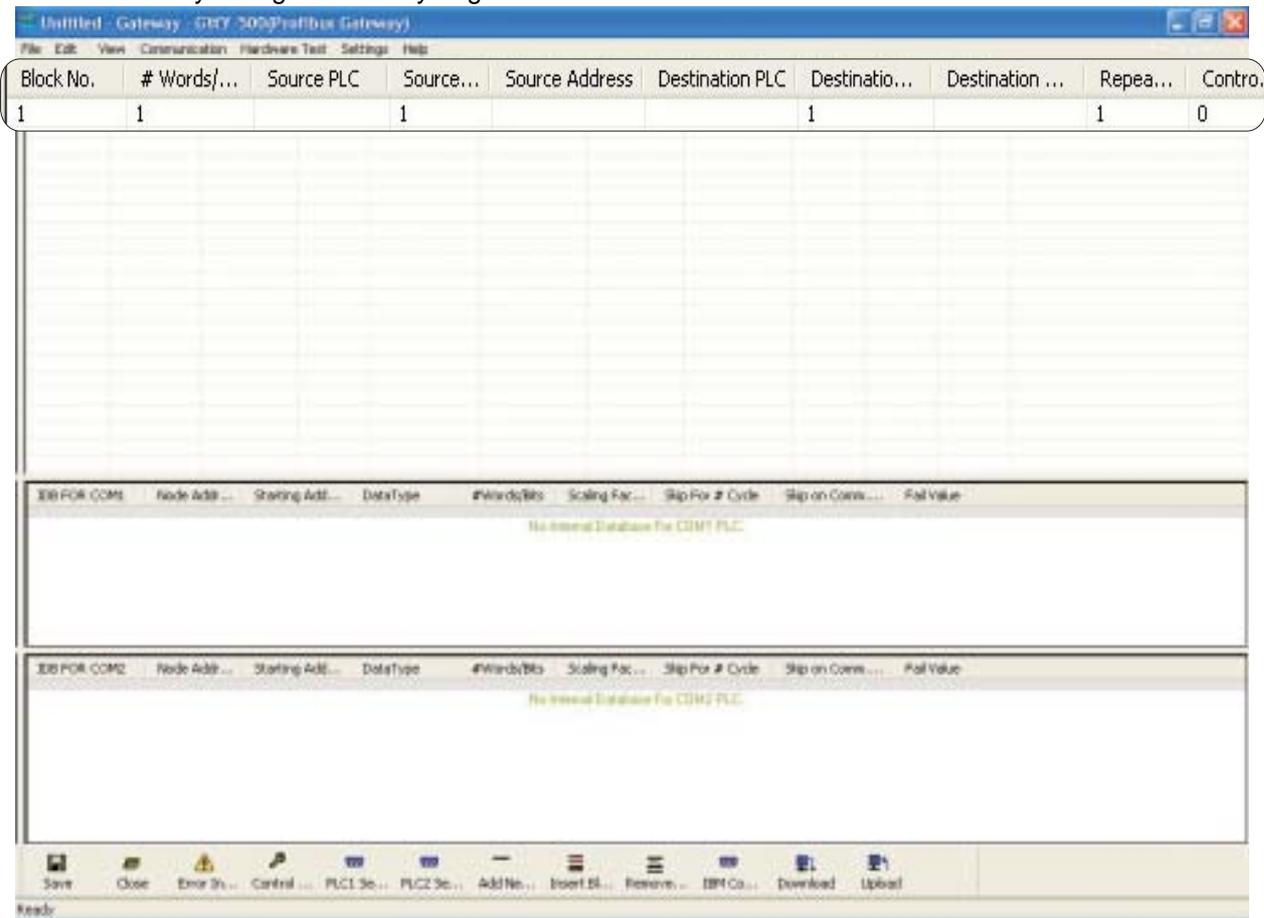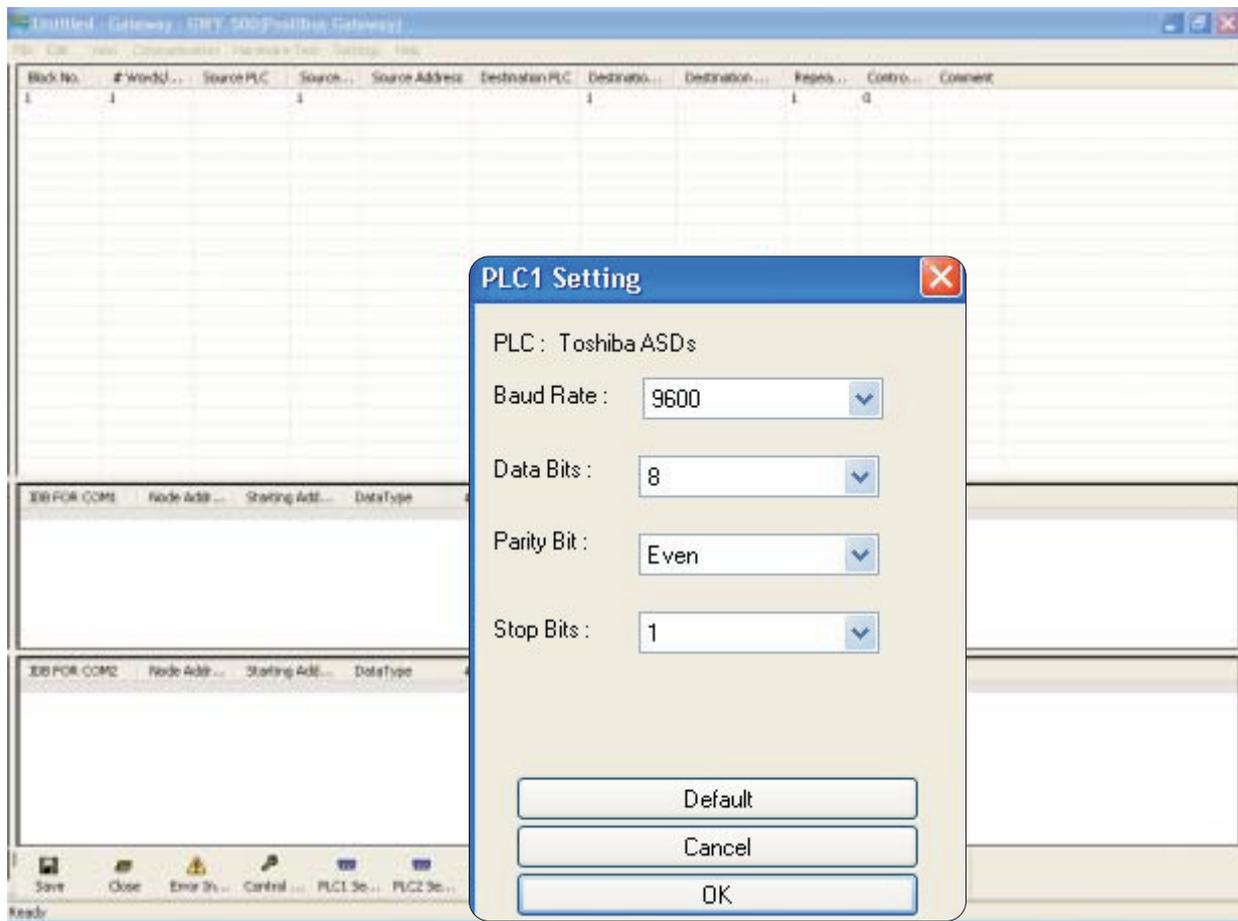| Block No.	# Words/Bits	Source PLC	Source ID	Source Add	Destination PLC	Destination ID	Destination Addr	Repeat...	Comment
1	01	Toshiba ASDs	1	FD00	Profibus-DPV0	1	I000	1	Output Frequency
2	01	Toshiba ASDs	1	FE30	Profibus-DPV0	1	I001	1	Output Power
3	01	Toshiba ASDs	1	0009	Profibus-DPV0	1	I002	1	Acceleration time 1 monitor
4	01	Toshiba ASDs	1	0010	Profibus-DPV0	1	I003	1	Deceleration time 1 monitor
5	01	Toshiba ASDs	1	FE05	Profibus-DPV0	1	I004	1	Voltage
6	01	Toshiba ASDs	1	FE03	Profibus-DPV0	1	I005	1	Current
7	01	Profibus-DPV0	1	O000	Toshiba ASDs	1	FA01	1	Command Frequency
8	01	Profibus-DPV0	1	O001	Toshiba ASDs	1	FA0R	1	Run/Stop
9	01	Profibus-DPV0	1	O002	Toshiba ASDs	1	0009	1	Acceleration time 1 setting
10	01	Profibus-DPV0	1	O003	Toshiba ASDs	1	0010	1	Deceleration time 1 setting
11	01	Profibus-DPV0	1	O004	Toshiba ASDs	1	FA0D	1	Direction

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6.   By Selecting PLC1 settings you can select the S11 Inverter settings.

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7.   The Profibus Slave Station no. is not assign from PLC2 settings.
       It is assign at power ON stage, which is specified in section 3.1, Address of profibus Slave.
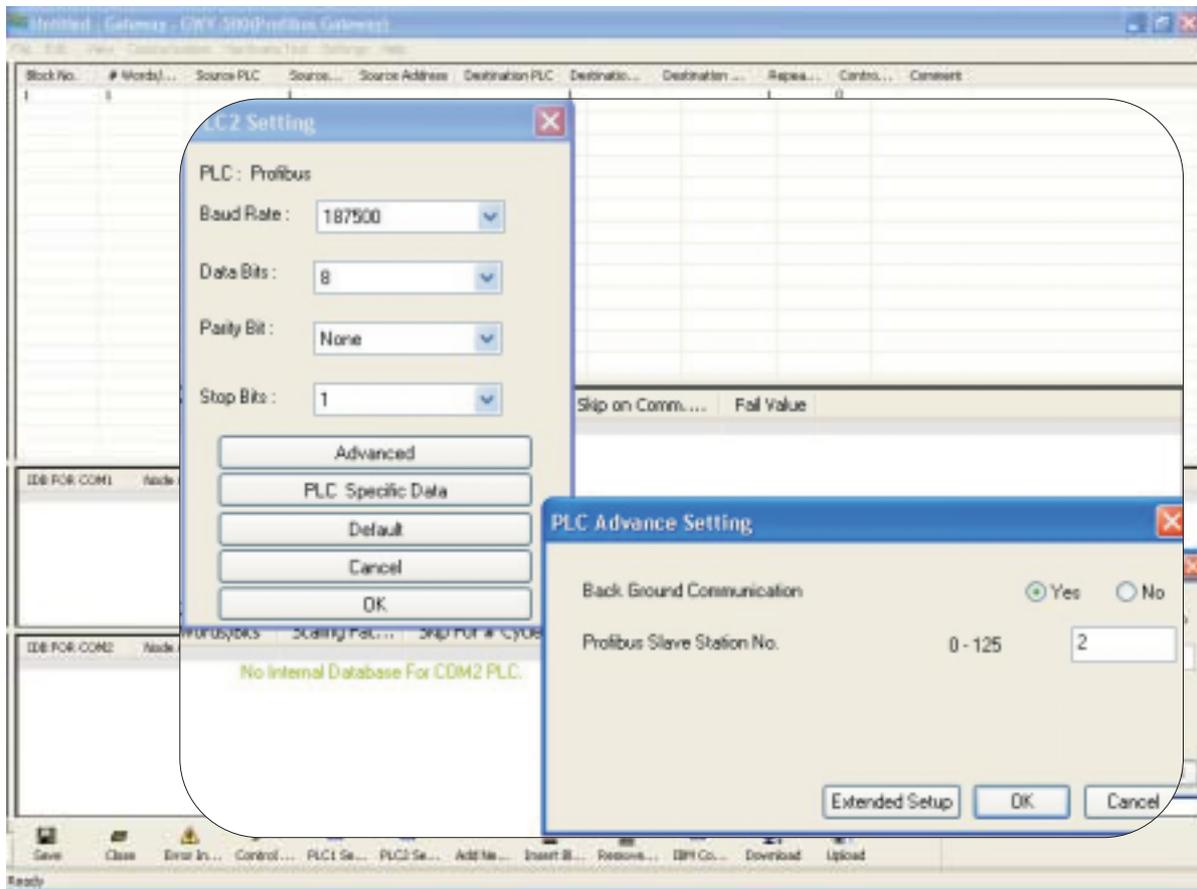
8.   Now save the project and say download.
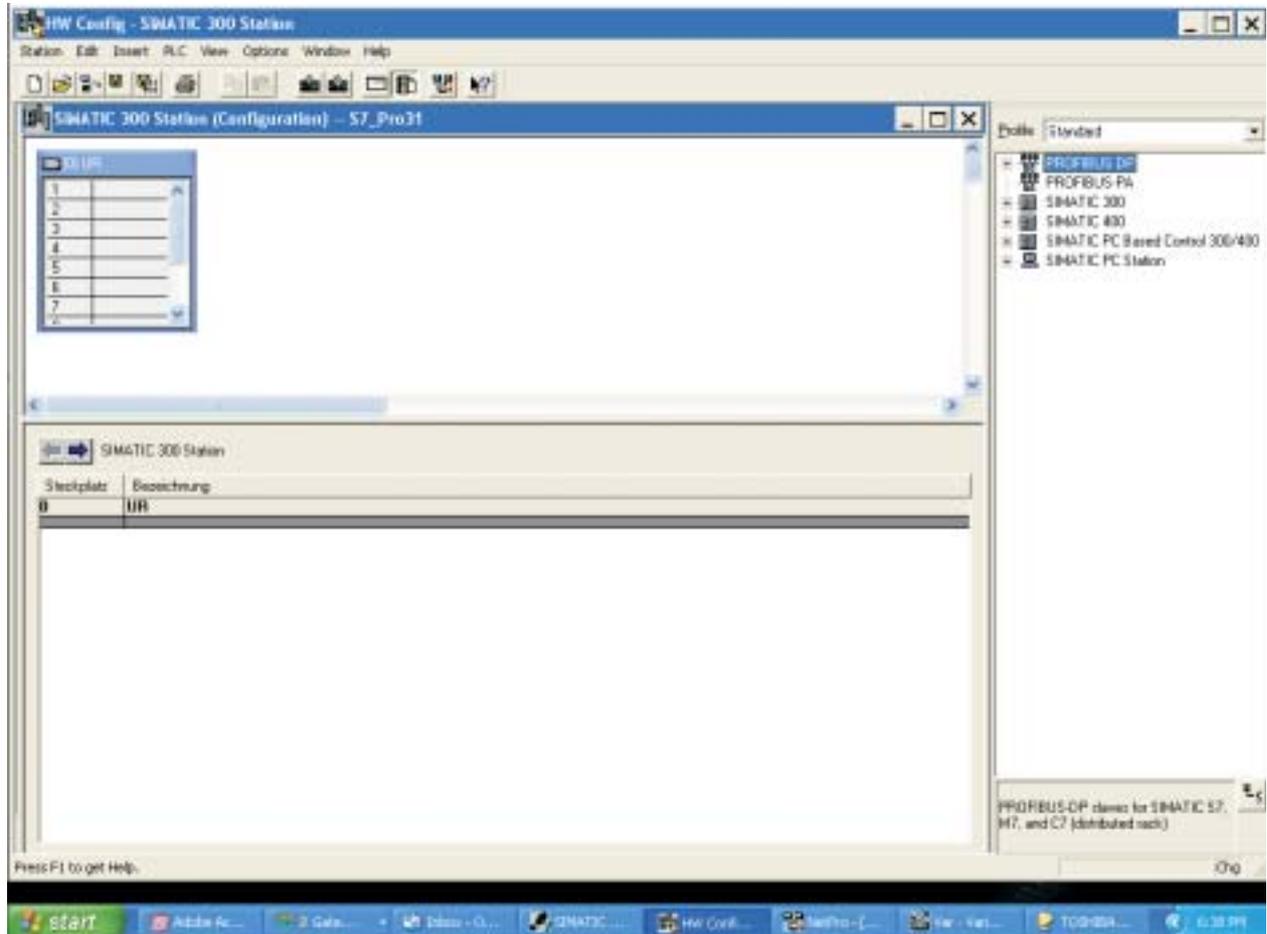
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3.3.2   Setup of Profibus Option Card with Siemens Profibus Master:

01.   Open A Simatic Manager
- ➢ You are getting a window with a name [Step 7 wizard:" New Project"]
- ➢ Click on "Next".
- ➢ Now select proper CPU & MPI add and then click on "Next".
- ➢ Again click "Next"
- ➢ Now if you want to change project name, you can change otherwise remains as it is and then click on "Finish"
- ➢ You are getting a window with lots of options,

        Like -> Simatic 300 station
               -> CPU 315-2 DP (1) [Name of selected CPU].
               -> S7 Program etc..

- ➢ Now click on Simatic 300 station.
- ➢ Now double click on "Hardware".

02.   Now you are getting a window with a name,
Simatic 300 configuration_S7_Pro_31.
S7_Pro_31? Name of a file.

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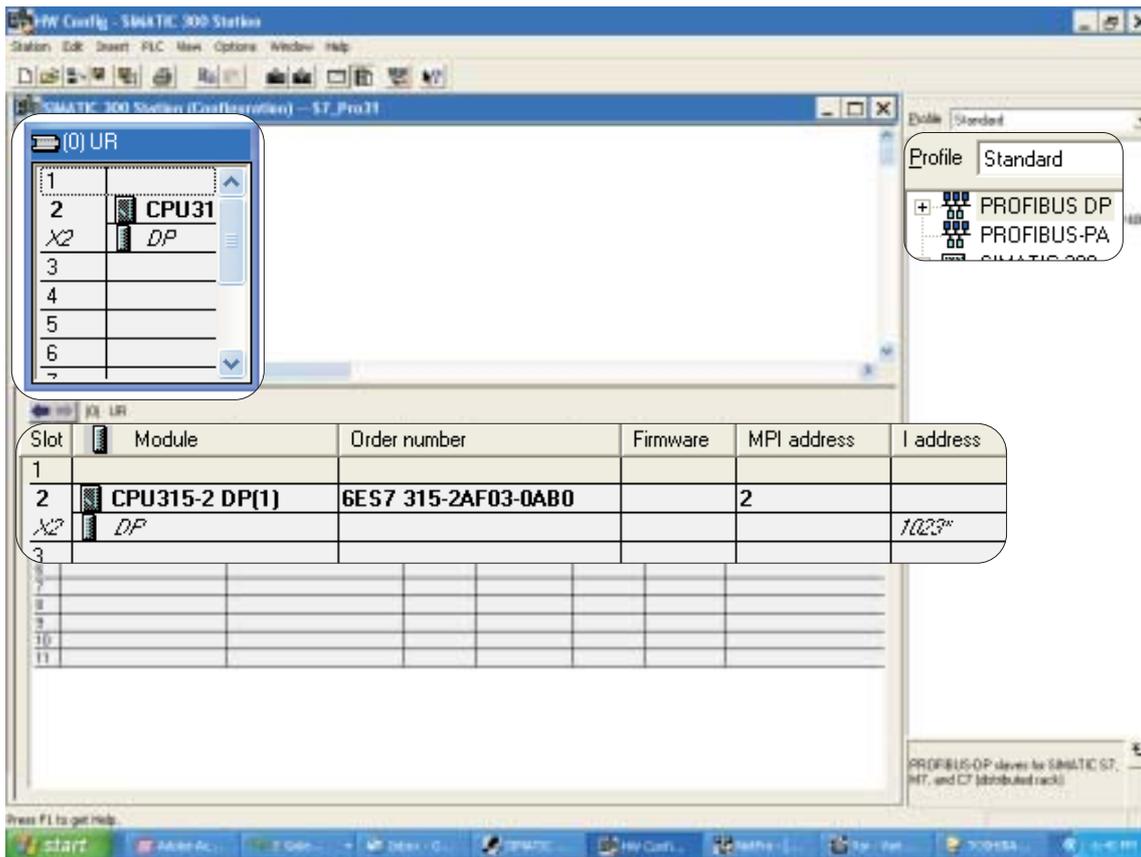
03. Then delete the CPU no. which is present in a window (0) UR comes under Simatic 300-configuration window.

04. You will see a window shown below.

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05.   Now install GSD file
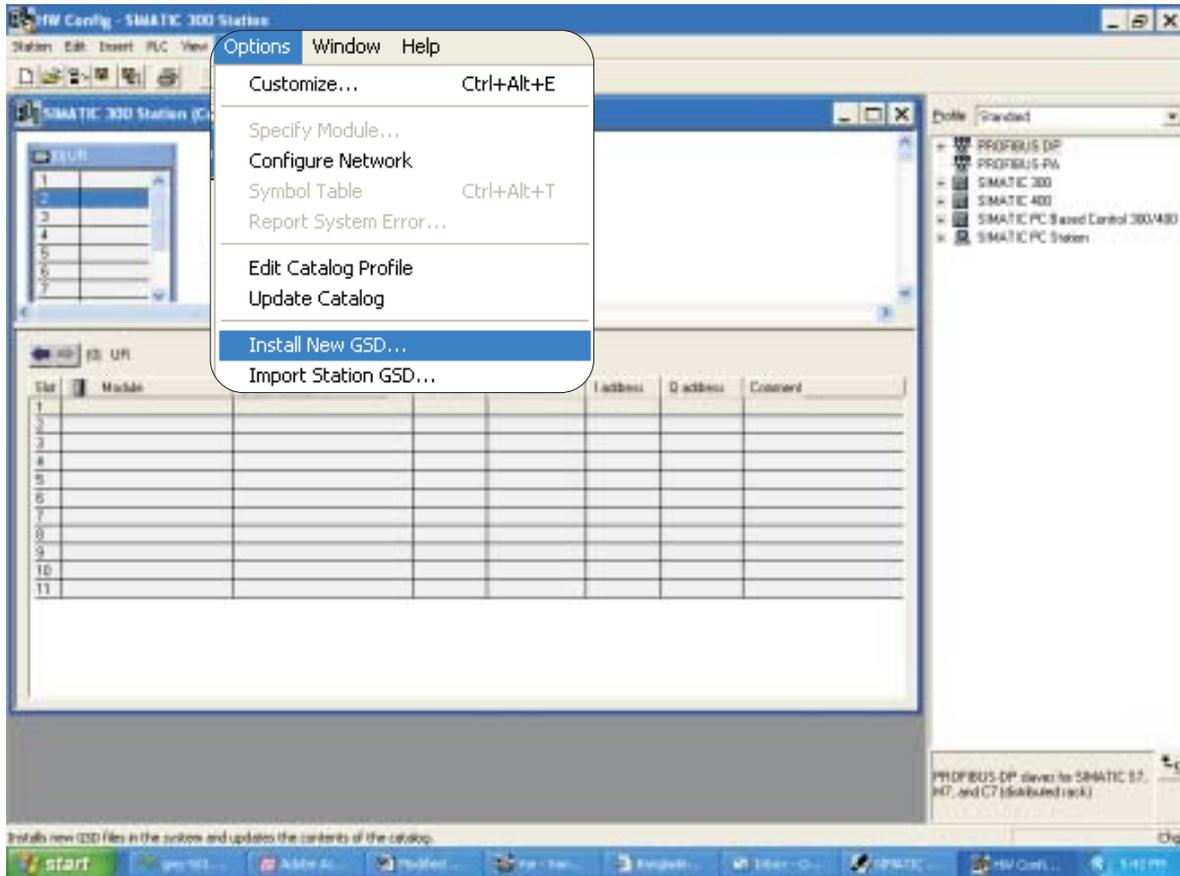
Path of GSD file:

"C:\Program Files\Gateway 3.11\GWY-500 (Profibus Gateway)\GSD".
This is the default path. The actual path is where the user has installed Gateway Setup Software.

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06.   Now drag proper CPU (Siemens CPU) from Hardware Catalog Window to Hardware configuration window.

Parameter Setting⎯⎯→ Network Setting…
                01.   Transmission Rate – e.g. 12 Mbps.
                02.   Profile – DP

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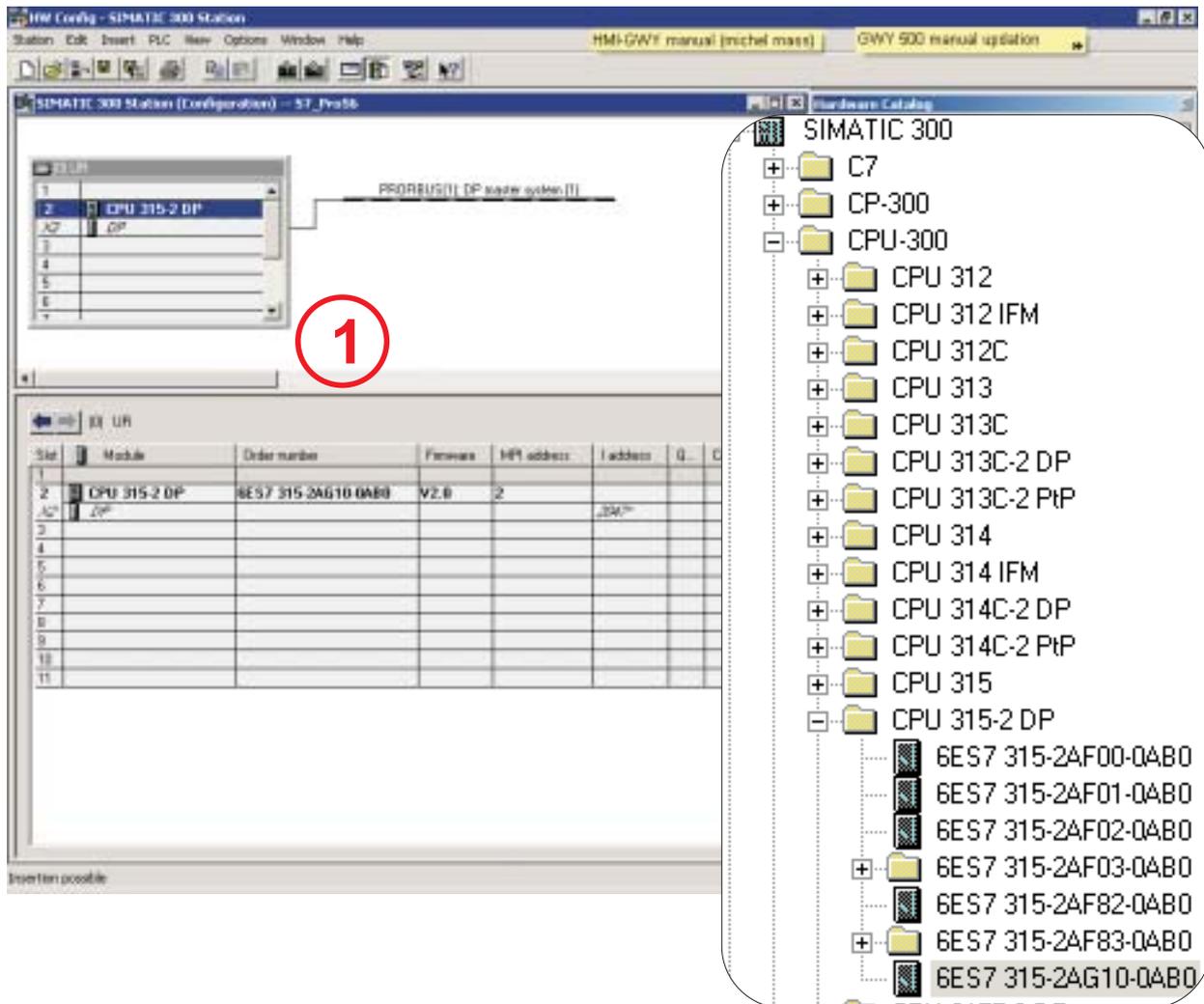
1

Slot		Module	Order number	Firmware	MPI address	I addre
1						
2		CPU 315-2 DP	6ES7 315-2AG10-0AB0	V2.0	2	
X2		DP				2047*
3						

07.   Now drag GWY-xxx from Hardware Catalog Window to HW configure Window.
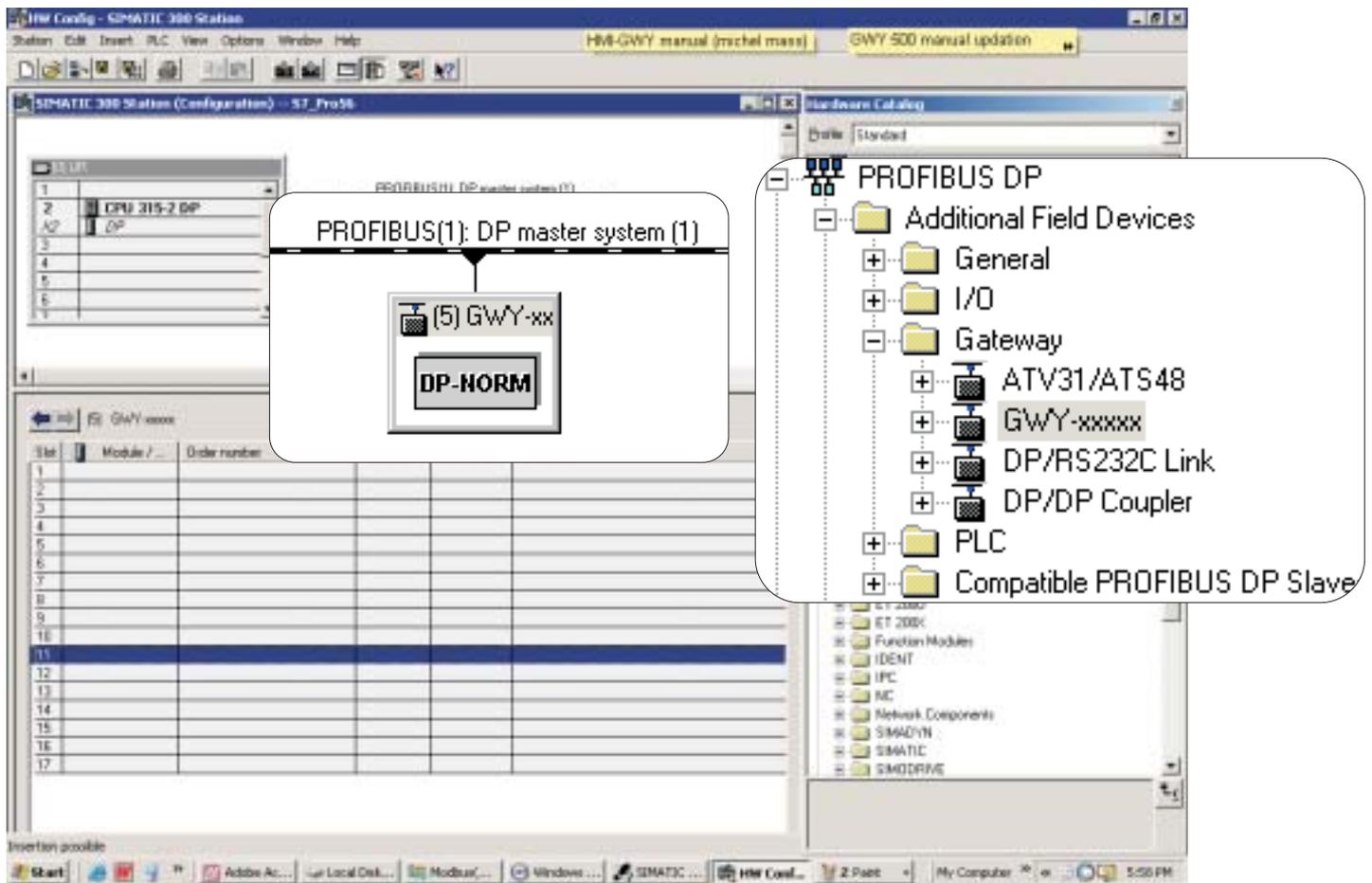
Give a proper address to profibus, which should be in between 0-125 because Siemens PLC range is 0-125 whereas VF-S11 Toshiba Inverter range is 0-255.

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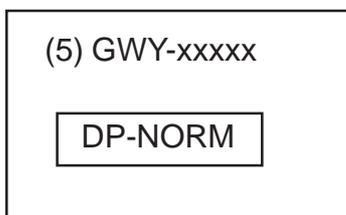Survey No. 2/6, Baner Road, Pune – 411 045
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08.   Then go to,
        Option ———>Configure Network.
        You are getting a window with a name Netpro S7_pro_31.
        S7_Pro_31———>Name of a file.
        (If Catalog window not appears on screen the click a button that is present at the left side of
exclamation mark.)

09.   Now drag GWY-xxx from Hardware Catalog to Netpro window.
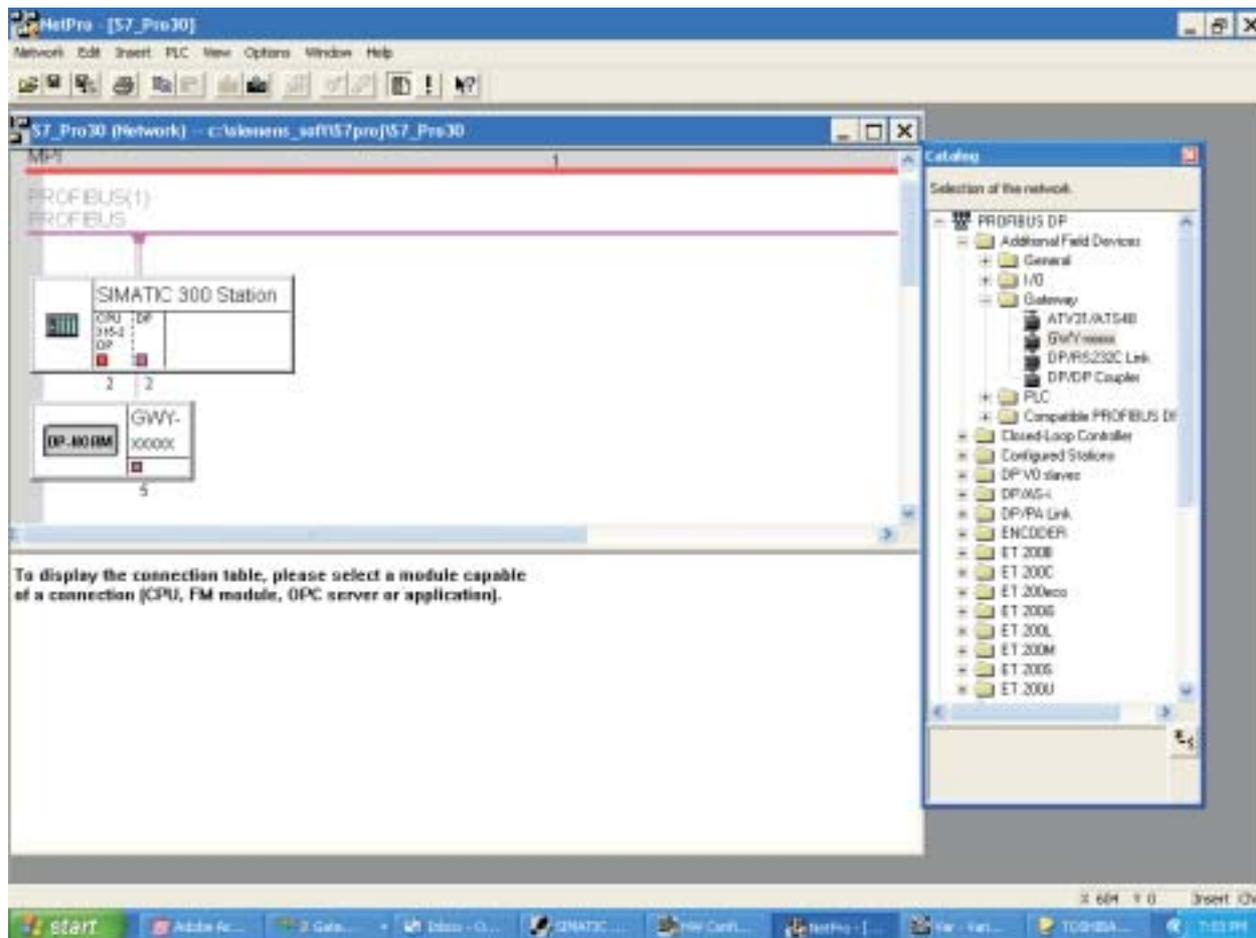
10.   Click on   GWY-xxxx which is shown below,

You are getting a table, which is related, with GWY-xxxx. You have to do a program in it.

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Important Note:
A slot has to be filling up from slot no.1. You can't leave blank slot in between.

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11.   After completion of program, download that program to PLC (Siemens PLC).

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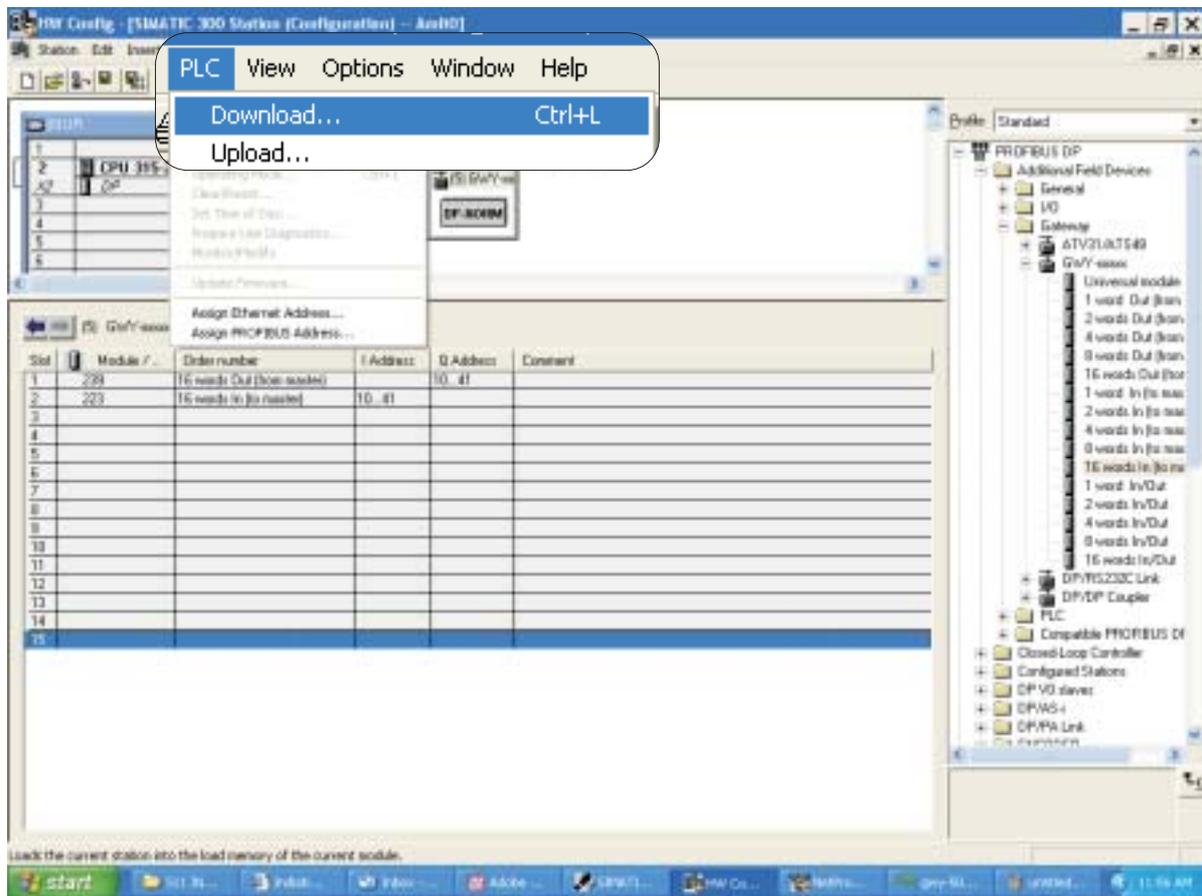
12. After downloading project to PLC,
     Go to,
     Simatic Manager Window ——→ PLC ——→Display Accessible Node.

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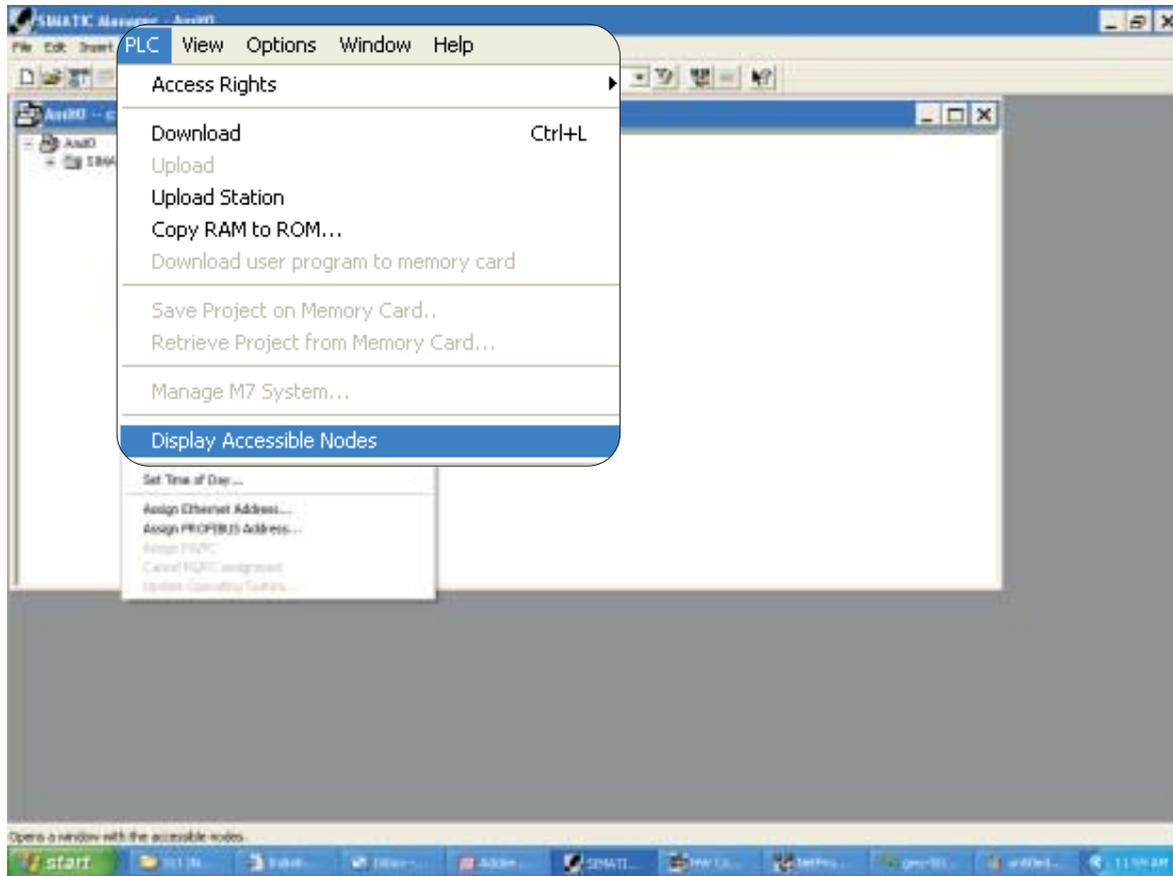
13.   Then,
        Go to,
        PLC⟶Monitor/Modify Variables.
        Before it 1st MPI=2 and the click on PLC. You get a window, whose name is,
        Var_Variable_Table1/2/3
        Table1/2/3⟶Name of a table.
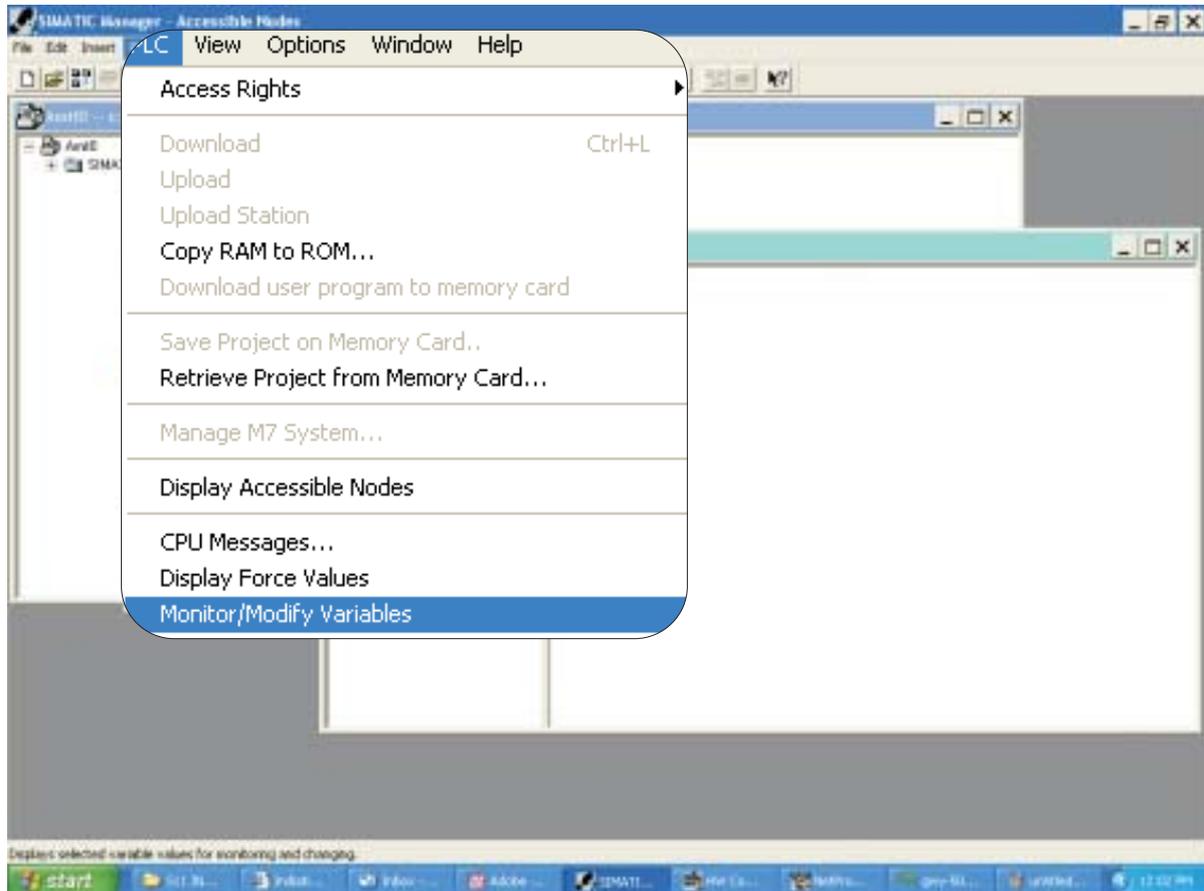
14.   Give the proper Input word (IW) and Output word (OW) addresses which corresponds to the program created in GWY software and program created for Profibus.

Just observe the three windows, which are shown below. From these three windows you will easily find out how a program is done and what is relation of being this three windows together.

15.   After this communication should takes place in between PLC and Toshiba inverter via Profibus Option Card.

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3.3.3 Setup of Profibus Option Card with Omron Profibus Master:

For Profibus communication, user needs the software Cx-Profibus. You need to enter the password as "password" (default), you can also change that.

The steps for configuration of Profibus network are as follows

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2   Then user should form the network that consists of master and slave module.
        Select the module - Add Device to the network

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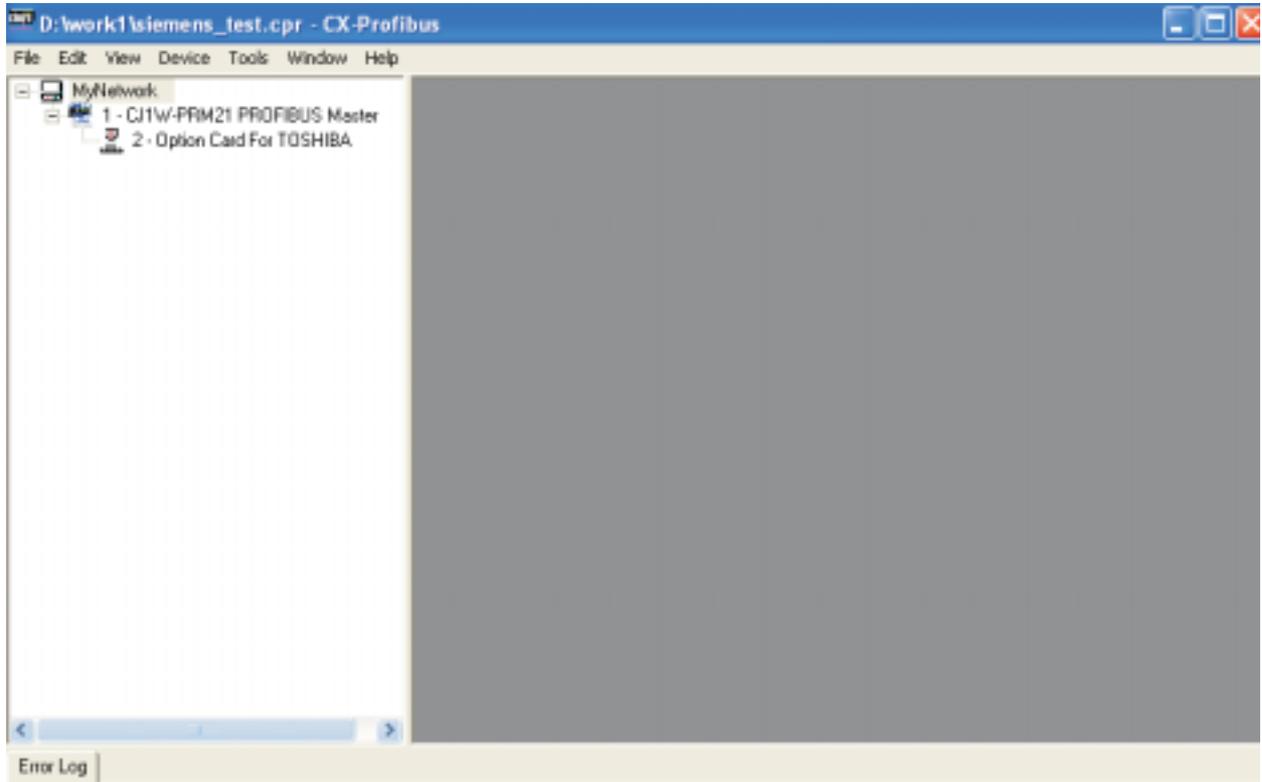
3   Profibus slave module is configured.
(a)   In Configuration tab, configure the Input and Output modules.
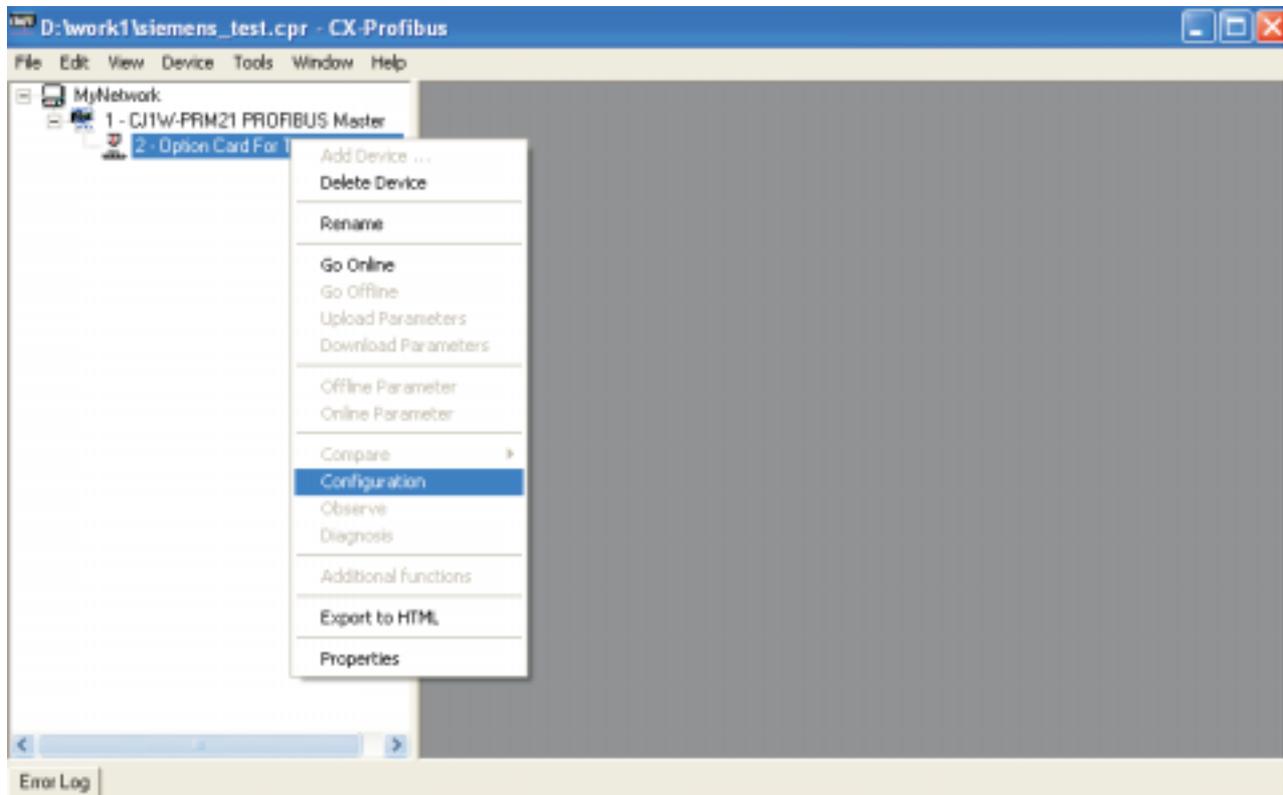
(b)   In Parameter tab, keep it to common.
(c)   In Group tab, assign the group for the slave, for global commands.

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4   Profibus master module is configured next

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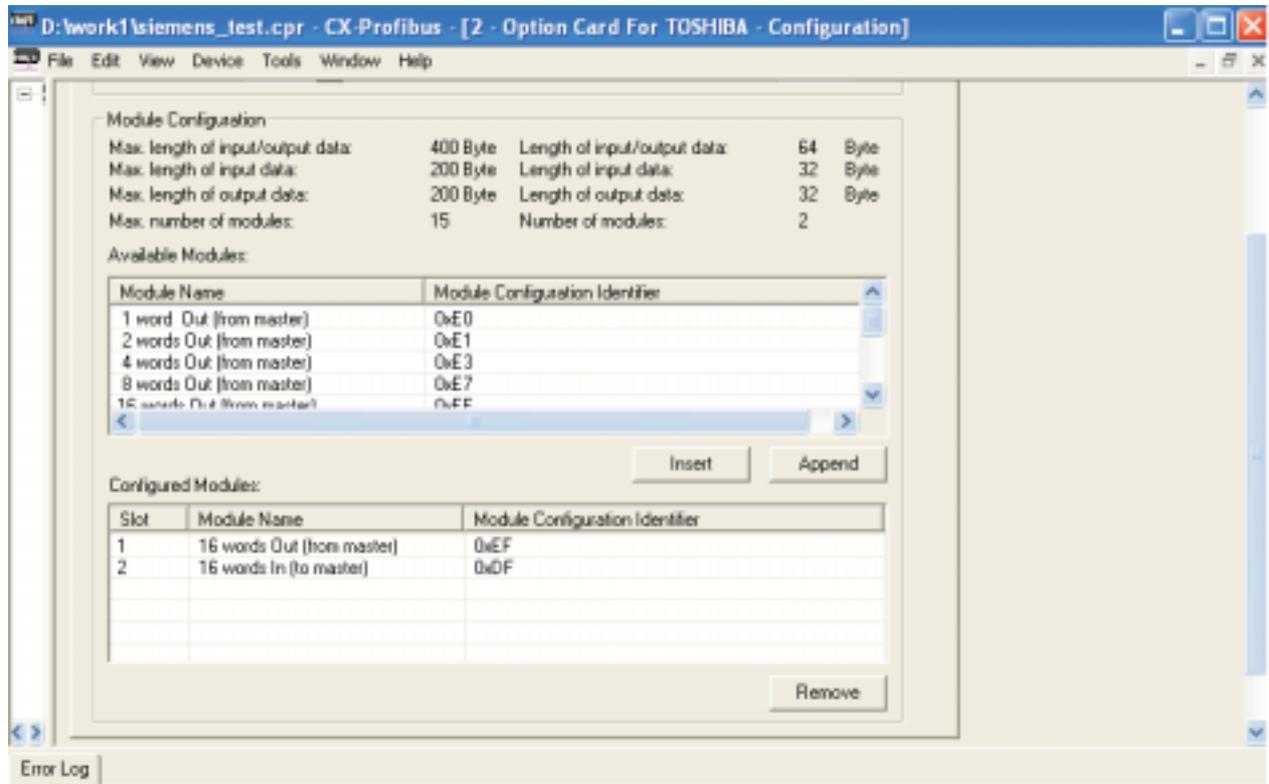
- Configuration should be done as shown in images.

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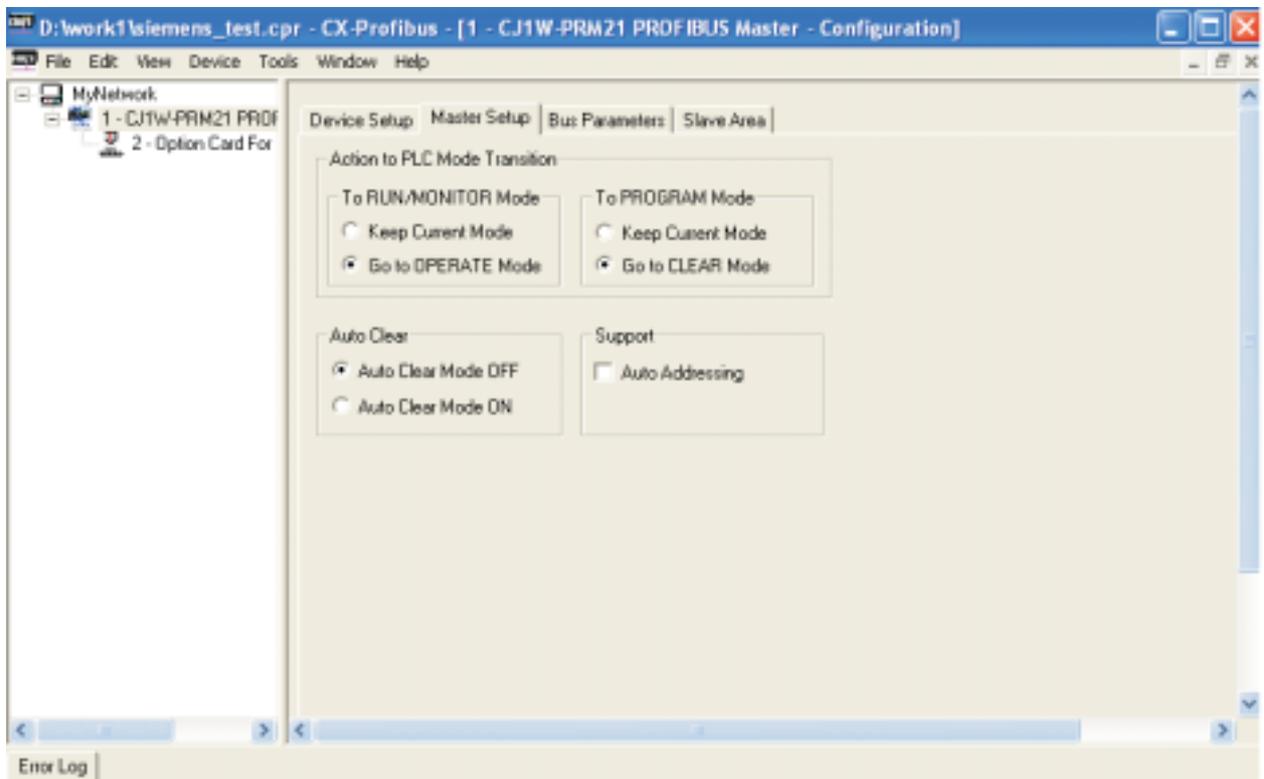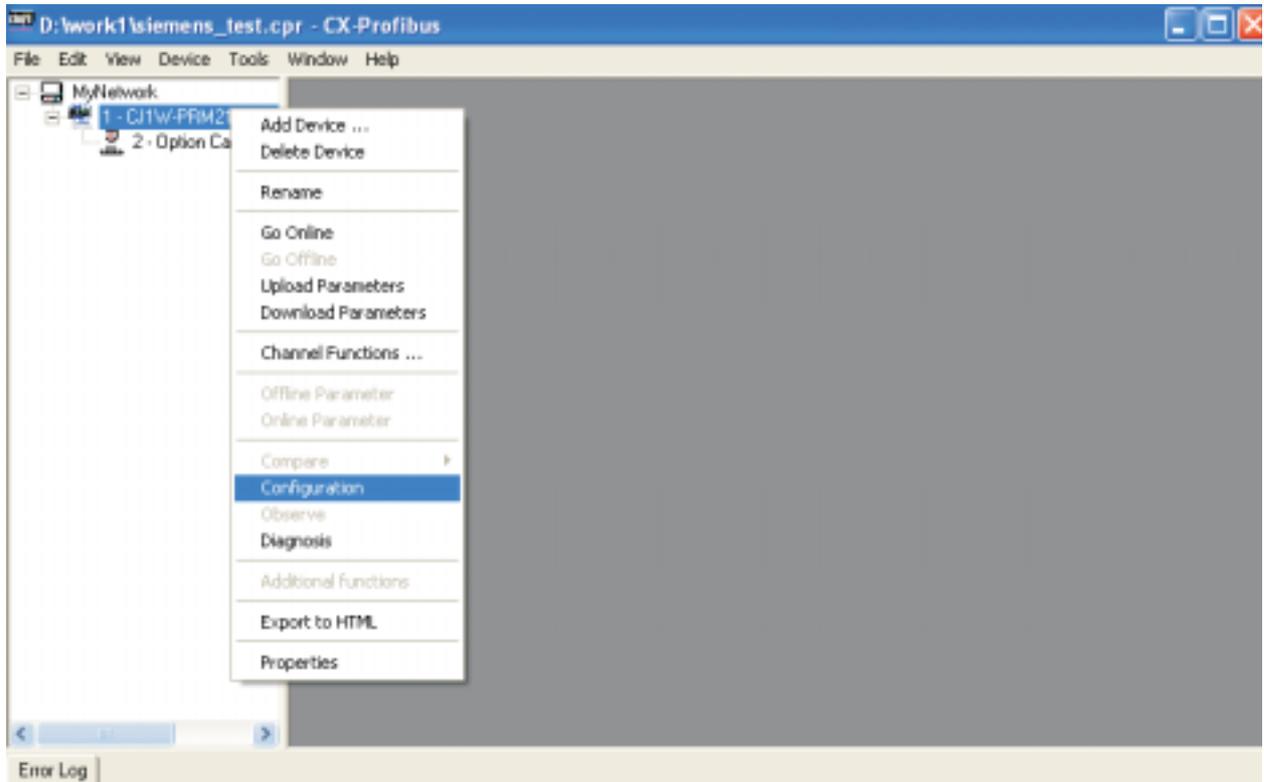
• You can change the baud rate in Bus Parameter tab.
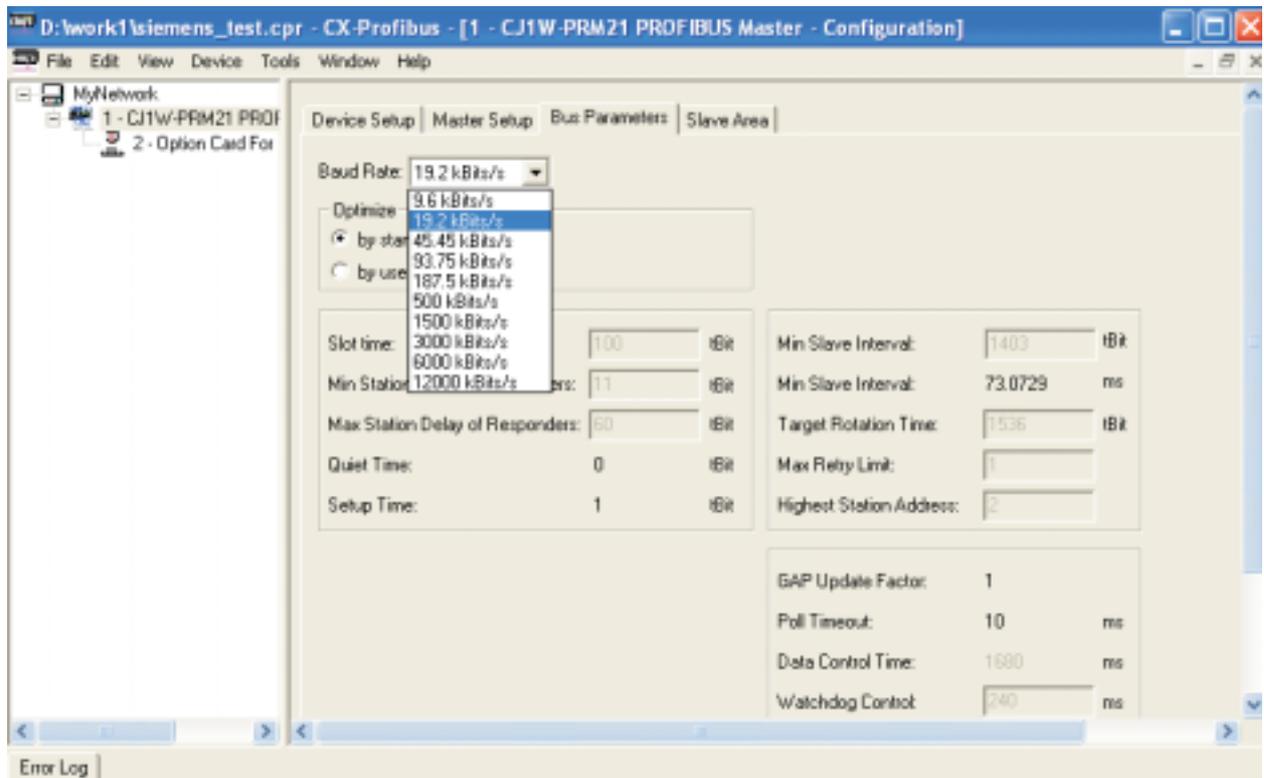
• In Omron master, some area is assigned for Input (Input to Master) and Output (output from master).

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- In case of this project, it is CIO3300 for Input and CIO3200 for output. The type of PLC and communication port, Baud Rate should be specified in Device setup tab

  Configure – Device Type – Settings
  Configure – Network Type – Settings

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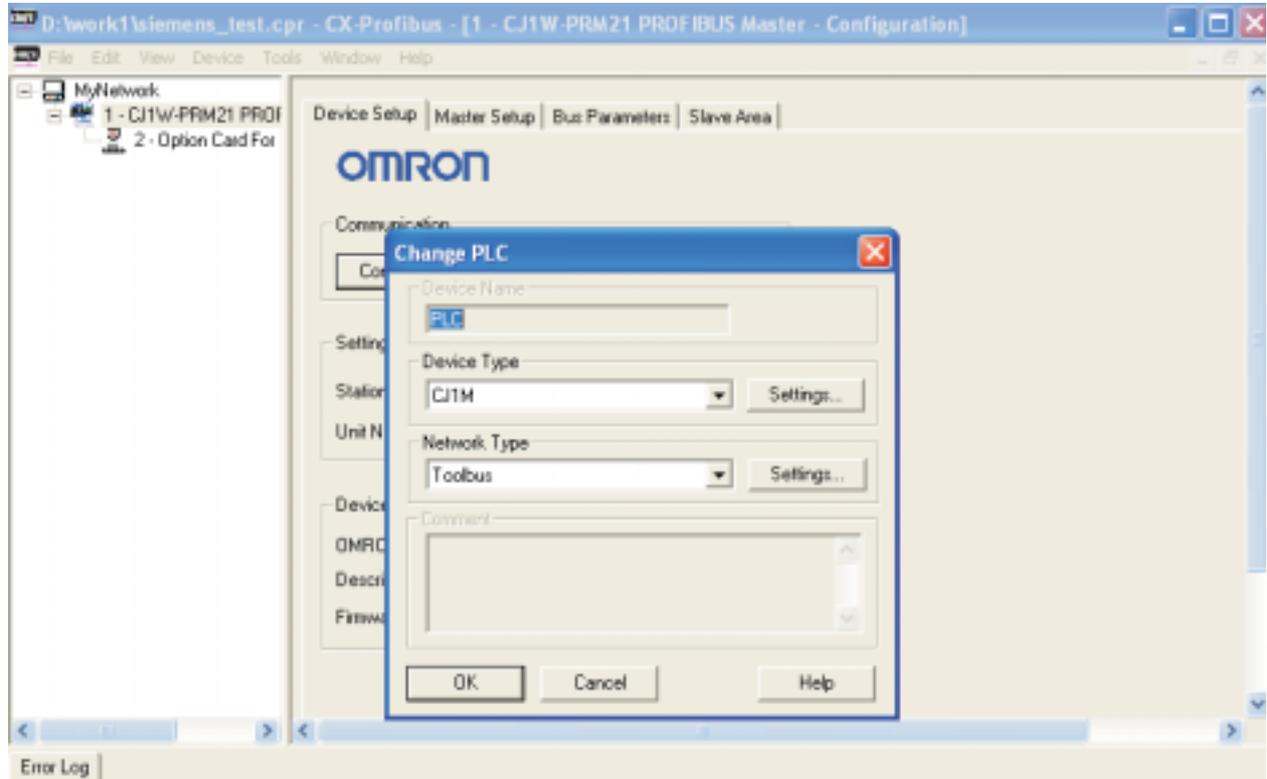
5   Download the parameters in PLC.
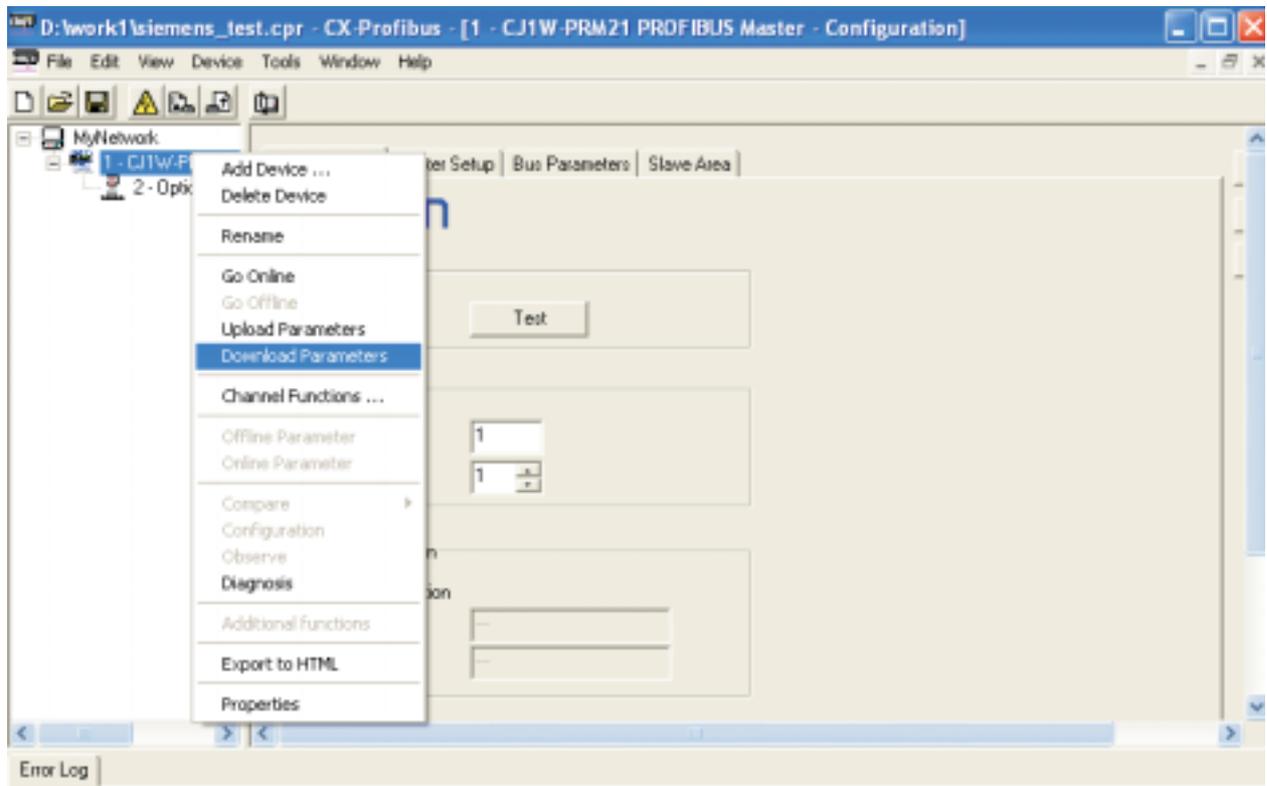
6   When The Slave starts communicating with master, the COMM led gets on.

7   User can watch the area CIO3200 and CIO3300 with help of CX- Programmer.

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3.4   Mounting

Before Connecting

After Connecting

Note 1: Dont forget to tighten the screw.

Note 2: the Green colored cable of Option unit should be connected to the Earth of VF-S11 Inverter.

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4.   FOR FIRST TIME USER

4.1   Introduction to Profibus

PROFIBUS is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Vendor independence and openness are guaranteed by the PROFIBUS standard EN 50170. With PROFIBUS, devices of different manufacturers can communicate without special interface adjustments.The PROFIBUS family consists of three compatible versions:

High Speed:
PROFIBUS-DP
DP stands for Decentralised Periphery. It is optimised for high speed and lowcost interfacing, especially designed for communication between automation control systems and distributed I/O at the device level.

Process Automation:
PROFIBUS-PA
PA stands for Process Automation. It permits sensors and actuators to be connected on one common bus line even in intrinsically-safe areas. It permits data communication and power supply over the bus using 2-wire technology according the international standard IEC 1158-2.

Higher Level:
PROFIBUS-FMS
FMS stands for Fieldbus Message Specification. This version is the generalpurpose solution for communication tasks at a higher level. Powerful services open up a wide range of applications and provide great flexibility. It can also be used for extensive and complex communications tasks.

Uniform bus access protocol:
PROFIBUS-DP and PROFIBUS-FMS use the same transmission technology and a uniform bus access protocol. Thus, both versions can be operated simultaneously on the same cable. However, FMS field devices cannot be controlled by DP masters or vice versa.

Note: It is not possible to exchange one of these family members by another family member. This will cause faulty operation.

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4.2   Protocol Architecture

The PROFIBUS protocol architecture is oriented on the OSI (Open System Interconnection) reference model in accordance with the international standard ISO 7498. Layer 1 (physical layer) of this model defines the physical transmission characteristics. Layer 2 (data link layer) defines the bus access protocol. Layer 7 (application layer) defines the application functions

	DP-Profiles	
		DP-Extensions
User Interface Layer	DP Basic Functions	
(7) Application Layer (6) Presentation Layer (5) Session Layer (4) Transport Layer (3) Network Layer	NOT DEFINED	
(2) Data Link Layer	Fieldbus Data Link (FDL)	
(1) Physical Layer	RS-485 / Fibre Optics	

Layer 1, 2 and user Interface:
PROFIBUS-DP uses layers 1 and 2, and the user interface. Layers 3 to 7 are not defined. This streamlined architecture ensures fast and efficient data transmission. The application functions which are available to the user, as well as the system and device behaviour of the various PROFIBUS-DP device types, are specified in the user interface.

Transmission medium:
RS-485 transmission technology or fibre optics are available for transmission. RS-485 transmission is the most frequently used transmission technology. Its application area includes all areas in which high transmission speed and simple inexpensive installation are required. Twisted pair shielded copper cable with one conductor pair is used.

Easy Installation:
The RS-485 transmission technology is very easy to handle. Installation of the twisted pair cable does not require expert knowledge. The bus structure permits addition and removal of stations or step-by-step commissioning of the system without influencing the other stations. Later expansions have no effect on stations which are already in operation. Transmission speeds between 9.6 kbit/s and 12 Mbit/s can be selected. One unique transmission speed is selected for all devices on the bus when the system is commissioned.

Cable Length:
The maximum cable length depends on the transmission speed. The specified cable lengths are based on type-A cable. The length can be increased by the use of repeaters. The use of more than 3 repeaters in series is not recommended.

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4.3 Device Type

PROFIBUS distinguishes between master devices and slave devices.

Master Devices:
Master devices determine the data communication on the bus. A master can send messages without an external request, as long as it holds the bus access right (the token). Masters are also called active stations in the PROFIBUS standard.

DPM1, DPM2:
There are two types of master devices: DP master class 1 (DPM1) and DP master class 2 (DPM2).
A DPM1 is a central controller which exchanges information with the decentralised stations (i.e. DP slaves) within a specified message cycle.
DPM2 devices are programmers, configuration devices or operator panels.
They are used during commissioning, for configuration of the DP system, or for operation and monitoring purposes.

Slave Devices:
Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives, and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slaves are also called passive stations.

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4.4   Profibus DP Characteristics
4.4.1   Bus Access Protocol

The bus access protocol is implemented by layer 2. This protocol also includes data security and the handling of the transmission protocols and messages.

Medium Access Control:
The Medium Access Control (MAC) specifies the procedures which determine when a station is permitted to transmit data. A token passing procedure is used to handle the bus access between master devices, and a polling procedure is used to handle the communication between a master device and its assigned slave device(s).

Token Passing:
The token passing procedure guarantees that the bus access right (the token) is assigned to each master within a precisely defined time frame. The token message, a special message for passing access rights from one master to the next master, must be passed around the logical token ring - once to each master - within a specified target rotation time. Each master executes this procedure automatically. A user can only change the target rotation time, but is not recommended.

Polling Procedure:
The polling or master-slave procedure permits the master, which currently owns the token, to access its assigned slaves. The picture below shows a possible configuration The configuration shows three active stations (masters) and six passive stations (slaves).
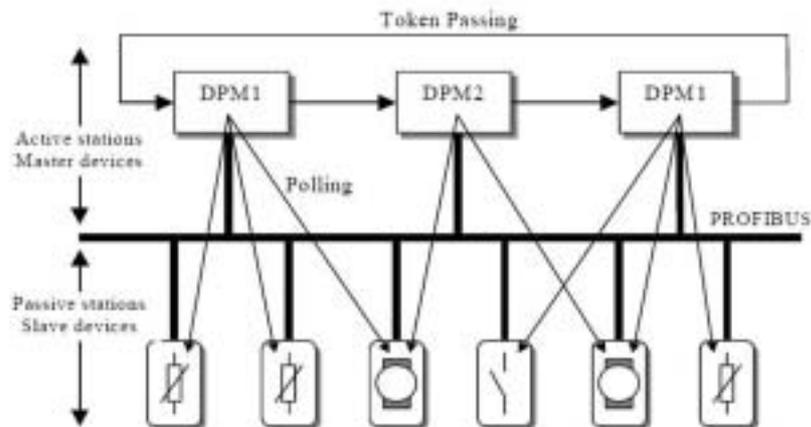
The three masters form a logical token ring. When an active station receives the token message, it can perform its master role for a certain period of time. During this time it can communicate with all assigned slave stations in a master-slave communication relationship, and a DPM2 master can take the initiative to communicate with DPM1 master stations in a master-master communication relationship.

Multi-peer Communication:
In addition to logical peer-to-peer data transmission, PROFIBUS-DP provides multi-peer communication (broadcast and multicast).
Broadcast communication: an active station sends an unacknowledged message to all other stations (masters and slaves).
Multicast communication: an active station sends an unacknowledged message to a predetermined group of stations (masters and slaves).

4.4.2   Data Throughput

Transmission Time:
At 12 Mbit/s, PROFIBUS-DP requires only about 1 ms for the transmission of 512 bits of input data and 512 bits of output data distributed over 32 stations. The figure below shows the typical PROFIBUS-DP transmission time depending on the number of stations and the transmission speed. The data throughput will decrease when more than one master is used.
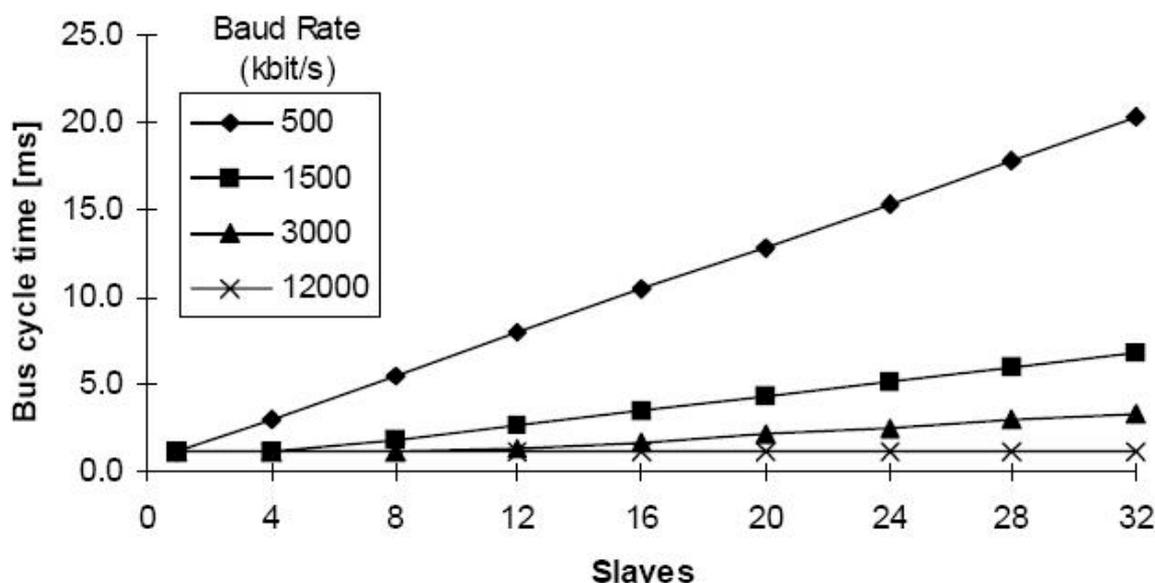
4.4.3   Diagnostic Functions

Extensive Diagnostics:
The extensive diagnostic functions of PROFIBUS-DP enable fast location of faults. The diagnostic messages are transmitted over the bus and collected at the master. These messages are divided into three levels:

Device related Diagnostics:
These messages concern the general operational status of the whole device (e.g. overtemperature or low voltage).

Module Related Diagnostics:
These messages indicate that a fault is present in a specific I/O range (e.g. an 8-bit output module) of a station.

Channel related Diagnostics:
These messages indicate an error at an individual input or output (e.g. short circuit on output 5).

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4.4.4   Protection Mechanism

Time Monitoring:
PROFIBUS-DP provides effective protection functions against parameterisation errors or failure of the transmission equipment. Time monitoring is provided at the DP master and at the DP slaves. The monitoring interval is specified during the configuration.

Protection Mechanism at the master:
The DPM1 master monitors data transmission of its active slaves with the Data_Control_Timer. A separate control timer is used for each slave. This timer expires when correct data transmission does not occur within the monitoring interval.
If the master's Auto_Clear mode is enabled, the DPM1 exits the 'Operate' state, switches the outputs of all assigned slaves to fail-safe status, and changes to its 'Clear' state (see also *1-4-5 Network states*).

Protection Mechanism at the slave:
The slave uses the watchdog control to detect failures of the master or the transmission line. If no data communication with the master occurs within the watchdog control interval, the slave automatically switches its outputs to the fail-safe status. This mechanism can be enabled or disabled for each individual slave.
Also, access protection is available for the inputs and outputs of the DP slaves operating in multi-master systems. This ensures that direct access can only be performed by the authorised master. For other masters, the slaves offer an image of their inputs and outputs, which can be read by any master, even without access rights.

4.4.5   Network states

PROFIBUS-DP distinguishes four different network states.

Off Line: Communication between all DP participants is stopped.

Stop: Communication between DPM1 and DP slaves is stopped. Only communication between DPM1 and DPM2 is possible.

Clear: DPM1 master attempts to set parameters, check the configuration, and subsequently perform data exchange with its associated DP-slaves. The data exchange comprises reading the inputs of the DP-slaves and writing zero's to the outputs of the DP-slaves.

Operate: DPM1 master exchanges data with its assigned slaves, inputs are read and outputs are written. Beside this, the DPM1 cyclically sends its local status to all assigned DP slaves (with a multicast message) at a configurable time interval.

Auto_Clear: When an error occurs during the data transfer phase of the DPM1, the 'Auto_Clear' configuration setting determines the subsequent actions. If this parameter is set to false, the DPM1 remains in the 'Operate' state. If set to true, the DPM1 switches the outputs of all assigned DP slaves to the fail-safe state and the network state changes to the 'Clear' state.

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4.5 Device Database files

GSD Files:
To achieve straightforward configuration of a PROFIBUS-DP network, the characteristic features of a device are specified in a file. This file is called a GSD-file (Gerätestammdaten file). The language of the GSD file is expressed with the last letter from the extension, *.GS?:

Default:	=GSD
English	=GSE
Deutsch	=GSG
Italian	=GSI
Portugees	=GSP
Spanish	=GSS

The GSD files are prepared individually by the vendor for each type of device, according to a fixed format. Some parameters are mandatory, some have a default value and some are optional. The device data base file is divided into three parts:

General Specifications:
This section contains the vendor name, the device name, hardware- and software release versions, station type and identification number, protocol specification and supported baud rates.

DP master-related specifications:
This section contains all parameters which only apply to DP master devices (e.g. maximum memory size for the master parameter set, maximum number of entries in the list of active stations, or the maximum number of slaves the master can handle).

DP slave-related specifications:
This section contains all specification related to slaves (e.g. minimum time between two slave poll cycles, specification of the inputs and outputs, and consistency of the I/O data).

Configurator:
The device data base file of each device is loaded in the configurator and downloaded to the master device. Refer to the Operation Manual of the PROFIBUS-DP Master Unit for usage of the GSD file in the master's configuration software.
GSD files are usually supplied with each unit. Alternatively, GSD files can be downloaded from the Internet, either from the manufacturer's site, or from the GSD library of the PROFIBUS Nutzerorganisation at http://www.profibus.com.

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4.6   Profiles

Exchanging Devices:
To enable the exchange of devices from different vendors, the user data has to have the same format.
The PROFIBUS-DP protocol does not define the format of user data, it is only responsible for the transmission of this data. The format of user data may be defined in so called profiles. Profiles can reduce engineering costs since the meaning of application-related parameters is specified precisely.
Profiles have been defined for specific areas like drive technology, encoders, and for sensors / actuators.

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5. APPLICATION

5.1 Applications

1. Profibus Option Card allows VF-S11 Inverter to act as Profibus DP- Slave on Profibus network

2. Toshiba Option unit can be connected to Profibus Option Card on Option Port.

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