User Manual for the
HE693SNPMPX

SNP Multiplexer for GE Fanuc Series 90™ PLCs

Third Edition
29 November 2000

MAN0080-03

MODEL NUMBER: HE693SNPMPX

SERIAL NUMBER:_____

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PREFACE

This manual explains how to use the Horner APG SNP Multiplexer for use with the GE Fanuc Series 90 family of Programmable Logic Controllers.

For user manual updates, contact Horner APG, Technical Support Division, at (317) 916-4274 or visit our website at www.heapg.com.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG, LLC. ("HE-APG") warrants to the original purchaser that the SNP Multiplexer 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 SNP MULTIPLEXER. THIS WARRANTY SHALL NOT APPLY TO THIS SNP MULTIPLEXER 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 SNP MULTIPLEXER IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

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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 SNP Multiplexer to appropriately design the end system, to appropriately integrate the SNP Multiplexer 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.

Revisions to This Manual

This version (MAN0080-02) of the **SNP Multiplexer User Manual** contains the following revisions, additions and deletions:

1. Converted manual into Word format.

2. Changed company name from Horner Electric, Inc. to Horner APG, LLC.

Table of Contents

PREFACE....5
ABOUT PROGRAMMING EXAMPLES....6
Revisions to This Manual....7
CHAPTER 1: INTRODUCTION....11
CHAPTER 2: INSTALLATION....13
CHAPTER 3: POWER CONNECTIONS....15
CHAPTER 4: OPERATION....17

NOTES

CHAPTER 1: INTRODUCTION

The Horner APG SNP Multiplexer (SNPM) is equipped with three (3) RS485 serial ports. Two of these ports have been designed for direct connection to SNP "Master" devices (i.e. Workmaster or an Operator Interface Unit), while the third port is designed for direct connection to a Series 90 CPU programming port. This document will refer to these ports as slave port #1, slave port #2 and master port (because the SNP multiplexer emulates two slave ports and one master port).

The SNPM receives SNP command messages through the two slave ports and passes these commands to the master port. Any SNP response messages are received by the master port and are relayed back to the inquiring slave port. If both slave ports present command messages simultaneously, the SNPM will arbitrate between the two slave ports, sending one of the command messages and buffering the other. The winner of the arbitration will then have control of the master port until the current SNP "conversation" is complete. When the conversation ends, the buffered command message is sent to the master port and the "loser" of the arbitration will have control of the master port until it's conversation ends.

To simplify, the SNP Multiplexer allows the user to connect **TWO** SNP master devices (i.e. a Workmaster, Operator Interface Unit, Thumbwheel Interface Unit, etc.) to a single Series 90 CPU. Each of the SNPM slave ports can be a single node on an SNP network, however the SNPM master port must be connected to one and only one Series 90 CPU. The SNP Multiplexer does **NOT** support the Hand-Held programmer.

NOTES

CHAPTER 2: INSTALLATION

The SNP Multiplexer can be panel mounted or used as a desktop accessory. An optional 15-pin cable is available for connection between the SNPM master port and the Series 90 programming port. The pin-out for the two slave ports is identical to that of a Series 90 programming port, therefore, any cables used for connection to the Series 90 can be connected to either SNPM slave port. Note, however that the SNPM does not support the Hand-Held programmer.

The SNPM is equipped with two banks of DIP switches accessible from the slave port end of the unit. These switches are used to configure the communications parameters for all three of the SNPM ports. The switch bank located near slave port #1 is used to configure slave port #1 **AND** the master port. The switch bank near slave port #2 is used only for slave port #2 configuration. The table on the following page illustrates the DIP switch setting for the desired communication parameters.

Each bank of DIP switches is used to configure three parameters (baud rate, parity and number of stop bits). All ports are forced to 8 data bits (SNP protocol requires 8 data bits).

Table 2.1 – Baud Rate Configuration

SW3	SW2	SW1	Baud Rate
OFF	OFF	OFF	300 Baud
OFF	OFF	ON	600 Baud
OFF	ON	OFF	1200 Baud
OFF	ON	ON	2400 Baud
ON	OFF	OFF	4800 Baud
ON	OFF	ON	9600 Baud
ON	ON	OFF	19200 Baud
ON	ON	ON	19200 Baud

Table 2.2 – Parity Type Configuration

SW5	SW4	Parity
OFF	OFF	None
OFF	ON	Odd
ON	OFF	None
ON	ON	Even

Table 2.3 – Stop Bit Configuration

SW6	Stop Bits
OFF	1
ON	2

The two slave ports can be configured with completely different communication parameters. For example, one port could be connected to a Workmaster with a baud rate of 19200, while the other slave port could be connected to a 1200 or 2400 baud modem. Note, however, that the master port is configured using the slave port #1 settings.

NOTES

CHAPTER 3: POWER CONNECTIONS

The SNP Multiplexer hardware can be powered by either the Series 90 or by the external supply. The +5VDC connection on the two slave ports can only be driven by an external supply. The SNP Multiplexer can be powered by 24Vdc. This supply is only necessary if one of the following conditions exist:

1. The cable between the SNP Multiplexer and the Series 90 CPU is greater than 10 feet in length. In this case, the external power supply must be connected **AND** the power selection jumper must be placed in the EXT 24V position (this jumper is accessed by removing the base plate).

2. A device is to be connected to one (or both) of the slave ports that requires the +5VDC power on the slave port connector (i.e. the Horner APG Operator Interface Unit, or the Horner APG Thumbwheel Interface Unit).

The power select jumper JP4, a four-pin jumper located on the multiplexer circuit board near the power connector, selects between 24VDC and 5VDC operation. To gain access to the jumper, remove the four screws on the rear cover plate and remove the plate. **Do not remove the top cover of the multiplexer!** The jumper configuration is as follows:

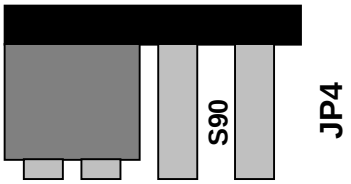

Figure 3.1 – 24V Operation from External 24V Supply through Terminal Connector

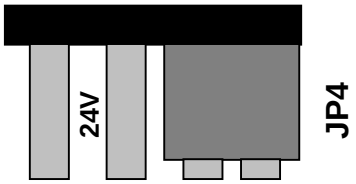

Figure 3.2 – 5V Operation from Series 90 SNP Port through Pin 5 of Master Port

NOTES

CHAPTER 4: OPERATION

With the SNPM installation and configuration complete, the SNPM can now be powered-up. The SNPM is equipped with two LED's, one near each slave port. At power-up, both LEDs will light during the SNPM internal initialization and diagnostics. When both LEDs go out, the initialization sequence is complete. The SNPM is then ready to accept SNP command messages through the slave ports.

During operation, the LEDs are used to indicate which of the slave ports is currently in control of the master port. For example, if slave port #1 is given control of the master port, all SNP command data received by slave port #2 is buffered. When slave port #1's SNP conversation is complete, slave port #1 releases control of the master port and slave port #2 is given control of the master port, the buffered message is sent to the master port.

To gain a better understanding of the SNPM operation, a brief discussion of the SNP protocol is necessary. SNP protocol is comprised of SNP messages. The SNP master device issues command messages and the SNP slave devices return response messages. Each of these messages are relatively short (usually 40 to 50 bytes each, but they can be as long as 8000 bytes). An SNP "conversation", however, can consist of several command/response transactions, and cannot be interrupted. For example, if slave port #1 were conducting a multi-message conversation with the Series 90 CPU (perhaps doing a program load) and slave port #2 were to issue a request for reference table data, the Series 90 CPU would confuse the data request for program information.

The SNPM is intelligent enough to recognize the end of an SNP conversation. A buffered command message will not be sent to the master port until the current conversation is complete. There are, however, some timing considerations to account for when using the SNPM. The SNP protocol has some built-in timeouts. For example, if an SNP master does not receive a response to a command message within a specified time limit, the master device will timeout and will attempt to re-establish the communications link (most likely generating an error message on the user interface). This scenario, although not serious, can be annoying if it occurs frequently.

Consider a situation where one slave port is configured for 300 baud, and the other is configured for 19200 baud. During a lengthy SNP conversation at 300 baud, a command message is received at 19200 baud and buffered. It is likely that the 19200 baud master device will timeout waiting for a response from the slave because the amount of time required to complete the 300 baud conversation exceeds the SNP timeout. The SNPM will yield better performance if both ports are configured for 1200 baud or higher.

Another anomaly surfaces when two SNP master devices are used and both devices set the privilege level. For example, assume that the master device connected to slave port #1 logs on to the Series 90 and sets the privilege level to 3. After which the master device connected to slave port #2 logs on to the Series 90 and sets the privilege level to 2. The first master might continue communicating while under the impression that the Series 90 is still at privilege level 3. To avoid this problem, make sure that the master device requiring the higher privilege level logs on last (allow the lower privilege level device to log on, then invoke the higher privilege level device).

The SNP protocol is a complex protocol. The SNP Multiplexer, although complex in design, should prove easy to implement into an end system and has been designed with ease of use in mind.

If the supplied cable is of insufficient length, the following cable can be constructed by the user.

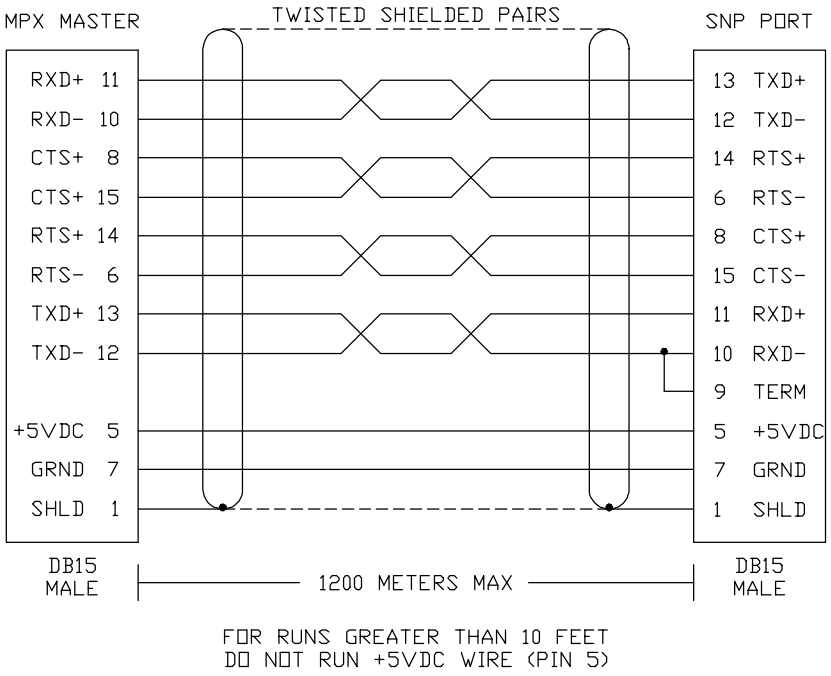

Figure 4.1 – Cable Diagram