

SECTION 1: INTRODUCTION

Congratulations on your purchase of a Horner Electric Stepper Positioning Module (SPM30)! The SPM30 is an intelligent, programmable motion control option module for the GE Fanuc Series 90-30 Programmable Logic Controller (PLC).

Within a stepper motor control system, the SPM30 acts as a programmable indexer which is capable of interfacing to a wide variety of stepper motor translator drives, limit switches and encoder feedback devices.

In addition, its high maximum step rate and wide dynamic range position control make the SPM30 compatible with microstepping translator drives, for smooth, quiet operation.

1.1 Stepper Positioning Module (SPM30) Features

The Stepper Positioning Module offers a variety of features, including:

- ☑ One and Three Axis (multiplexed) models
- ☑ Up to 245,730 steps (or microsteps) per second
- ☑ Motion may be completely controlled by ladder program
- ☑ Non-volatile memory storage
- ☑ Auto "find home" and manual jogging
- ☑ Moves to relative and/or absolute positions
- ☑ Home and Overtravel inputs
- ☑ Power-up/watchdog timer safety interlock
- ☑ Emergency Stop input
- ☑ Incremental Encoder input (some models)
- ☑ Programmable position, velocity, and acceleration
- ☑ Automatic ramp-down deceleration calculation
- ☑ Trapezoidal and Triangular velocity profiles

SECTION 2: INSTALLATION

2.1 Module Placement

The Stepper Positioning Module may be placed in any I/O module slot of the GE Fanuc Series 90-30 model 311, 321 or 331. The user should **NEVER** insert or remove the Stepper Positioning Module while power is applied to the host PLC. Follow the guidelines defined in the Series 90-30 literature for proper module insertion and removal.

2.2 Terminal Wiring

The Stepper Positioning Module is equipped with a 20 contact removable terminal block. The pinout of the removable terminal block is illustrated on the following page.

Terminals are provided for interfacing the Stepper Positioning Module with a variety of devices, including:

- a) Stepper Motor Drives (Translators),
- b) Incremental encoders (quadrature or up/down)
- c) Mechanical and Proximity type limit switches
- d) E-stop pushbuttons.

The sign (+ or -) after each signal name indicates what state the signal is in when it is active. Active-high is indicated by +, while active-low is indicated by -.

The motor outputs may be connected to translator drives with either differential or single-ended inputs. For single-ended drives, select the motor output whose active signal state (+/-) matches the drive's input.

The encoder inputs may be connected to an encoder with either differential or single-ended outputs. For single-ended encoders, use the active high encoder inputs (ENCODERA+ and ENCODERB+).

The emergency stop input should be connected to terminal 20 via a normally-closed ESTOP switch for normal operation.

PIN	SIGNAL	UNITS	Type
1	D GND	Digital Ground	Diff
2	STEP1-	Axis 1 motor step outputs	Diff
3	STEP1+		Diff
4	STEP2-	Axis 2 motor step outputs	Diff
5	STEP2+		Diff
6	STEP3-	Axis 3 motor step outputs	Diff
7	STEP3+		Diff
8	DIR-	Motor direction outputs	Diff
9	DIR+		Diff
10	ENC B-	Phase B incremental encoder inputs	Diff
11	ENC B+		Diff
12	ENC A-	Phase A incremental encoder inputs	Diff
13	ENC A+		Diff
14	HOM 3-	Axis 3 home input	S.E./Isol
15	HI LIM-	Upper end limit input	S.E./Isol
16	HOM 2-	Axis 2 home input	S.E./Isol
17	LO LIM-	Lower end limit input	S.E./Isol
18	HOM 1-	Axis 1 home input	S.E./Isol
19	ESTOP+	Emergency stop input	S.E./Isol
20	D GND / I GND	Digital Ground or Isolated Ground	S.E./Isol

Figure 2-1. Stepper Positioning Module Terminal Strip Pinout.
(Type: Diff=Differential, S.E./Isol.=Single Ended or Isolated)

2.3 LED Indicators

INDICATOR	COLOR	DESCRIPTION
STOP	Red	Stopped
RAMP	Yellow	Accelerating or decelerating
CNST	Green	Moving at constant velocity

Figure 2-2. Stepper Positioning Module LED Indicators.

2.4 Configuring the Series 90-30

Before any I/O module can be accessed by the Series 90-30, the "makeup" of I/O modules must be defined inside the Series 90-30 CPU. This process is called "configuration". Stepper Positioning Module configuration is supported by Logicmaster 90, version 2.01 or later. Alternatively, the user may configure the Series 90-30 using the Hand-Held Programmer.

2.4.1 Configuration with Logicmaster

The Stepper Positioning Module is programmed in the Logicmaster 90-30 Configuration program as a foreign module. From the main configuration menu, select *I/O Configuration (F1)*, cursor over to the slot containing the module and select *Other (F8)*, and *Foreign (F3)*. The foreign module screen appears (see below).

SOFTWARE CONFIGURATION	
SLOT	FOREIGN MODULE
2	Catalog #: FOREIGN
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 : 00 Byte 11 : 00
%Q Size :	16 Byte 4 : 00 Byte 12 : 00
%AI Ref Adr :	%AI001 Byte 5 : 00 Byte 13 : 00
%AI Size :	2 Byte 6 : 00 Byte 14 : 00
%AQ Ref Adr :	%AQ001 Byte 7 : 00 Byte 15 : 00
%AQ Size :	6 Byte 8 : 00 Byte 16 : 00

Figure 2-3. Logicmaster 90-30 Configuration Foreign Module Screen.

The foreign module screen contains many different parameters. The first column of parameters configures the I/O references allocated to the module. The amount of I/O references required by the module will depend upon its model number. See the following chart:

MODEL	%I	%Q	%AI	%AQ	Byte 1	Byte 2	Byte 3
HE693STP100	16	16	2	6	1	0	0
7HE693STP101				7			
HE693STP110			4	6			
HE693STP111				7			
HE693STP300			2	6			
HE693STP301				7			
HE693STP310			4	6			
HE693STP311				7			

Figure 2-4. I/O Reference and Bytes 1-3 configuration parameters.

The second column of configuration parameters contains a number of additional configuration bytes. The stepper module requires that Byte 1 through Byte 7 be configured. For these parameters, see the chart above for Bytes 1-3, and the chart below for Bytes 4-7.

MODEL	Byte 4	Byte 5	Byte 6	Byte 7
HE693STP100	0	0	0	0
7HE693STP101				
HE693STP110	Encoder Type	Encdr. Multiplier (01-FF)H	Encoder Divisor (01-0F)H	Encdr. Tolerance (00-FF)H
HE693STP111				
HE693STP300	0	0	0	0
HE693STP301				
HE693STP310	Encoder Type	Encoder Multiplier	Encoder Divisor	Encoder Tolerance
HE693STP311				

Figure 2-5. Bytes 4-7 configuration parameters.

Bytes 4-7 are utilized by those indexer models which feature encoder feedback capability. Byte 4 configures the type of encoder used (see Figure 2-6), Byte 5 and 6 set the encoder multiplier and divisor, and Byte 7 sets the encoder tolerance. For details on encoder feedback operation, see Chapter 5.