HORNER
APG

User Manual for the
HE693TCU400,
HE693TCU401,
HE693TCU402

THUMBWHEEL INTERFACE

Fourth Edition
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MAN0087-04

PREFACE

This manual explains how to use the Horner APG Thumbwheel Interface for use with GE Fanuc Series 90 PLCs.

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

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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 Thumbwheel Interface to appropriately design the end system, to appropriately integrate the Thumbwheel Interface 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 (MAN0087-04) of the **Thumbwheel Interface 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.

NOTES

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CHAPTER 1: INTRODUCTION

1.1   Product Description

Congratulations on your purchase of the Horner APG Thumbwheel Interface. The Thumbwheel Interface provides four 10-position, 4-digit thumbwheel assemblies. It should be connected directly to the Series 90 programming port via a 15-pin cable. The Thumbwheel Interface communicates to the Series 90 using SNP protocol. The Thumbwheel Interface receives power from a 5 VDC supply in the Series 90 programming port, directly through the cable.

The HE693TCU400 was specifically designed with the Series 90-20 in mind because of its limited supply of %R registers. However, all of the Thumbwheel Interfaces can be used with any Series 90 PLC that has more than 280 %R registers (See page 11). Up to three Thumbwheel Interfaces can be used on one PLC as long as the they each have a different part number and dedicated SNP port. For example, if a TCU400 is used on the programming port of a PLC, then a TCU401 can be used on port 1 of a CMM311 and a TCU402 can be used on port 2 of the same CMM311 (See page 14 for CMM311 cable diagrams).

1.2   Installation

The Thumbwheel Interface is designed for front-panel mounting (See Page 12). The Thumbwheel Interface is not sealed. If an environmental seal is required, provisions must be made externally. The Thumbwheel Interface is installed from the front of the panel. Four #6-32 nuts and lock-washers are provided for permanent mounting.

Once the Thumbwheel Interface has been mounted, the 15-pin communications cable can be installed between the Thumbwheel Interface and the Series 90 programming port. The cable is a one-to-one cable interface. If the available length is not sufficient, a longer cable can be constructed (refer to page 13 for the wiring diagram). The communications cable should be shielded, twisted pairs and should be a suitable gauge for the distance needed. **IF THE CABLE LENGTH IS TO EXCEED 10 FEET, THE USER SHOULD MAKE PROVISIONS FOR AN EXTERNAL +5VDC @ 200mA POWER SUPPLY.**

1.3   Thumbwheel Configuration

Before the Thumbwheel Interface is installed, the Thumbwheel Interface and the Series 90 must be configured for operation. The Thumbwheel Interface has a 5 position dip switch for configuring the communications rate and programmable transmission delay. The Thumbwheel Interface always uses ODD parity, 8 data bits and 1 stop bit for communications. The Thumbwheel Interface is factory configured for 19,200 baud and no transmission delay. The following table shows the dip switch settings for communications rates (OFF=open).

Table 1.1 – Dip Switches 1-3 (Baud Rate)			
Switch 1	Switch 2	Switch 3	Baud Rate
OFF	OFF	OFF	300
OFF	OFF	ON	600
OFF	ON	OFF	1200
OFF	ON	ON	2400
ON	OFF	OFF	4800
ON	OFF	ON	9600
ON	ON	OFF	19200
ON	ON	ON	19200

The Thumbwheel Interface can also be configured to wait for up to two seconds from the time that a thumbwheel switch change is recognized before transmitting the new switch value to the Series 90. This feature allows the user to minimize the chance of an erroneous value being transmitted to the Series 90 while a switch is in-between digits, since the transition from one digit to the next may present a non-intended value. The table below shows the dip switch settings for the time delay (OFF=open).

Table 1.2 – Dip Switches 4-5 (Time Delay)		
Switch 4	**Switch 5**	**Time Delay**
OFF	OFF	No Time Delay
OFF	ON	0.5 Seconds
ON	OFF	1 Second
ON	ON	2 Seconds

1.4   Series 90 Configuration

The Series 90 must also be configured to communicate with the Thumbwheel Interface. The Thumbwheel Interface will not communicate unless the following steps are taken.

1.   The CPU ID in the Series 90 must be nothing. Spaces are a legal character for the CPU ID and will stop communications with the Thumbwheel Interface.

2.   The passwords for level 1 and level 2 must be disabled. If a password exists for level 1 or 2 the Thumbwheel Interface will not communicate.

3.   The communications parameters for the Series 90 must be set to ODD Parity, 8 Data bits, 1 Stop bit and the same baud rate as the Thumbwheel Interface.

4.   The Thumbwheel Interface must be connected to a single PLC. The Thumbwheel Interface will not communicate on a multidrop network.

CHAPTER 2: OPERATION

2.1   Communications

With the Thumbwheel Interface and Series 90 installation complete, the system can be powered-up. The Thumbwheel Interface will immediately attempt to establish communication with the Series 90. An LED is provided on the Thumbwheel Interface to give a visual indication of the communication status. If the Thumbwheel Interface is unable to establish communication, the LED will flash quickly with each attempt (about once per second). When successful communication is established, the LED will illuminate and stay lit.

The Thumbwheel Interface will initially transmit the data for all of the thumbwheel switches to the Series 90 CPU. After the initialization, the Thumbwheel Interface will only transmit switch data when a switch value is changed by the operator (the communication link is, however, maintained even if there is no switch activity).

2.2   Register Usage

The Thumbwheel Interface will place the binary thumbwheel switch data into the following Series 90 data registers (%R).

Table 2.1 – Register Assignment					
HE693TCU400		**HE693TCU401**		**HE693TCU402**	
Switch 1	%R246	Switch 1	%R258	Switch 1	%R270
Switch 2	%R249	Switch 2	%R261	Switch 2	%R273
Switch 3	%R252	Switch 3	%R264	Switch 3	%R276
Switch 4	%R255	Switch 4	%R267	Switch 4	%R279

These registers were chosen to allow direct compatibility with Series 90 Timer/Counter preset value registers (Timer/Counters require 3 consecutive registers with the second register of each set being the preset value register). These registers also allow the HE693TCU400 to be used with the Series 90-20, since only 256 data registers are available in the Series 90-20. The other models can be used with any Series 90 PLC that has at least 280 %R registers.

2.3   Timer/Counter Presets

To use the Thumbwheel Interface as a Timer/Counter preset, the Timer/Counter must have nothing defined as the preset. If a constant or a register value is used as the preset, the value from the Thumbwheel Interface will not be used as the preset for the Timer/Counter. Below is an example showing how the Timer/Counter should be used.
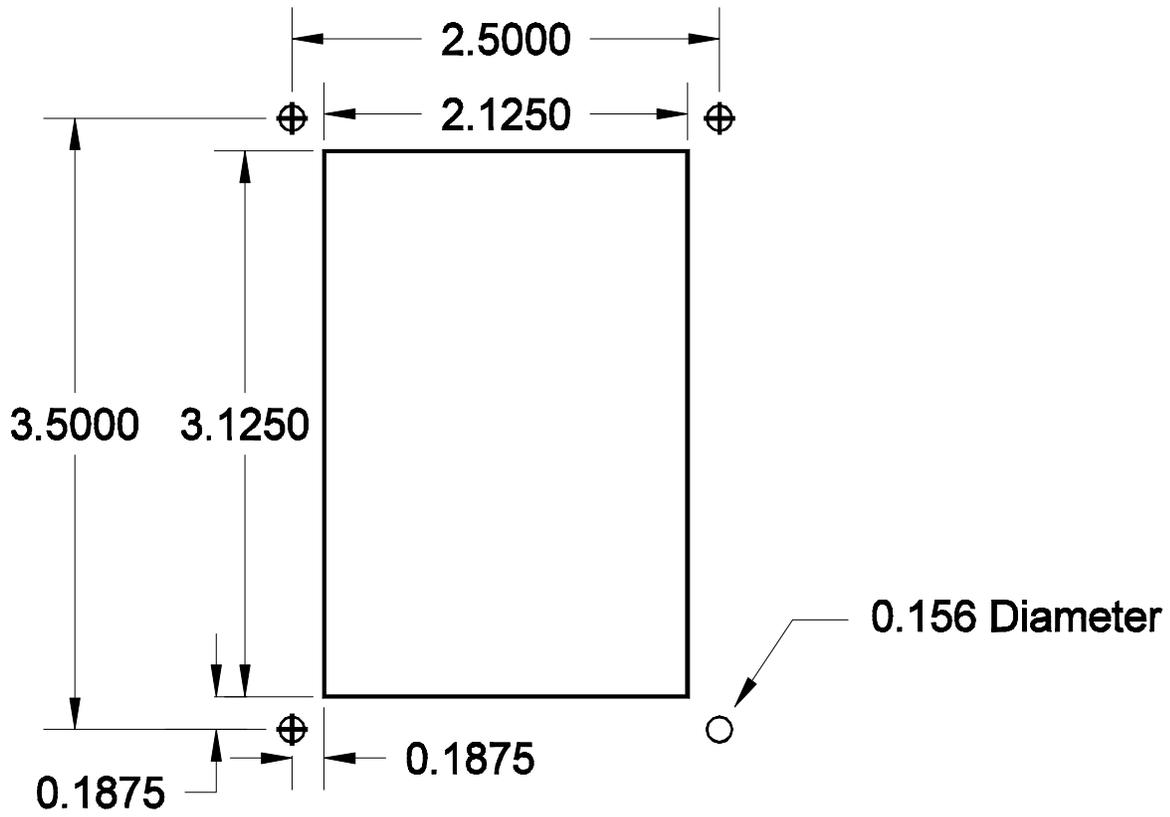

No Preset Value
(Thumbwheel value
will be used, %R246)
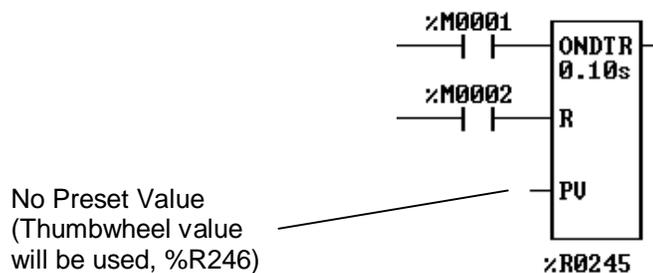
2.4   Panel Cutout

Figure 2.1 – Panel Cutout for HE693TCU400, 401 and 402
(All dimensions are in inches)

2.5   Cable Diagrams

TWISTED SHIELDED PAIRS

THUMBWHEEL MODULE   SERIES 90 PLC

RXD+ 13	13 TXD+
RXD- 12	12 TXD-
CTS+ 14	14 RTS+
CTS- 6	6 RTS-
RTS+ 8	8 CTS+
RTS- 15	15 CTS-
TXD+ 11	11 RXD+
TXD- 10	10 RXD-
	9 TERM
SHIELD 1	1 SHIELD
GROUND 7	7 GROUND
+5VDC 5	5 +5VDC

15-PIN MALE D   3 METERS MAX   15-PIN MALE D

Figure 2.2 – Cable for HE693TCU400, 401 and 402 to Series 90 PLC
(Less than 3 meters)

TWISTED SHIELDED PAIRS

THUMBWHEEL MODULE   SERIES 90 PLC

RXD+ 13	13 TXD+
RXD- 12	12 TXD-
CTS+ 14	14 RTS+
CTS- 6	6 RTS-
RTS+ 8	8 CTS+
RTS- 15	15 CTS-
TXD+ 11	11 RXD+
TXD- 10	10 RXD-
	9 TERM
SHIELD 1	1 SHIELD
GROUND 7	7 GROUND
+5VDC 5	

15-PIN MALE D   15-PIN MALE D
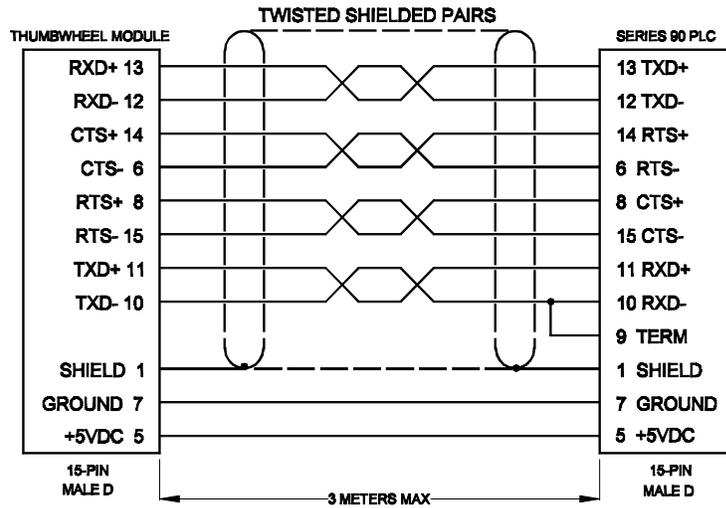
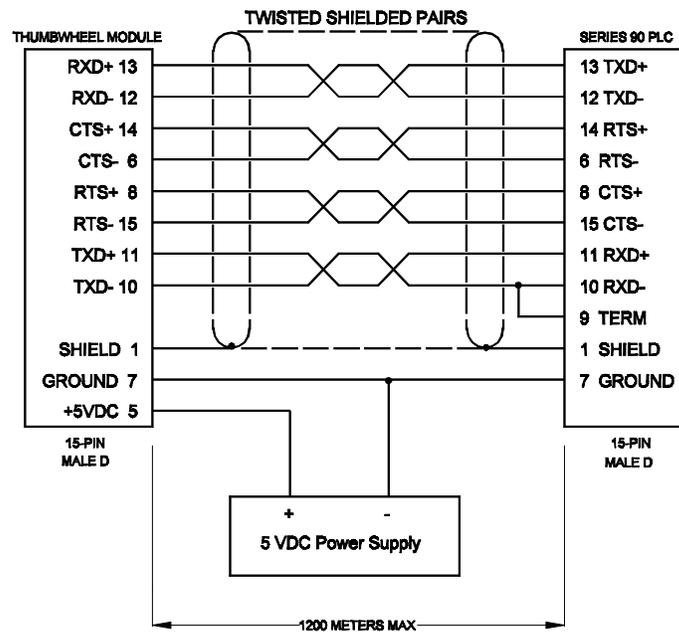+   -
5 VDC Power Supply

1200 METERS MAX

Figure 2.3 – Cable for HE693TCU400, 401 and 402 to Series 90 PLC
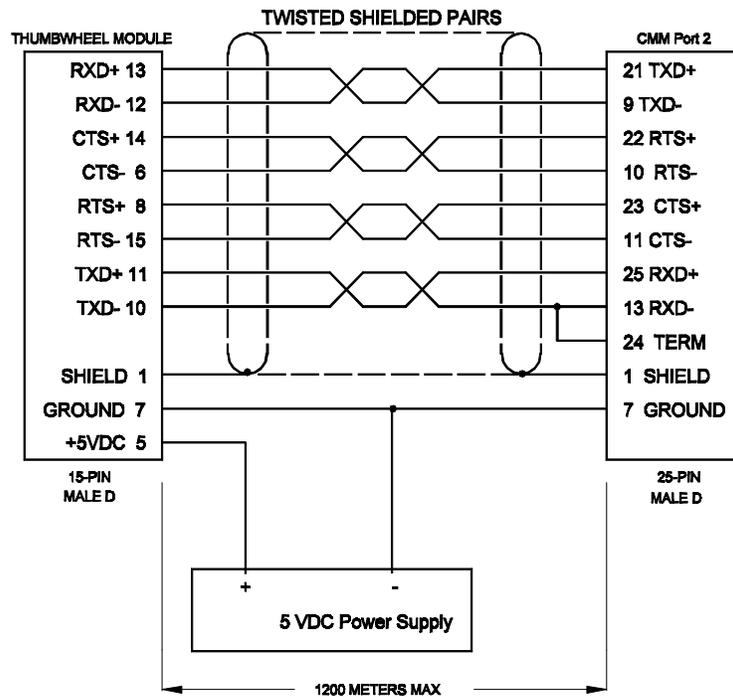**(Greater than 3 meters)**

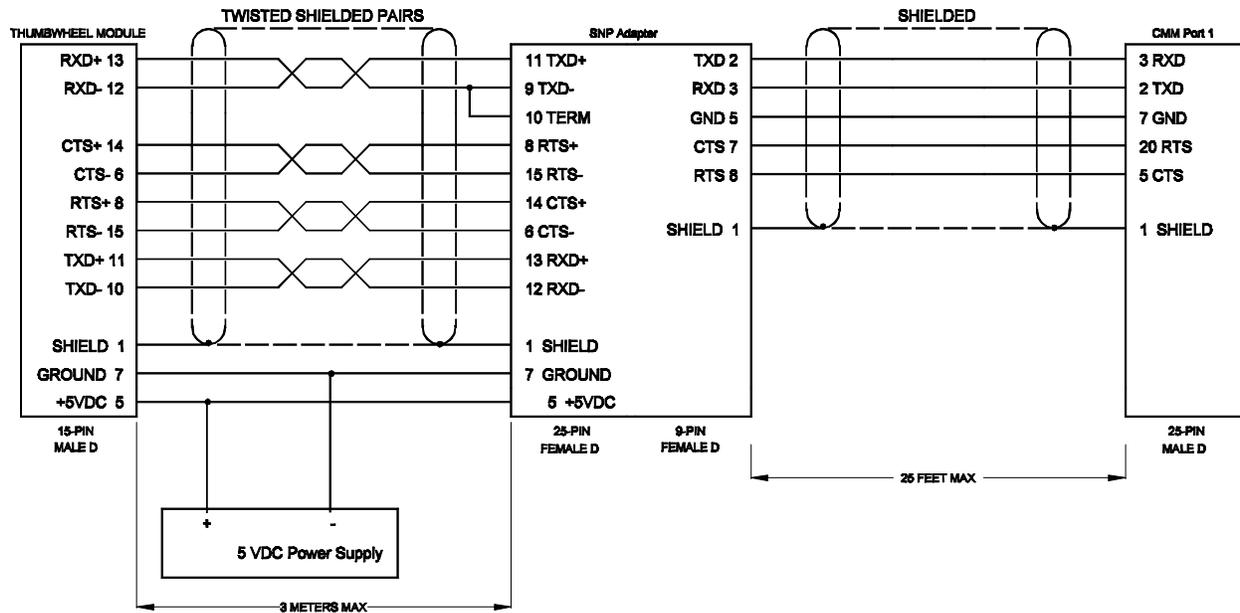**Figure 2.4 – Cable for HE693TCU400, 401 and 402 to CMM311 Port 2**

Figure 2.5 – Cable for HE693TCU400, 401 and 402 to CMM311 Port 1