HORNER
APG

User Manual for the
HE693PBS105

PROFIBUS SLAVE

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PREFACE

This manual explains how to use Horner APG's Profibus Slave Module.

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LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG, LLC ("HE-APG") warrants to the original purchaser that the Profibus Slave manufactured by HE-APG is free from defects in material and workmanship under normal use and service. The obligation of HE-APG under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within two (2) years from the date of manufacture or eighteen (18) months from the date of installation by the original purchaser whichever occurs first, such defect to be disclosed to the satisfaction of HE-APG after examination by HE-APG of the allegedly defective part or parts. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES AND HE-APG NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR HE-APG, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS Profibus Slave. THIS WARRANTY SHALL NOT APPLY TO THIS Profibus Slave OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. HE-APG MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY HE-APG. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON FOR WHOM THE Profibus Slave IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

In no event, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, shall HE-APG or its suppliers be liable of any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of original purchaser's customers for such damages.

To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, post paid, insured and in a suitable package.

ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing the Profibus Slave to appropriately design the end system, to appropriately integrate the Profibus Slave and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

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CHAPTER 1: INTRODUCTION

1.1   General Overview

1.1.1   The Profibus Slave User Manual describes the operation, configuration, and physical characteristics of the PROFIBUS Slave device. The Horner APG HE693PBM100/101 and HE693PBS105 provide the GE Fanuc PLC with a flexible communications interface to PROFIBUS networks for Decentralized Peripherals (DP).

1.1.2   The HE693PBM100/HE693PBS105 operate as PROFIBUS DP modules only. They do not support the other types of Profibus (FMS, PA). The PROFIBUS utilizes a Master-Slave type of communication with the HE693PBM100/101 functioning as the master device, and the HE693PBS105 functioning as the slave device. Decentralized Peripherals (The Slave) include but are not limited to: input/output devices, drives, valves, and measuring transmitters. DP's are mainly used to connect programmable controllers to the above devices via a high-speed serial link. Baud rates of up to 12 MBd can be obtained through PROFIBUS.

1.1.3   Up to 32 devices (masters or slaves) can be connected in one segment without using repeaters, or up to 64 devices can be connected using repeaters.

1.1.4   Master devices are used to determine the data communication on the bus. One master can service several slaves. Several Masters can participate on the bus simultaneously, but a slave can only receive outputs from one master.

1.1.5   The slave devices are peripheral devices that include input/output devices, valves, and drives. Slaves do not have bus access rights and can only acknowledge received messages or send messages to the master when requested to do so. Data from the Slaves can be read by any master. All connected Slaves have the same priority.

For further information on the PROFIBUS Network, visit their website at *http://www.profibus.com*

1.2   System Requirements:

IMPORTANT:

1.2.1   **The HE693PBS105 requires a CPU351 (or higher) with Firmware Version 8.0 (or better. CIMPLICITY**® **Control Version 2.0 or higher is required to configure the modules. *Logicmaster*** ® ***software and earlier versions of CPU Firmware can* NOT *support these modules*.**
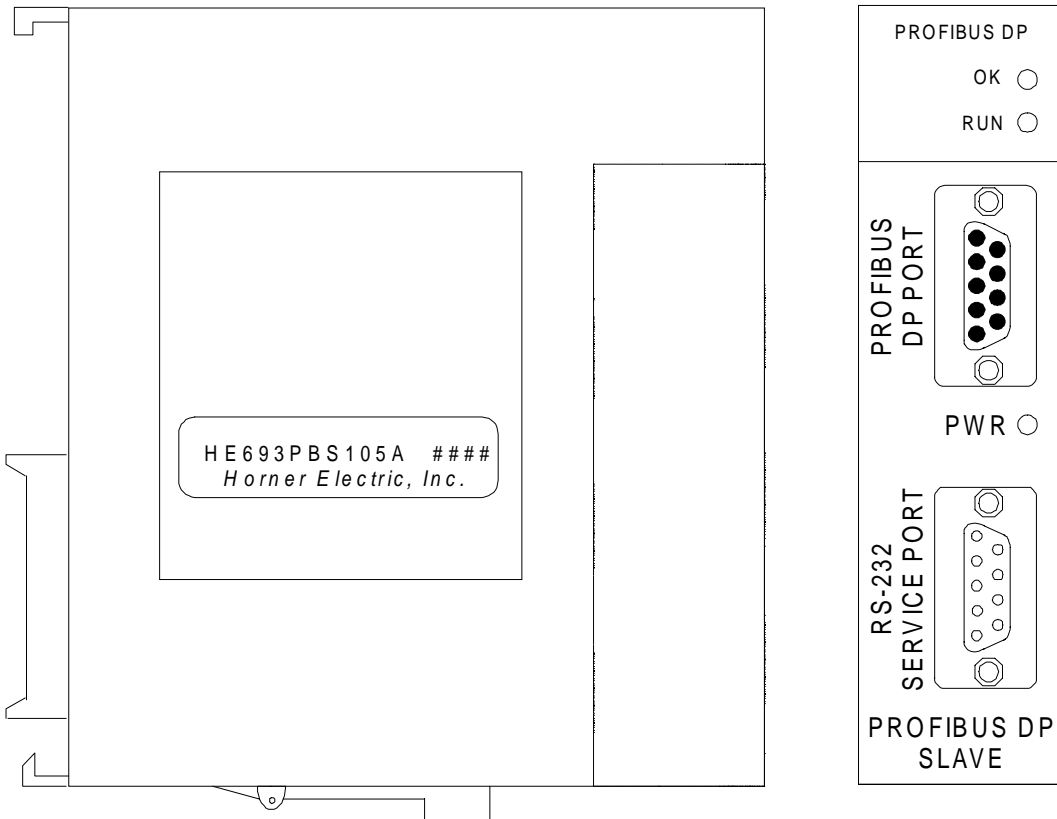
1.3   Physical Layout of PBS105:

Figure 1.1 - PBS105 Module (Front Cover and Side View)

1.4   LED Operation of PBS105:

1.4.1   There are three visible LED's on the PBS105, the OK LED, RUN LED, and the POWER LED. Various combinations of these LED's will indicate different states of the Slave. **See Table 1.1** for the states indicated by the LED's.

OK LED	RUN LED	POWER LED	Meaning
**Table 1.1 – LED Operation**			
Off	Off	Off	Module not receiving any power.
Yellow	Red	Green	Module has good power, but has not received valid configuration from CPU, and is not communicating on the Profibus-DP network.
Green	Red	Green	Module has good power, has received valid configuration from CPU, but is not communicating on the Profibus-DP network.
Green	Green	Green	Module has good power, has received valid configuration from CPU, and is communicating on the Profibus-DP network.
Red	Blinking between yellow and green	Yellow	A fault has occurred. Refer to the following description to determine fault.

| Table 1. 2 – Fault Conditions ||
Pulse Count	Meaning
2	An error encountered during system initialization.
3	A mismatch between PLC I/O length and Profibus-DP network map has occurred.
The blinking RUN light indicates a fault, to determine the fault; simply count the number of green pulses (the LED will pause for 2 seconds, pulse green a number of times, then repeat the cycle). **Table 1-2** describes the fault as represented by the number of green pulses.	

1.5   Profibus DP Connector

1.5.1   The 9-pin Profibus DP connector is for physical connection between the slaves and the master. For further information on the cable and connectors, see **Chapter 3** in this manual.

1.6   RS-232 Connector

1.6.1   The RS-232 Service Port is used to upgrade the firmware specific to the slave. This port uses a standard RS-232 9-pin connector.
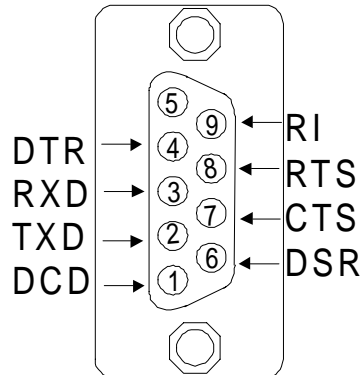

**Figure 1.2 - Pin-out for the
RS-232 connector.**

1.7   PBS105 Status

1.7.1   PLC Status Bit Definition

Table 1.3 – PLC Status Bit Definition		
Status Word Bits	**Meaning**	**Values**
15-12	Baud Rate	0= 12M 1= 6M 2= 3M 3= 1.5M 4= 500K 5= 187.5K 6= 93.75K 8= 19.2K 9= 9.6K
11-10	DP State	0= Wait PRM 1= Wait CFG 2= Data Exchange 3= Error
9	On-line	0= Off-line
8	PLC Config	1= Good PLC Configuration
7-4	Major Rev	0-9 Firmware Major Rev. level
3-0	Minor Rev	0-9 Firmware Minor Rev. level

CHAPTER 2: INSTALLATION AND CONFIGURATION

> **WARNING:**   ***Do <u>not</u> use the load function of Cimplicity™ Control for Profibus.***
> *Cimplicity™ is unable to disassemble binary data to information that it can use itself. Using the Load function will result in a <u>corrupt</u> Cimplicity™ data file.*

Note: The GSD Files can be found on Horner APG's Website at www.heapg.com.

2.1   PBS105 Mounting Requirements

2.1.1   The PBS105 Module is designed to plug into any GE FANUC Series 90™-30 or CEGELEC Alspha 8000 local slot. The PBS105 requires at least a CPU351 model or higher with Firmware Revision 8. The PBS105 will not operate correctly with a lower version Firmware. Please refer to the GE Fanuc PLC Installation manual GFK-0356E for information on installing the module.

2.2   Configuring the PBS105

2.2.1   CIMPLICITY® Control Version 2.0 or higher is required in order to configure the PBS105. The following is a step by step methodology on configuring the PBS105 using CIMPLICITY® Control.

Step 1: Get into CIMPLICITY® Control and select "Create New Equipment Folder" at the opening window. Give the new folder a name. Or if a desired folder already exists select that folder.

Step 2: Select Hardware Configuration. A screen similar to **Figure 2-1** should appear.
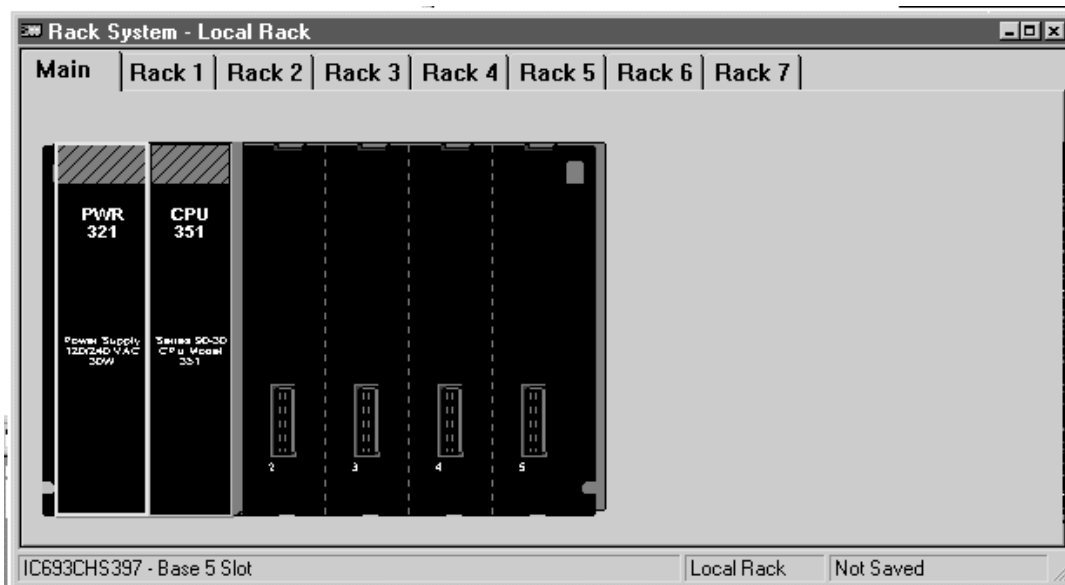

Figure 2.1

Step 3: If the rack type is not correct, right click on the rack and select Change Rack Type.

Step 4: Highlight the slot where the PBS105 is to be placed by left clicking on that spot.

Step 5: Right click on the highlighted slot and select "Add Module". The following screen will
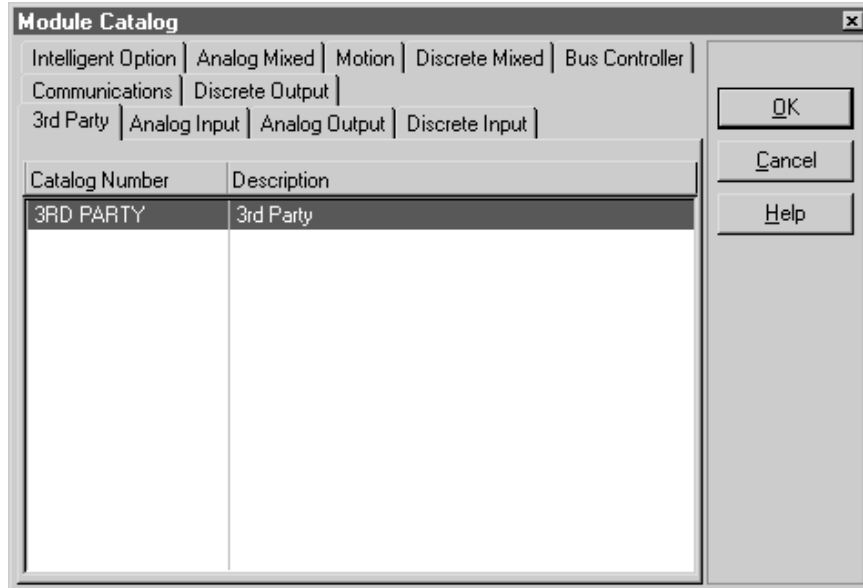   appear **(Figure 2-2)**.

Figure 2.2

Step 6: Click on the "Communications" tab and select HE693PBS105. The empty slot on the virtual
PLC should be replaced with the PBS module and the following screen will appear **(Figure 2-3)**. Note:
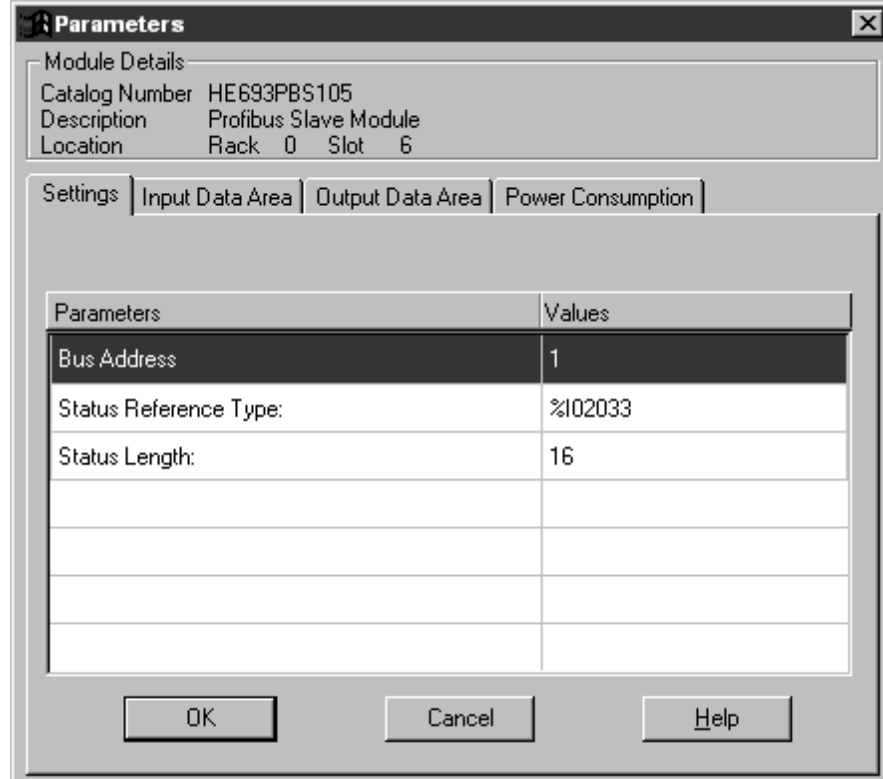If HE693PBS105 is not located on the Communications tab, see **Appendix A**.

Figure 2.3

The following table briefly describes the fields on the Settings Tab.

Table 2.1 – Fields on the Settings Tab	
Bus Address	This refers to the Profibus-DP bus address.
Status Reference Type	Location of Status Bits (see **Table 1.3** of this document) in PLC memory.
Status Length	Number of Status Bits (Fixed at 16)

Step 7: Set the Bus Address, and Status Reference Type.

Step 8: Next Click on the Input Data Area tab, the following screen should appear (**Figure 2-4)**.
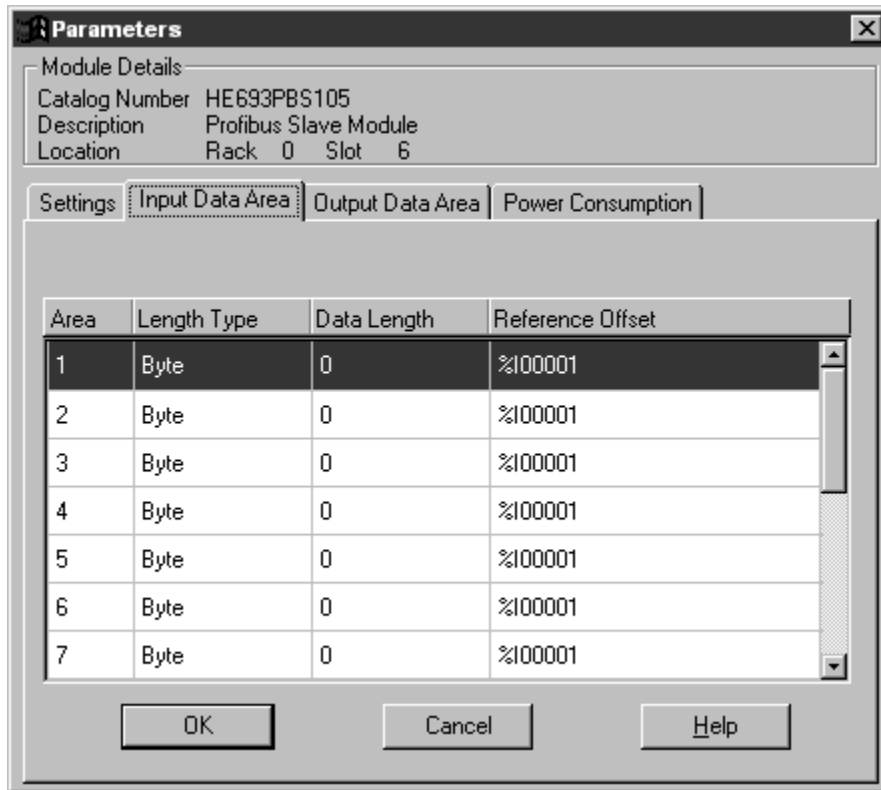

Figure 2.4

a)   The Input Data Area tab allows for configuration of the Data Length, Length type, and Reference Offset. The Area field represents the Memory Area being defined internal to the PLC. This field is not configurable.

b)   The Length Type specifies whether the data is a Byte or a Word. PLC memory locations must match the type (Bytes can use %I, %Q, and %G, and Words can use %AI, %AQ, %R).

c)   The Data Length specifies the length of the data and is expressed in units according to the Length Type field. The range is from 0-16, and a value of zero implies that the data area is not defined.

d)   The Reference Offset is simply the memory location internal to the PLC where input data will be mapped.

Step 9: After the above parameters are set, click on the "Output Data Area" tab. The following
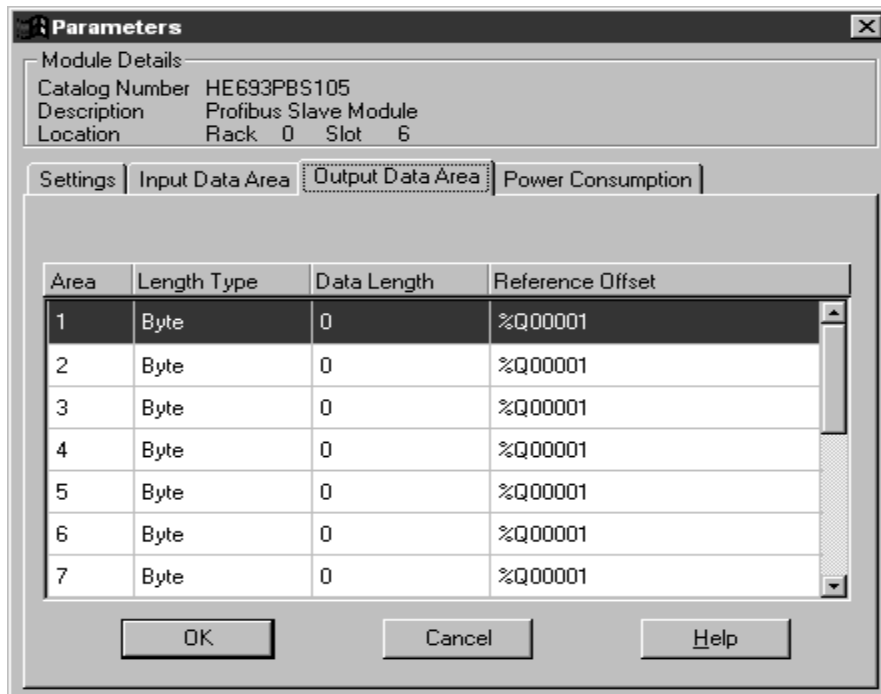   Screen should appear **(Figure 2-5)**.

Figure 2.5

a)   The Output Data Area tab allows for configuration of the Data Length, Length type, and
Reference Offset for the output data. The Area field represents the Memory Area being defined
internal to the PLC. This field is not configurable.

b)   The Length Type specifies whether the data is a Byte or a Word. PLC memory locations
must match the type (***Bytes* can use %I, %Q, %G**, and Words can use %AI, %AQ, %R).

c)   The Data Length specifies the length of the data and is expressed in units according to the
Length Type field. The range is from 0-16, and a value of zero implies that the data area is not
defined.

d)   The Reference Offset is simply the memory location internal to the PLC where input data will
be mapped.

**NOTE: It is important to remember that an input to the Slave is an Output to the Master and
vise-versa.**

e)   The "Power Consumption Tab" is used to display power consumption characteristics of the
        module. No fields are editable on this tab.

f)   After the configuration is complete download the configuration to the PLC, Complete details on
        how to do so can be found in GE Fanuc manual GFK-1295A, *Using CIMPLICITY®
        CONTROL*.

CHAPTER 3: WIRING DIAGRAMS

3.1   Profibus Wiring:

3.1.1 Assembling the cable for use with the DP port on the PBM100/101 and PBS105.

a. The HE693PBS105 uses a 9-pin D sub plug connector for its DP port. The pin
    assignment of the Profibus plug connector and the wiring are shown below.
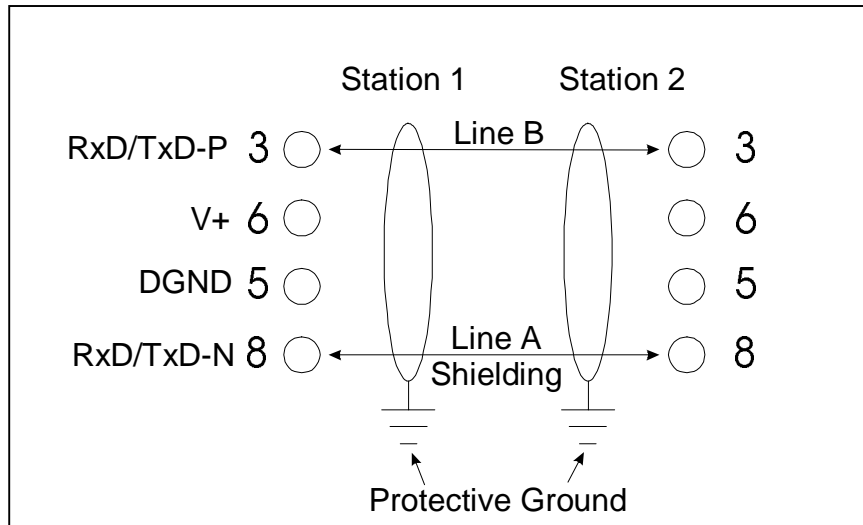
b. It is necessary to terminate both ends of the network. Both terminations must have power to them to insure proper operation of the network. The following diagram (Figure 3-2) illustrates the correct connection for the termination resistors.
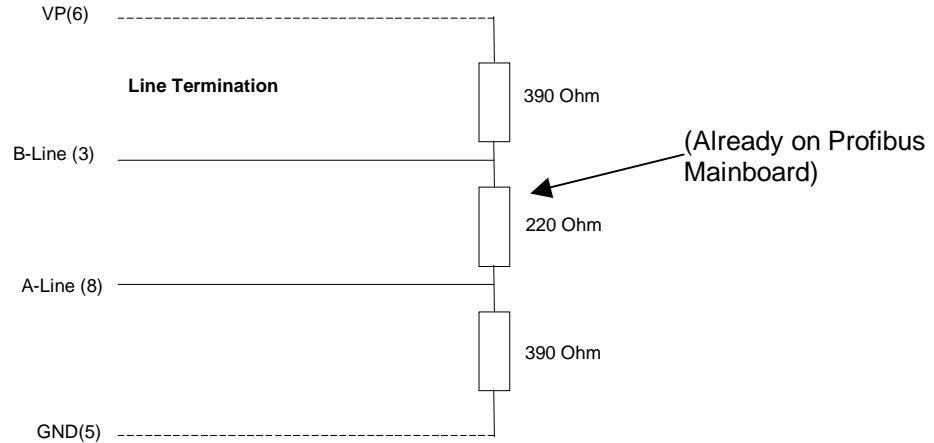

Figure 3.2

NOTE: The above wiring diagram (Fig. 3.2) is for illustrative purposes only. Cabling and connectors should be PTO approved to achieve the desired performance results. See Section 3.1.3 for recommended part numbers.

c.   The shield braiding and, if present, the shield foil should be connected to protective ground on both sides and with good conductivity via shield clamps covering as large an area as possible. In addition, it is recommended that the data lines be kept separate from all high-voltage cables.

3.1.2   Other considerations when wiring the Profibus network:

a. In the Profibus network, up to 32 stations (master or slaves) can be connected per segment without the addition of repeaters. If more that 32 stations are desired repeaters must be used. The repeaters are used to connect individual bus segments together.

b. The maximum cable length depends on the transmission speed. The specified cable length can be increased by the use of repeaters; however, the use of more than three repeaters in series is not recommended.

c. The following cable length specifications are based on type-A cable with a 135 to 165 Ohm impedance, less than 30 pf/m capacity, a loop resistance of 110 Ohms/Km, a wire gauge of .64mm, and a conductor area of 0.34mm².

Table 3.1 Baud Rate / Distance							
Baud Rate(bit/sec)	9.6K	19.2K	93.75K	187.5K	500K	1.5M	12M
Distance/Segment	1200m	1200m	1200m	600m	200m	200m	100m

d. For data transmission speeds of greater than 500 kbit/sec, Stub lines should be avoided. There are plug connectors available on the market that permit data line A and data line B to be connected directly to the plug connector.

3.1.3   **Recommended Part numbers**:

It is **highly** recommended that the following cable and connectors be used for high-speed data transmissions. Both Cable and Connector part numbers are Siemens part numbers.

a.   **Connectors**:   **Extra 9-pin DSUB for easy cable stacking.**
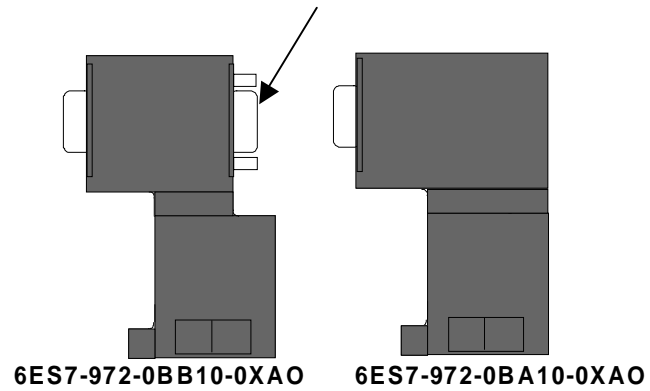

6ES7-972-0BB10-0XAO   6ES7-972-0BA10-0XAO

Figure 3.3 - Connectors

b**.**   **Cable**: Part Number **6XV1-830-OAH10**

NOTES

APPENDIX A: PREPARING CIMPLICITY®CONTROL FOR USE WITH PROFIBUS

> **WARNING***:*   **Do not use the load function of Cimplicity™ Control for Profibus.**
> Cimplicity™ is unable to disassemble binary data to information that is usable. Using the Load function will result in a corrupt Cimplicity™ data file*.*

*NOTE: **Version 2.0** requires 2 data disks that may be obtained by contacting Technical Support at (317) 916-4274 or via www.heapg.com.*

1.1   Adding the required files to CIMPLICITY®Control

1.1.1   CIMPLICITY®Control does not support Profibus directly[1], so in order to configure the HE693PBM100/101 and the HE693PBS105, it is important to add files to the CIMPLICITY® Control directory.   These files include a library (DLL), a Windows95® registration, and a Database that contain the necessary data for the Profibus configuration. Without these files, Profibus modules will not be displayed in the CIMPLICITY® Control module configuration tabs (as mentioned in Chapter 2 of this manual).

2.2   Installation of Required Files into Cimplicity® Control Directory to Configure HE693PBM100/101 & HE693PBS105

2.2.1   Equipment Needed

a)   Two 3.5" floppy disks are supplied to install required files into the Cimplicity® Control directory.

b)   Disks 1 and 2 contain installation software for installing the libraries and catalogs into the Cimplicity® directory. Disk 2 also contains the installation software for installing the GSD files into the Cimplicity® GSD directory.

2.2.2   Procedures

1)   Insert Disk 1 into the floppy drive. From the Run menu under the Start bar, type A:\setup.exe. The installation software will load the required files for the installation. When the installation is complete a welcome screen will come up.

2)   After reading the welcome screen click on "Next". This will bring up the "Choose a destination directory" window. From here select the drive and path that contains the Cimplicity® directory. The default is set at "C:Program Files\Cimplicity".

It is important that the correct path is chosen or the files will not be placed in the proper directory*.*

3)   After choosing the correct path, click on the "Next" button. The installation software will now place the files in the specified directory. A prompt window will appear when the scan bar reaches approximately 60%. When this occurs, remove Disk 1 from the floppy drive and insert Disk 2.

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[1] CIMPLICITY™ Control Version 2.1 will support the modules without requiring the additional steps.

4)   Click the "OK" button to finish installing the files. When the files are completely installed a "Setup Complete" window will appear, click on "Finish". The libraries and database files are now installed into the Cimplicity® Control Directory.

5)   The GSD files now have to be installed into the GSD directory located under the Cimplicity® directory. To install these files:

a)   Insert Disk 2 if it is not already in the floppy drive. From the "Run" field under the "Start" menu type in "a:\GSD\setup" and press the "Enter" key. The installation software will load and a "Welcome" window will appear.

b)   Press the "Next" button. The "Choose Destination Location" window will appear. Select the path leading to the Cimplicity® GSD folder. The default is "C:\Program Files\Cimplicity\GSD".

c)   After selecting the correct path click on the "Next" Button. The files will now be placed into the GSD directory under Cimplicity®. Press the "Finish" button when the "Setup Complete" window appears.

Cimplicity® Control is now ready to be used to configure the HE693PBM100/101 and the HE693PBS105.

3.3   Files

a)   The HE085a.GSD is the file needed to configure the master module for use with the HE693PBS105. See the user manual for the HE693PBM100/101 for more information. (This file is also shipped with the HE693PBM100/101).

b)   The PBMOFDLL.DLL is the library containing the Profibus data. Without this library located in the CIMPLICITY® Control directory, it will be impossible to configure either the HE693PBM100/101 or the HE693PBS105. **Insure this file is located in the CIMPLICITY® directory. If not simply copy the file from the A: drive to the CIMPLICITY® directory**

c)   The PBMOFDLL.REG is the Window95® registration file. Simply double click on this item after it and the DLL have been placed into the CIMPLICITY® Control directory to register the DLL for use with Windows95®.

d)   The EQUIPDB.MDB file is a Microsoft Access® database that contains information on all the Profibus equipment.

e)   The 9030CATALOG.gmd file contains information on Profibus products.

        NOTE: The file listed is compatible with CIMPLICITY® Control Release 2.0. The files will not work with earlier versions of the software.