



User Manual for the
HE693PBS106

PROFIBUS SLAVE

Second Edition
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PREFACE

This manual explains how to use the Horner APG Profibus Slave Module (HE693PBS106).

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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

The Profibus Slave User Manual describes the operation, configuration, and physical characteristics of the PROFIBUS Slave device. The Horner Electric HE693PBS106 provides the GE Fanuc PLC with a flexible communications interface to PROFIBUS networks for Decentralized Peripherals (DP).

The HE693PBS106 operates 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 HE693PBS106 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.

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.

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.

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. Any master can read data from the Slaves. All connected Slaves have the same priority.

1.2 System Requirements:

Note: The HE693PBS106 requires GE-Fanuc Series 90 / CEGELEC Series 8000 PLC programming and configuration software for use.

The LogicMaster version of the Horner Electric Profibus Slave for 90-30 (HE693PBS106) allows the incorporation of the Profibus slave module on a Series 90-30 rack that does not support Cimplicity Control and/or does not require a "slot 1" CPU. An example of such a rack would be the IC693CPU313. It is possible to use a Profibus Slave on these racks using the LogicMaster software for configuration. There are, however, some limitations in the capabilities of this version of the PBS106. The network data is limited to 1 to 16 words of input and 1 to 16 words of output. An additional word of input is added to the PLC data for module status information.

1.3 Physical Layout of PBS106:

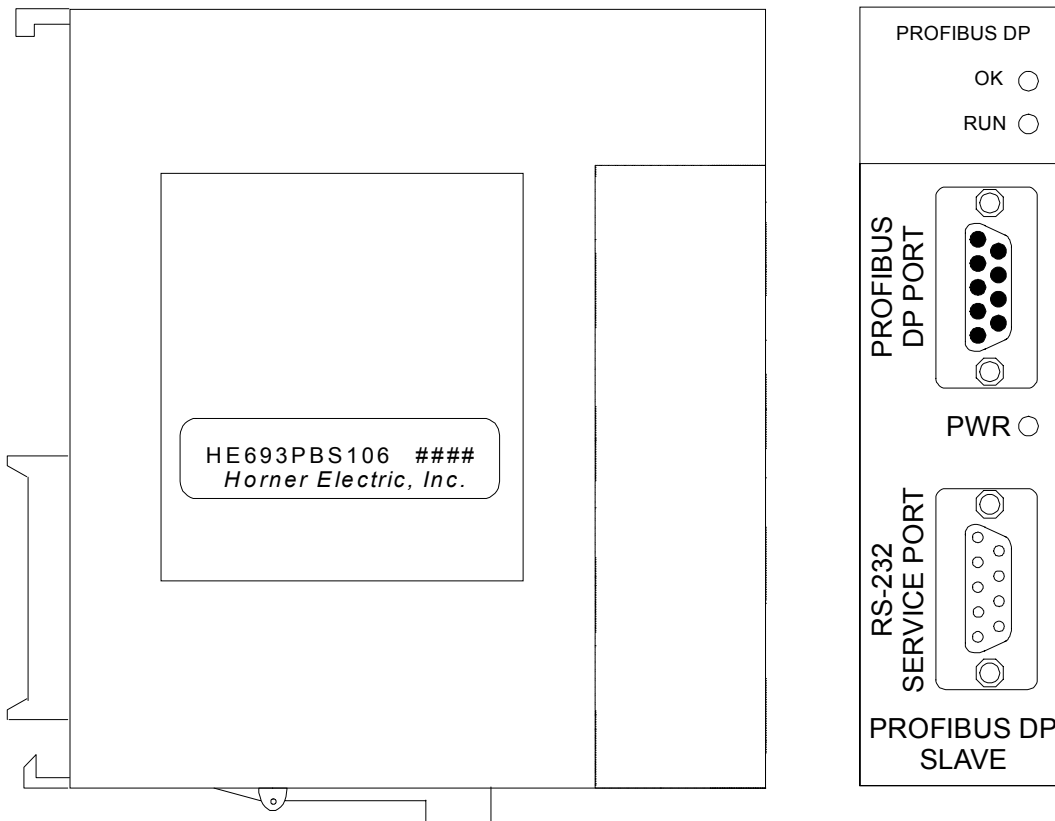


Figure 1.1 - PBS106 Module (Front Cover and Side View)

1.4 LED Operation of PBS106:

There are three visible LED's on the PBS106, 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.

Table 1.1 – LED Operation			
OK LED	RUN LED	POWER LED	Meaning
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

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**.

1.6 RS-232 Connector

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.

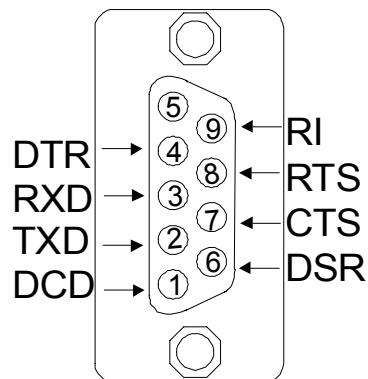


Figure 1.2 - Pin-out for the RS-232 connector.

1.7 PBS106 Status

1.1.7 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

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CHAPTER 2: INSTALLATION AND CONFIGURATION

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

2.1 PBS106 Mounting Requirements

The PBS106 Module is designed to plug into any GE FANUC Series 90™-30 or CEGELEC Alpha 8000 local slot. The PBS106 can be used with any version of the previously mentioned PLC's. Please refer to the GE Fanuc PLC Installation manual GFK-0356E for information on installing the module.

2.2 Configuring the PBS106

The PBS106 is configured for the PLC as a FOREIGN MODULE (ID 3).

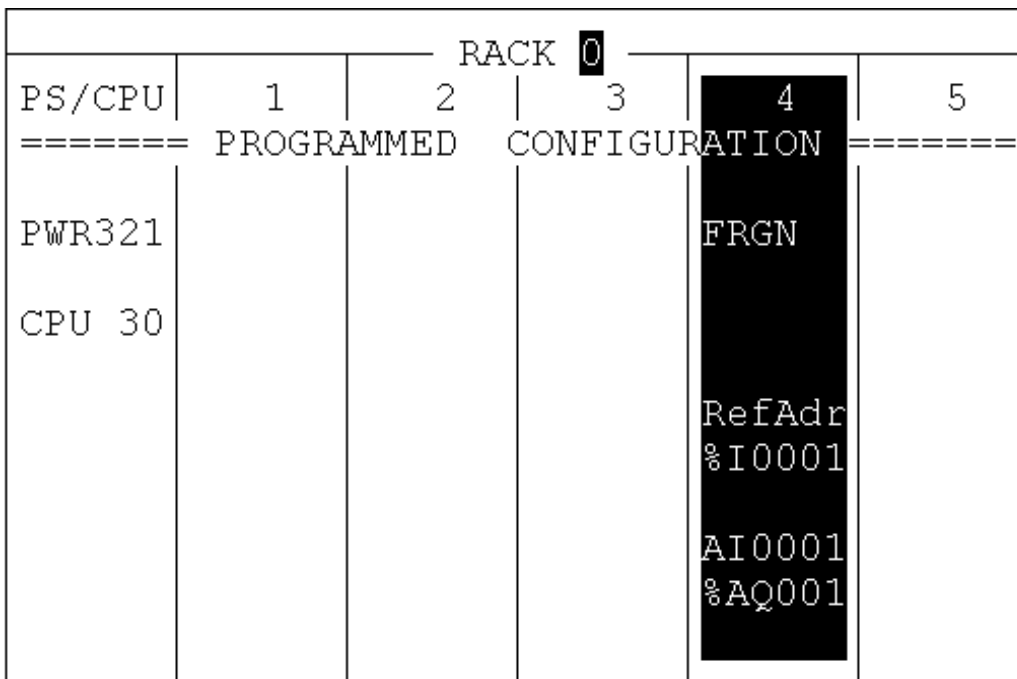


Figure 2.1 – Configuration Screen

The following fields of the Foreign Module screen must be completed for the network configuration.

- Byte 1 = 00000001 Always 1
- Byte 2 = 00000000 Always 0
- Byte 3 = 01H - 7DH Hex value if station ID 1 - 125
- Byte 4 = 00H Always 0
- Byte 5 = 01H - 10H Hex value of the number of Inputs Words 1 - 16
- Byte 6 = 01H - 10H Hex value of the number of Output Words 1 -16
- Bytes 7 - 16 = 00H Always 0

EXAMPLE:

SERIES 90-30 MODULE IN RACK 0 SLOT 4	
SOFTWARE CONFIGURATION	
SLOT 4	Catalog #: FOREIGN FOREIGN MODULE
FRGN	Module ID : 3 %I Ref Adr : %I0001 Byte 1 : 00000001 Byte 9 : 00 %I Size : 16 Byte 2 : 00000000 Byte 10 : 00 %Q Ref Adr : %Q0001 Byte 3 : 14 Byte 11 : 00 %Q Size : 0 Byte 4 : 00 Byte 12 : 00 %AI Ref Adr: %AI0001 Byte 5 : 01 Byte 13 : 40 %AI Size : 1 Byte 6 : 0B Byte 14 : 40 %AQ Ref Adr: %AQ0001 Byte 7 : 00 Byte 15 : 00 %AQ Size : 11 Byte 8 : 00 Byte 16 : 00

Figure 2.2 – Configuration Screen (Example)

Byte 3 = 14 hexadecimal = Slave Station address of 20 decimal.

Byte 5 = 0B hexadecimal = 11 words of Inputs

Byte 6 = 01 hexadecimal = 1 word of Output

The network data below (%I, %Q, %AI and %AQ) must be mapped to PLC references and could be done in the following manner:

%I Ref Adr	:	%I0001	Note: Either 1 word or 16 bits of data must be added to the inputs. The status will always be the first 16 bits of input data.
%I Size	:	16	
%Q Ref Adr	:	%Q0001	
%Q Size	:	0	
%AI Ref Adr	:	%AI0001	
%AI Size	:	1	
%AQ Ref Adr	:	%AQ0001	
%AQ Size	:	11	

This would configure 16 %I's starting at %I0001 and ending at %I0016 as status bits. 0 %Q's, 1 %AI at %AI1, and 11 %AQ's starting at %AQ1 and ending at %AQ11. The Module status bits can either be configured as 16 %I's or 1 word of %AI's.

It is important to remember that Bytes 5 and 6 are used to configure the number of network data words and the PLC data is configured by setting the reference addresses to the proper data lengths. For instance if the network is set up for five words of outputs (by setting byte 6 to five) then the PLC data must be set to five outputs as well. This can be done by setting up the %Q's to a size of 80 bits or by setting the %AQ's to a size of five words, or any combination of %AQ's and %Q's.

2.3 Status Bits

It is also important to remember that there has to be 16 bits (1 word) of PLC data set aside for status bits. This can be done by setting aside 16 %I's or 1 word of %AI's. In order to insure this is done there should always be 16 more bits of input data (or 1 more word of input data) configured in the PLC than there is for the network data.

Example: If there are eight words of inputs configured at Byte 5 then there should be either nine %AI's configured or eight %AI's and 16 %I's making up a total of nine words (eight words for network data and one word for status data). Even if there are no inputs configured across the network (Byte 5 = 0), there must still be 16 bits (1 word) of data set in the PLC.

Note: %I data can be combined with %AQ data or %AI data can be combined with %Q data.

CHAPTER 3: WIRING DIAGRAMS

3.1 Profibus Wiring

The following information covers the assembling of the cable for use with the DP port on the PBM100 and PBS106 modules.

- a. The HE693PBS106 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.

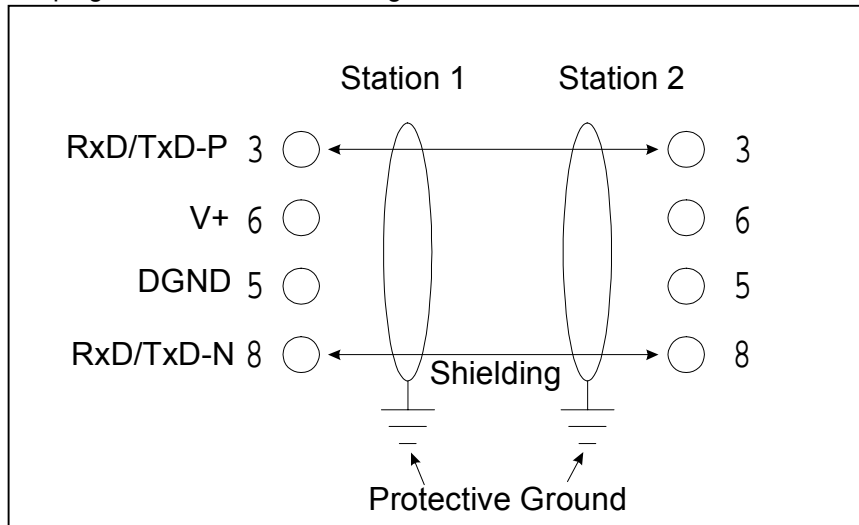


Figure 3.1

- 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. Figure 3-2 illustrates the correct connection for the termination resistors.

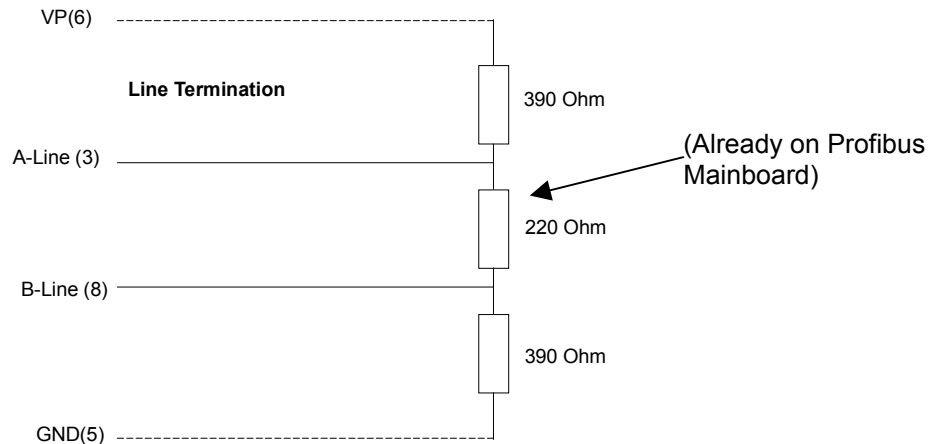


Figure 3.2

NOTE: Figure 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 shield foil (if shield foil is present) must be connected to protective ground on both sides. There must also be 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.

Other considerations when wiring the Profibus network are:

a. In a 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 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.

3.2 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.

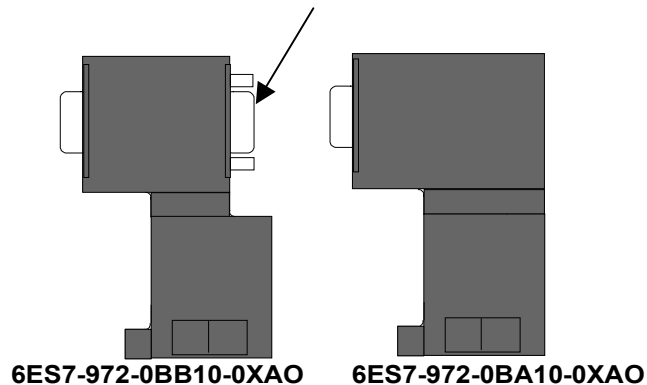


Figure 3.3 - Connectors

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