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Series Six ™ I/O Controller for GE Fanuc Series 90™- 70 PLCs

Product Specifications and Installation Data

24 MAY 2002

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Preface

This manual explains how to use the Horner APG Series Six™ I/O Controller for use with the GE Fanuc Series 90™-70 and CEGELEC Alspa 80-75 family of Programmable Logic Controllers.

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About the Program Examples

The example programs and program segments in this manual are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liablity for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing the I/O Controller to appropriately design the end system, to appropriately integrate the I/O Controller 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.

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CHAPTER 1: GETTING STARTED

1.1 Overview

The HE697BEM600 allows external power supplies to be used to power the Series 90-30 PLC. The Adapter is configured for use with a power supply that supplies 5 VDC and 24 VDC. A Power Supply OK (PSOK) signal is required from the external power supply to allow proper shutdown of modules in the rack before power loss.

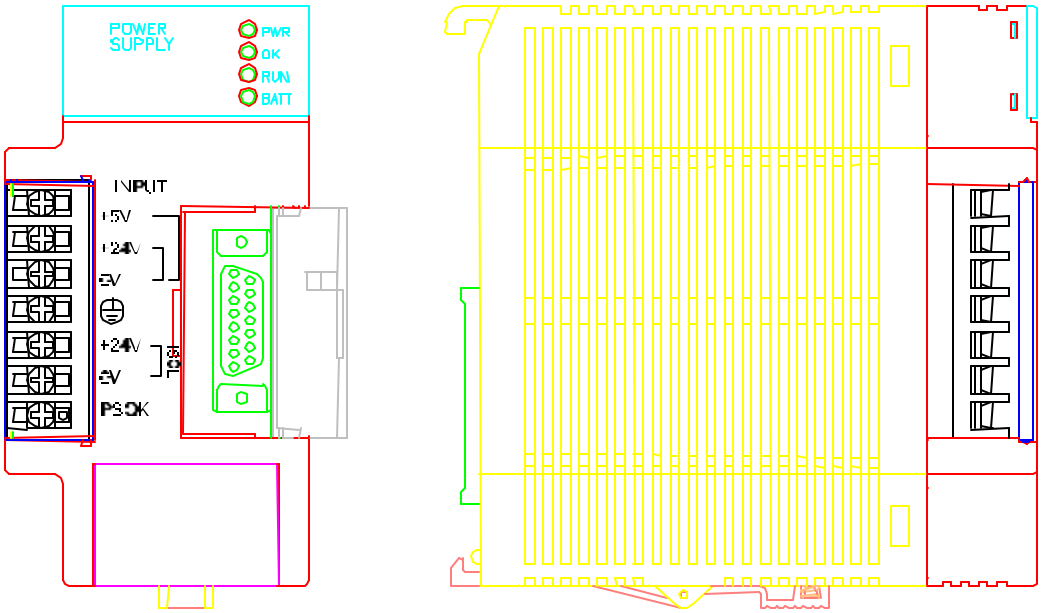


Figure 1.1 – HE693PWR524 Module

1.2 Specifications

Table 1.1 – HE693PWR524 Specifications

HE693PWR524 Specifications		External Power Supply Requirements	
Maximum Power	30 Watts @ 5VDC	Remote Sense	Adjustable to 6.0 V
		Power Fail	4 ms before loss of 5 or 24V
	30 Watts @ 24VDC	5VDC Supply	+/-.1V @ 6 Amps
		24VDC Supply	+/-2.5 V @ .63 Amps
	30 Watts @ 24VDC Isolated	Output Ripple	+/-1% p-p max
		Output Noise	+/-5% p-p max (100kHz – 50mHz)
		Protection	Overvoltage / Overcurrent

1.3 Product Description

The HE697BEM600 is an intelligent Series 90-70 I/O module that can be programmed to control an entire chain of Series Six I/O (up to 8096 input points and 8096 output points). Multiple BEM600 modules can be installed in a system (up to 63 modules, 510,048 input points and 510,048 output points.)

The BEM600 consists of a GE Fanuc Series 90-70 Programmable Coprocessor Module (IC697PCM711), with a custom daughter-board designed, installed, and tested by Horner Electric. Custom firmware has also been written and installed on the module in EPROM (no battery back memory is required).

A single custom ladder logic function block has been developed in "C" programming language for inclusion into the user's ladder logic program. This function simplifies the transfer of control and status information between the PLC and the BEM600 module. The function block is included on the supplied floppy disk.

1.4 Hardware Installation

The BEM600 module can be placed in any slot of a Series 90-70 rack. There are no hardware jumpers or switches to manipulate on the BEM600 module. Follow the guidelines for the Series 90-70 I/O module installation to insert the BEM600 module into the Series 90-70 rack.

1.5 LM90 Configuration

The BEM600 module is configured as a GE Fanuc Series 90-70 Programmable Coprocessor Module (IC697PCM711), using the local "PCM CFG" configuration, see figure 1-1:

1). Invoke Logicmaster, select Series 90-70 <Shift – F5>.

2). Enter the Logicmaster Configuration Package <F2>.

3). Select I/O Configuration <F1>.

4). Highlight the desired slot (of the desired rack) using the arrow keys, select the PCM711 module (<F8> <F1>), then press the <ENTER> key to zoom into that slot.

5). Press the <DOWN-ARROW> key until the "Config Mode" parameter is highlighted, then press the <TAB> key until the "PCM CFG" selection appears, then press the <ENTER> key (configure no memory expansion).

6). Press the <ESC> key twice to save the selection and return to the main menu. If the message, "No memory expansion as been configured, continue?", appears, press Y to continue. Then follow the GE Fanuc documentation to store the new configuration to the PLC.

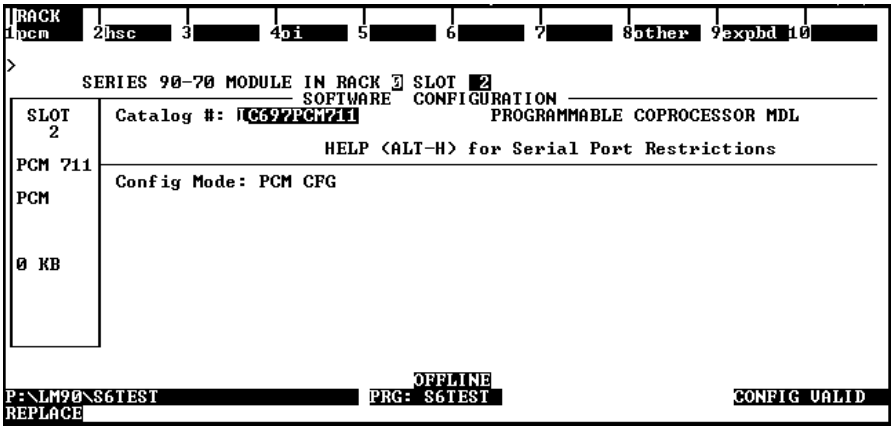


Figure 1.2 - Software Installation

Before the module can be used, the interface function block must be installed. The included floppy disk contains the S6_IOC.EXE file. This file must be imported into the LM90-70 library and then into the user's ladder folder before it will be available for use. To install the function block:

1). Invoke Logicmaster, select Series 90-70 <Shift-F5>.

2). Enter Logicmaster Programming Package <F1>.

3). Select Program Block Librarian <F6>.

4). Select Add Element To Library <F6>.

5). Insert the supplied floppy disk into the A: drive and enter the following filename at the "NEW ELEMENT" parameter: *A:\S6_IOC.EXE*

6). Press the <DOWN-ARROW> key to move the highlight to the "ELEMENT TYPE" field and press the <TAB> key twice to select "EXTERNAL BLOCK", then press <ENTER>.

7). Logicmaster will prompt you for the number of input/output parameter pairs, press the <3> key. Logicmaster will prompt you to verify the name and number of pairs, press <Y> if all is correct.

8). Logicmaster should import the S6_IOC function into the 90-70 library. Press the <ESC> key to return to the Librarian menu, then press the <F3> key to enter the "Import Library Element To Folder" function.

9). The S6_IOC function should appear in the upper box, and should be highlighted. Simply press the <ENTER> key to import the S6_IOC function into the current folder. Logicmaster will prompt for verification, press <Y>.

10). Press the <ESC> key twice to return to the main menu, the BEM600 is now ready to be programmed. If multiple BEM600s are to be used, it will be necessary to have a S6_IOC function block for each BEM600. Each function block will have a different name assigned to it in the library, and each block must be imported into the folder.

NOTES

CHAPTER 2: PROGRAMMING

2.1 Overview

The BEM600 scans the Series Six I/O concurrently with the execution of the ladder program. The ladder programmer must perform the following steps to utilize the BEM600:

1. Select the %R registers to be assigned for the Series Six inputs, outputs and status (this will be discussed in detail later).

2. To output data from the Series Six, write the values to the %R registers designated for Series Six outputs.

3. Use the S6_IOC function block to initiate the Series Six I/O scan. The parameters supplied to the S6_IOC function block determine whether the 90-70 ladder program will wait for the S6_IOC block to complete (when the specified Series Six is complete and new input data input is available), or whether the 90-70 ladder scan will execute concurrently while the Series Six scan takes place.

4. Upon completion of the Series Six scan, the function block's output energizes to indicate that new Series Six input data is available in the designated %R registers.

5. Continuously perform steps 3 and 4 to perform error checking.

2.2 Initiating the Series Six Scan

The S6_IOC function block is used to initiate the Series Six scan. The function block can be inserted into the ladder program by pressing <F1><Shift-F9><F1> (INSERT, CONTRL, CALL) and entering the S6_IOC function name. This function block requires 3 input parameters and 3 output parameters. The block appears as follows:

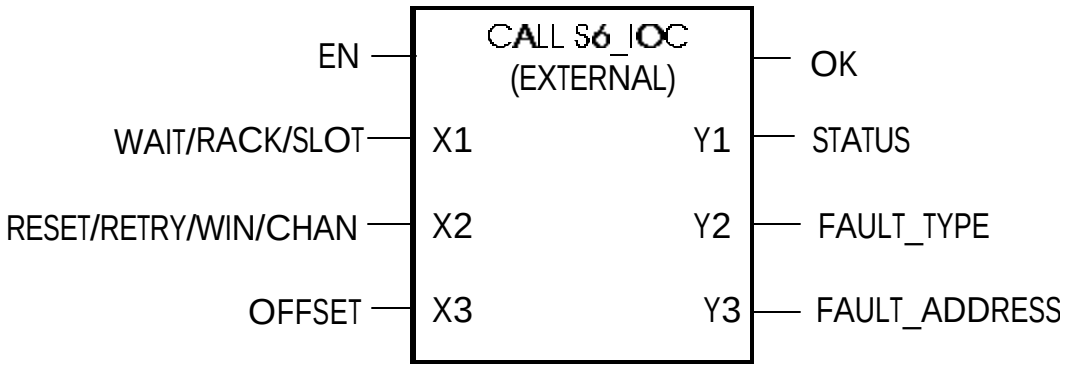


Figure 2-1 S6_IOC function block

EN The function block will execute when this input, Boolean function enable, Receives power.

OK The Boolean status output energizes when the previous Series Six scan is complete and new input and status data is available.

WAIT/RACK/SLOT A 16-bit value (constant or register) whose most significant bit is set to enable "wait" mode. This will force the S6_IOC block to "wait" until the Series Six scan is complete and the input data has been transferred before returning to the ladder program. The remainder of the upper byte contains the RACK number of the BEM600 to access (0 to 7). The lower byte contains the SLOT number of the BEM600 (2 to 9).

RESET/RETRY/ WIN/CHAN A 16-bit value (constant or register) whose upper byte is used to define the output disable and programmable window cycle transfer time:

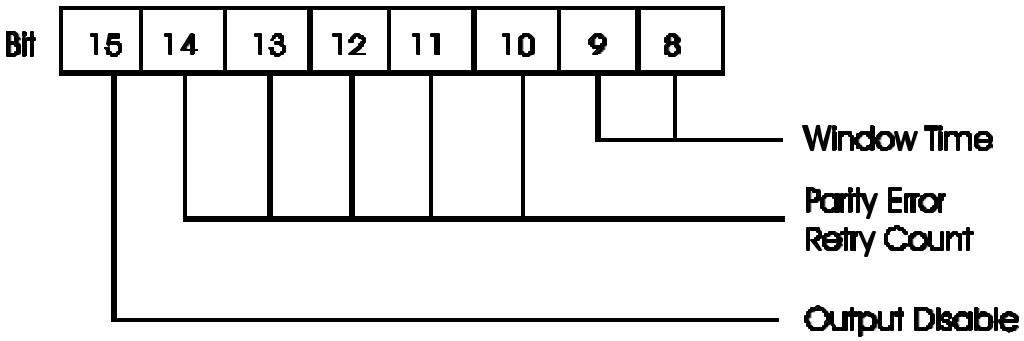


Figure 2-2 Bit Map

Set the most significant bit of this value to 1 if the Series Six outputs are to be Disabled. To enable the outputs, set the most significant bit to 0.

The "retry count" is a binary value from 0 to 31 that represents the number of retry cycles the BEM600 will execute before returning a parity error.

The lower byte is a "bit-mapped" value where each bit represents a channel on the Series Six chain (up to eight channels are available in expanded mode, only one channel is available in normal (non-expanded) mode). If bit 0 is set, channel 1 is scanned. If bit 0, 1, and 4 are set, channels 1, 2, and 5 are scanned. In normal mode, simply set the lower byte to 1.

OFFSET A 16-bit value(constant or register) that specifies which %R register marks the beginning of the Series Six I/O data transfer table (1 to 15288).

STATUS Zero if execution is successful, non-zero for error conditions:

127 (7FH)	Not used
126 (7EH)	Bad OFFSET specified
125 (7DH)	Bad RACK or SLOT specified
124 (7CH)	Not ready for specified command
123 (7BH)	Busy, Series Six scan in progress

FAULT_TYPE If an error occurs during the I/O scan, the error type is reported here as follows:

0 – No error
1 – Input
2 – Chain parity error
4 – Open chain error

FAULT_ADDRESS If an input parity error occurs (and persists through the specified number of retries), this return value will contain the Series Six bus address of the input module reporting the parity error. If no parity error is reported, this value is zero.

2.3 Reading Series Six Inputs and Status

The S6_IOC function block's power flow output is only energized if the scan is complete. This indicates that the specified Series Six input and status are read from the BEM600 into the input and status section of the specified %R registers.

2.4 Register Mapping

It is very important that the user have a firm understanding of the register "mapping" before writing any ladder logic. The BEM600 module requires the use of %R register memory for the transfer of data. The programmer is free to select the starting %R reference address. All data is transferred consecutive from the starting %R reference address.

The transfer data is organized into 4 sections:

Series Six output data	(64 words per channel)
Series Six input data	(64 words per channel)
Series Six present status	(8 words per channel)
Series Six channel status	(1 word per channel)

The output data is 64 words (or 128 bytes) per channel. Each bit of output data can control a single Series Six output point. The BEM600 addressing is the same as the Series Six.

The input data is 64 words (or 128 bytes) per channel. Each bit of input data can represent the state of one Series Six input point. The BEM600 addressing is the same as the Series Six.

The input present status table is 8 words (16 bytes) per channel. Each bit of the status table is set to indicate whether an input card was emitting data during the 8-bit Series Six I/O cycle. The least significant bit of the first word represents the first 8 I/O points, etc.

The channel status word contains bit-mapped information regarding the state of each channel. The lower byte of this value contains the status data received from the I/O transmitter. The upper byte contains the following additional diagnostics: See figure 2-3.

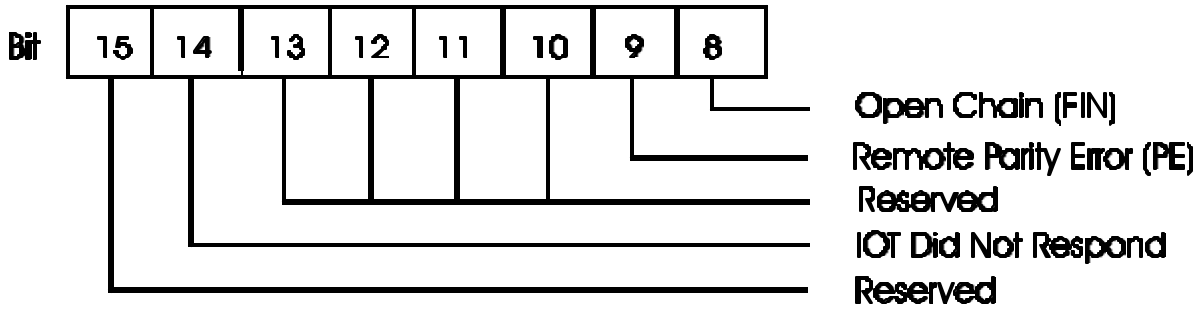


Figure 2-3 Channel Status

If only 1 channel is specified, this table will contain data exactly as shown above starting at the specified %R register. If more than one channel is scanned, these tables will increase in size such a manner as to keep the input and output data consecutive. If channel 1 and 2 are specified and the OFFSET is 100; the transfer data table will appear as follows:

Channel 1 output data	(64 words)	%R100-%R163
Channel 2 output data	(64 words)	%R164-%R227
Channel 1 input data	(64 words)	%R228-%R291
Channel 2 input data	(64 words)	%R292-%R355
Channel 1 input present data	(8 words)	%R356-%R363
Channel 2 input present data	(8 words)	%R364-%R371
Channel 1 channel status	(1 word)	%R372
Channel 2 channel status	(1 word)	%R373

This consecutive order holds true even if the specified channels are not consecutive. If channels 1, 3, and 7 are specified with the same OFFSET, the transfer data transfer table will appear as follows:

Channel 1 output data	(64 words)	%R100-%R163
Channel 3 output data	(64 words)	%R164-%R227
Channel 7 output data	(64 words)	%R228-%R291
Channel 1 input data	(64 words)	%R292-%R355
Channel 3 input data	(64 words)	%R356-%R419
Channel 7 input data	(64 words)	%R420-%R483
Channel 1 input present status	(8 words)	%R484-%R491
Channel 3 input present status	(8 words)	%R492-%R499
Channel 7 input present status	(8 words)	%R500-%R507
Channel 1 channel status	(1 word)	%R508
Channel 3 channel status	(1 word)	%R509
Channel 7 channel status	(1 word)	%R510

If all 8 channels are selected, 1096 %R registers will be required. Keep in mind that the 90-70 only allocates 1024 %R registers by default. If more %R registers are required, they must be allocated in the CPU configuration.

2.5 PLC Fault Notification

The BEM600 is capable of generating 3 different faults in the 90-70 PLC fault table. The fault generated will list the RACK and SLOT number along with one of the following faults:

0.1 Application Msg (z): Rx-Sy, S6 Fault Chain
0.1 Application Msg (z): Rx-Sy, S6 Remote Parity
0.1 Application Msg (z): Rx-Sy, S6 Input Parity

Rx-Sy contains the RACK and SLOT number of the offending BEM600, and z indicates the specified Series Six channel number (1 to 8).

Note that each error can be logged once for each channel scanned and will not log another entry for an offending channel until an error-free scan is realized.

The following example illustrates the use of the S6_IOC function block:

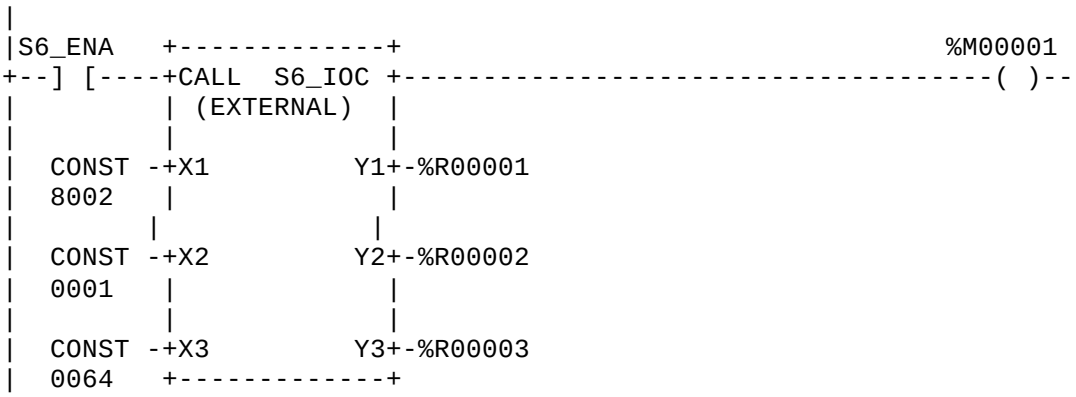
It is up to the programmer to decide whether the S6_IOC block is always enabled or selectable. In the following example, S6_ENA contact, nickname assigned to the contact, controls the S6_IOC block. When enabled by the S6_ENA contact, the S6_IOC block will execute in “wait” mode (MSB of the first parameter set). This means that the function will initiate the Series Six scan specified by the second parameter and will wait (delay the ladder program) until the BEM600 module indicates that the specified Series Six scan is complete and the new input and status data is available.

If “no wait” mode is selected, the S6_IOC block will first check to see if a scan is already in progress. If a scan is in progress, it will then check to if the pending scan is complete. In either case, control passes immediately back to the 90-70 ladder program.

When the scan is complete, the S6_IOC block will attempt to transfer the data for channel 1 into the register table beginning at %R100.

If an error occurs during the scan or data transfer, power flow is inhibited and an error is reported to the status output.

In the example below, the %M00001 coil is energized each time the Series Six scan completes successfully. This allows synchronization of the 90-70 ladder program with the Series Six.



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