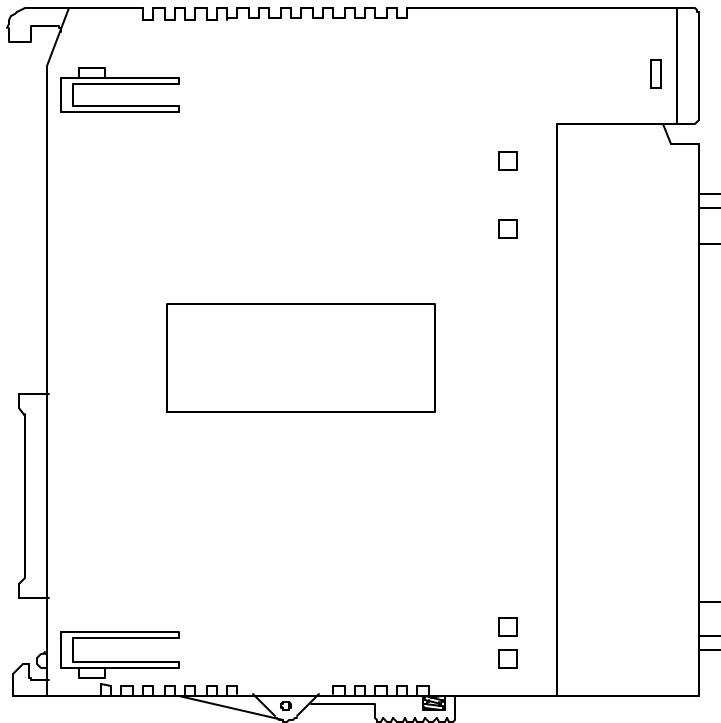
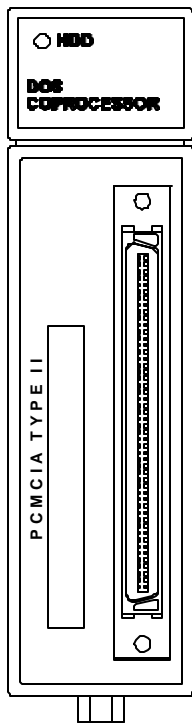




DOS Coprocessor Module

User Manual for the
HE693PCCXXX



PREFACE

This manual explains how to use the DOS Coprocessor Modules for use with the GE Fanuc Series 90 and CEGELEC Alspa 8000 family of Programmable Logic Controllers.

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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.

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CHAPTER 1: INTRODUCTION

Congratulations on your purchase of the DOS Coprocessor for the GE Fanuc Series 90-30 PLC! This product brings the power of a full personal computer to the Series 90-30 backplane. It was designed using state-of-the-art, miniaturized components providing a product which is compact, rugged, and powerful. This product allows customers to take advantage of the proliferation of personal computers and the multitude of software and peripherals available for that platform.

1.1 What is the DOS Coprocessor?

The DOS Coprocessor is a single-slot Series 90-30 module. As its name implies, it is a coprocessor, designed to provide processing power asynchronously with the PLC CPU. The coprocessor does not directly control PLC I/O, but performs some other function(s) which the PLC CPU is incapable of performing, or which if performed by the PLC CPU would adversely affect its performance.

Almost all PLC Lines feature coprocessor modules, but what sets the Horner Electric DOS Coprocessor apart is the fact that it is based on standard personal computer (PC) hardware in an extremely compact package. The usage of standard PC hardware allows users to choose from the many software and development packages designed for that platform. The compactness of this hardware package allows it to be used anywhere in which a Series 90-30 PLC can reside. The use of highly integrated components not only allows for a compact package, but provides a high degree of reliability and ruggedness.

The DOS Coprocessor communicates to the Series 90-30 backplane through a high performance, dual port RAM interface. A dedicated microprocessor handles bus communications, maximizing throughput without delaying the personal computer microprocessor. The DOS Coprocessor appears to the Series 90-30 CPU as a module with 16%I and (up to) 198 %R registers.

1.2 What you have:

The DOS Coprocessor packaging should include the following:

- ✓ DOS Coprocessor Module
- ✓ Microsoft™ MS-DOS 6.2 Manual and Master Diskettes
- ✓ External DIN rail mounted I/O Board (POD)
- ✓ High Density Cable (connects POD to module)
- ✓ Setup Utility Diskette
- ✓ This Manual

1.3 What you need:

The DOS Coprocessor module will require at least the following:

- ✓ Keyboard (PS/2 Style connector)
- ✓ Monitor (VGA or LCD)
- ✓ POD Mounted Floppy drive accessory (HE693ACC355) or Serial Transfer Program (i.e. LapLink™)

1.4 Product Features

- ✓ Epson™ CARDIO™ integrated package (credit card size), including
 - ✓ Intel 386™ SL or 486TMDX microprocessor
 - ✓ 1MB, 4MB, or 8MB RAM
 - ✓ Keyboard Interface (PS/2™ Style)
 - ✓ RS-232 port
 - ✓ RS-485 port (15-pin, SNP pinout)
 - ✓ Parallel port
 - ✓ Mouse Port (PS/2™ Style)
 - ✓ VGA connector (CRT)
 - ✓ LCD display connector (Mono-STN or color TFT)
 - ✓ Floppy Disk Controller

- ✓ PCMCIA ATA Hard Disk Drive (100MB or greater) or
- ✓ PCMCIA ATA Flash Disk Drive (10MB or 20MB)
- ✓ Dedicated 89C31 microprocessor for Series 90-30 bus communications
- ✓ Microsoft™ MS-DOS™ 6.2 pre-installed

1.5 Specifications

Model (HE693PCCxxx)	314	344
PC Specifications		
Microprocessor	Intel 386SL	
Main Memory (RAM)	1	4
Hard Drive Size	42MB	
Hard Drive Access Time	15ms, average	
Video Resolution	640 x 480 (VGA)	
PLC Interface Specifications		
Number of PLC Slots	1	
PLC I/O Interface	16 %I, 2-198 %R (1-99 in, 1-99 out)	
Power Consumption (w/o floppy)	800mA @ 5VDC	
Power Consumption (w/ floppy)	1250mA @ 5VDC	
Environmental & Physical		
Temperature	-5 to +55°C	
Relative Humidity	8 to 80% RH non-condensing	
Connector POD Dimensions (w/ FDD)	5.75"(146mm)W x 4.5"(114mm)H x 3"(76mm)D	
Minimum Enclosure Depth	12" (305mm)	
Noise Immunity (Conformance)		
IEC801-2 (Electro-Static Discharge)	Level 3	
IEC801-4 (Burst-test Communications)	Level 3	
IEC801-4 (Burst-test Power)	Level 4	

CHAPTER 2: PERSONAL COMPUTER HARDWARE

The DOS Coprocessor is a highly integrated package consisting of 5 main components, listed below:

- ✓ CARDIO Integrated Package
- ✓ Hard Drive
- ✓ PCMCIA Socket
- ✓ Connector Pod
- ✓ Series 90-30 Bus Interface

2.1 CARDIO Integrated Package

The CARDIO package integrates the key personal computer components in a credit card-sized form factor. The block diagram is shown in **Figure 2-1** below:

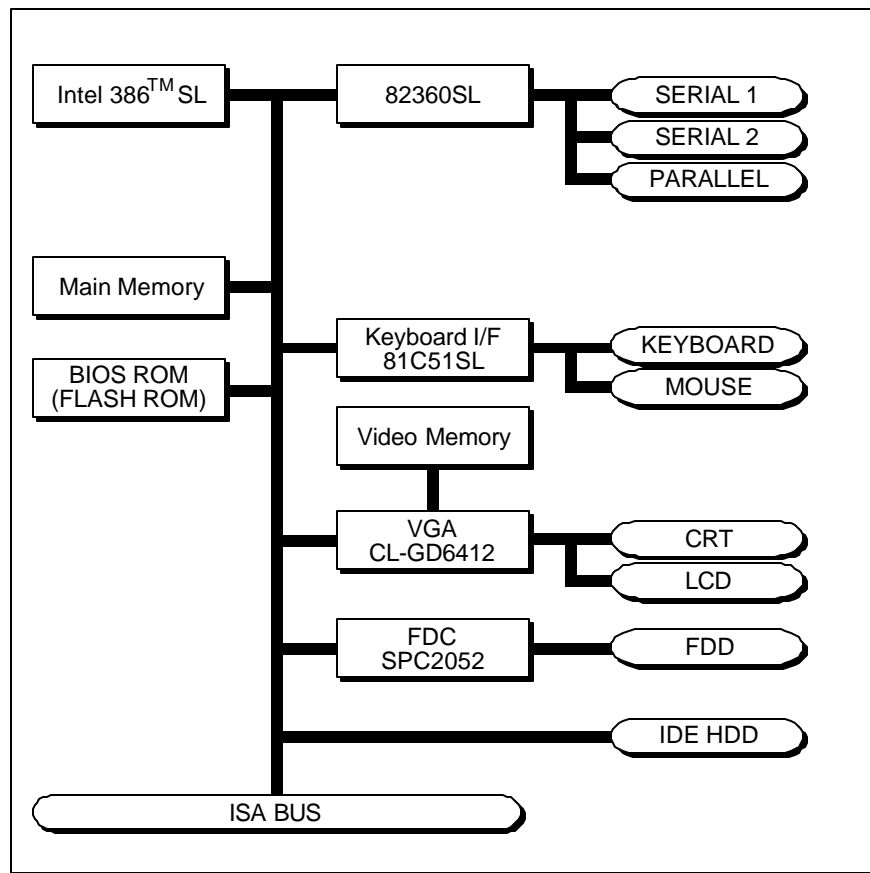


Figure 2-1. CARDIO Block Diagram

The CARDIO resides on the DOS Coprocessor main circuit board in a 236-pin socket. Because it is socketed, the CARDIO unit can be easily upgraded. **Figure 2-2** shows the CARDIO form factor:

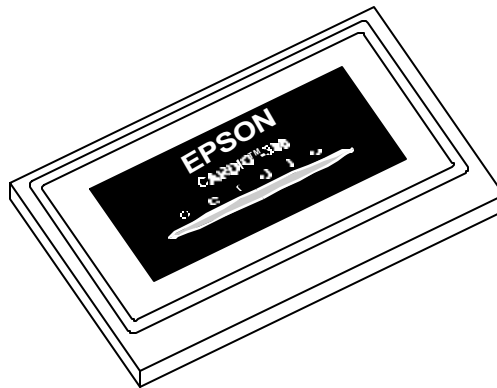


Figure 2-2. Epson CARDIO Form Factor

2.2 Hard Drive

The Dos Coprocessor module features a very compact, rugged hard drive from Hewlett Packard Company, the "Kittyhawk." The hard drive measures only 2" x 1.5" x .42" and is available in a 40MB version. The hard drive is mounted on the DOS Coprocessor's secondary board. The drive is preconfigured at the factory as drive C: with MS-DOS 6.2 installed. No further setup of the drive should be necessary.



Figure 2-3. Hewlett Packard Kittyhawk Hard Drive

2.3 PCMCIA Socket

The DOS Coprocessor's secondary board includes a PCMCIA socket. "PCMCIA" stands for "Personal Computer Memory Card International Association." This is an organization which established standards for compact, credit card-sized memory cards for personal computers. The form factor standards established by this organization have been adopted for many different peripherals besides memory cards. Modems, Ethernet cards, etc. are examples of peripherals which are available in this form factor. PCMCIA established four different sizes of sockets, Type I, Type II, Type III, and Type IV. These socket types vary by the width of the cards which they will accept. The DOS Coprocessor PCMCIA socket is Type II, supporting Type I and Type II cards.

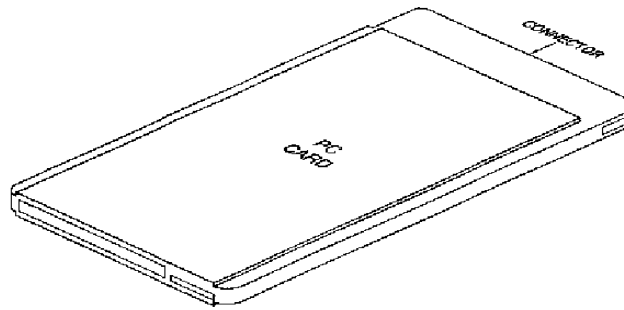


Figure 2-4. Example PCMCIA Type II Peripheral

PCMCIA cards are typically provided with software drivers from the manufacturer. These should allow the peripheral to operate with most computers. However, because PCMCIA is a fairly new standard, compatibility problems can exist from card-to-card and computer-to-computer. Horner Electric is testing a variety of PCMCIA peripherals. Ethernet and Fax/Modem cards tested with the DOS Coprocessor are available from Horner Electric.

2.4 Connector Pod

The DOS Coprocessor has a 100-pin high density connector on the front of the module. A 12-15 inch molded, shielded cable is provided to connect the DOS Coprocessor module with a DIN-rail mountable Connector Pod. This Connector Pod provides standard PC connections for peripherals such as keyboards, printers, etc. to be connected to the module. **Figure 2-5** shows the front panel layout of the module, and **Figure 2-6** shows the Connector Pod layout.

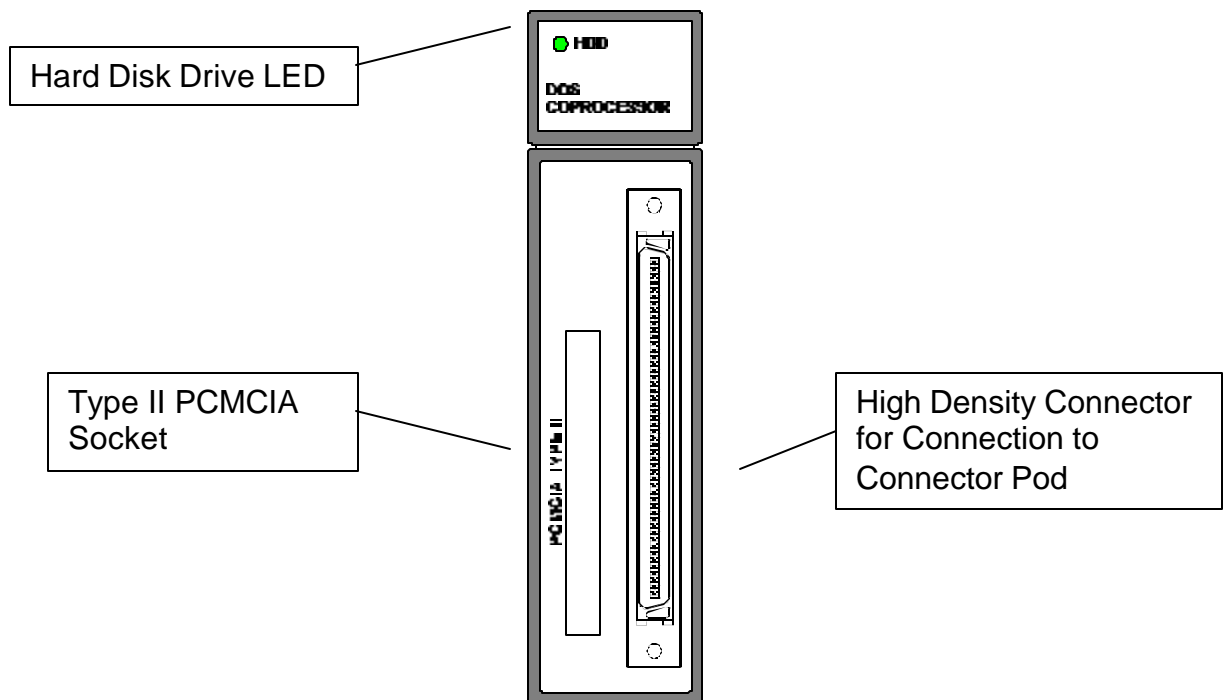


Figure 2-5. Front Panel Layout

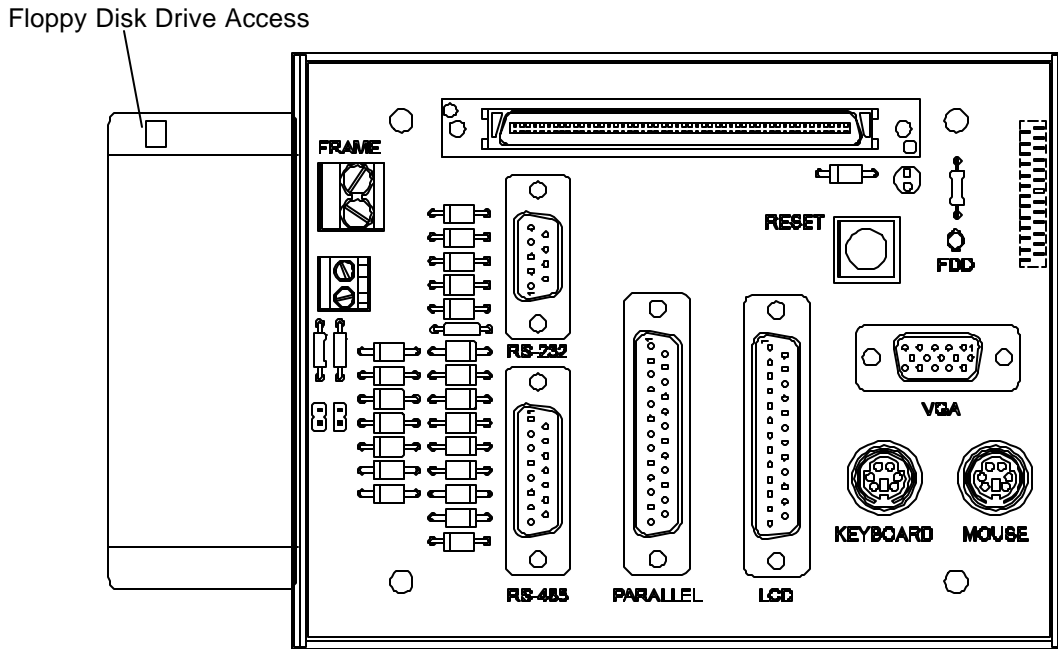


Figure 2-6. Connector Pod Layout

2.4.1 Printer Port

The Connector Pod features a standard, 25-pin D-subminiature Parallel Port. This is a standard pinout, compatible with commercially available parallel printer cables.

2.4.2 COM Port Connections

The serial cable contains two ports. COM1 is an RS-232 port with a DB9 male connector. The pinout is compatible with devices designed to connect to a standard personal computer 9-pin serial port. The pinout for COM1 is shown in **Table 2-1**. COM2 is an RS-485 port with a DB15 female connector. The pinout is the standard SNP pinout and is shown in **Table 2-2**. When connecting this port to a Series 90 PLC, a reversing cable should be used (such as a Horner Electric HE693CBL 150 or GE Fanuc IC693CBL303).

Pin	Signal	Function	I/O
2	RXD	Receive Data	In
3	TXD	Transmit Data	Out
5	GND	Signal Ground	n/a
7	RTS	Request to Send	Out
8	CTS	Clear to Send	In

Table 2-1. COM1 RS-232 pinout.

Pin	Signal	Function	I/O
6	RTS-	Request to Send (-)	Input
7	GND	Signal Ground	n/a
8	CTS+	Clear to Send (+)	Out
9	TERM	Terminating Resistor	Out
10	RXD-	Receive Data (-)	Out
11	RXD+	Receive Data (+)	Out
12	TXD-	Transmit Data (-)	In
13	TXD+	Transmit Data (+)	In
14	RTS+	Request to Send (+)	In
15	CTS-	Clear to Send (-)	Out

Table 2-2. COM2 RS-485 pinout.

Two jumpers on the Connector Pod pertain to the RS-485 port. JP1 should only be jumpered when using Horner Electric's Hand Held Emulation software. JP2 should only be jumpered when 5V is to be provided to the RS-485 port. For instance, if a Horner Electric SNP adapter is to be connected to the RS-485 port, JP2 should be present to provide power to that device. **If a Series 90-30 is connected to the RS-485 port, JP2 must be absent; otherwise serious damage can be made to the Series 90-30 Power Supply**

2.4.3 LCD Display Port

Due to the multitude of LCD displays on the market and the lack of a standard pinout, the DOS Coprocessor does not include a cable for the LCD Display Interface. The pinout is compatible with Flat Panel LCD Displays available from Horner Electric. Contact Horner Electric for LCD display compatibility for other LCD displays.

2.4.4 VGA Port

The Connector Pod provides a standard DE15 female connector for connection to VGA Monitors (CRTs). This is sometimes known as a 15-pin "high density" connector as 15 pins reside in a connector the same width as a DB9 connector.

2.4.5 Keyboard & Mouse Ports

The Connector Pod contains 6-pin, "PS/2" style mouse and keyboard connectors. Standard keyboards with this connector are widely available. To connect keyboards with the larger, "AT style" connector, adapter cables are available from computer supply stores.

2.4.6 Reset Pushbutton

For convenience, a momentary Reset Pushbutton is present on the Connector Pod. This causes a “soft boot” or “warm boot” of the DOS Coprocessor

2.4.7 Floppy Diskette Option

For those who order the HE693ACC355 factory installed floppy diskette option, a high density, 3.5” floppy drive is installed within the Connector Pod. This drive is accessible from DOS as Drive A. When this option is used, power draw of the DOS Coprocessor is increased from 800mA to 1250mA.

2.4.8 Frame Ground Connection

Horner Electric's DOS Coprocessor has been carefully designed to withstand harsh industrial environments. The key to the success of this design is a solid ground connection made to the Connector Pod. A two-position terminal strip is present on the POD labelled :FRAME GROUND” for this purpose. Two 10 gauge conductors should be connected between this terminal strip and the control panel earth ground. **Without a proper Earth Ground, the noise immunity of the DOS Coprocessor is reduced significantly.**

2.4.8 External Power Connector

Because of the significant power consumption of the DOS Coprocessor (up to 1.2A @ 5VDC with the floppy drive option), the module has been designed to accept external power. A two-position terminal strip labelled “P4” is present on the Connector Pod and may be used to connect external 5VDC power supplies. The Connector Pod is labelled to indicate the proper polarity of the connection. Before external power can be provided at these terminals, a jumper must be moved within the DOS Coprocessor Module Assembly. **Equipment damage will result if power is provided to the Connector Pod without removal of this jumper. Contact Horner Electric for detailed instructions on this process.**

CHAPTER 3: PLC CONFIGURATION

The DOS Coprocessor resides in any Series 90-30 rack as an I/O module. It is assigned 16 digital input points (%I), and up to 198 registers (%R). Because it is an I/O module, the PLC slot must be configured, mapping the I/O to the desired location in the PLC I/O table. Traditionally, module configuration is accomplished with a GE Fanuc Hand Held Programmer, or more commonly with Logicmaster 90-30. Unfortunately, at the time of this printing **Logicmaster 90-30 version 4.02 does not support configuration of the DOS Coprocessor**. This situation will be rectified in a future release. Therefore, module configuration must be accomplished with the GE Fanuc Hand Held Programmer.

3.1 Coprocessor Status Bits (%I)

The DOS Coprocessor is assigned 16 %I bits for module status. These may be mapped to any valid %I addresses, which will vary with Series 90-30 CPU model. The status bits are defined in **Table 3-1**.

Bit #	Description
1	PC Application Running
2 to 16	Reserved

Table 3-1. Status Bits (%I)

The "PC Application Running" status bit will remain on as long as the software in the DOS Coprocessor is reading or writing the module I/O at a minimum interval. This interval is defined as the "Minimum PC Time", which is set through module configuration. This configuration parameter may have a value of 1 through 255, with each count equivalent to a 100mS delay.

3.2 I/O Words (%R)

The DOS Coprocessor may be assigned from 2 to 198 %R registers for passing data back and forth to the PLC CPU. This is unique for a Series 90-30 I/O module. Traditionally, only %I, %Q, %AI, and %AQ data types may be assigned to a I/O module. These data types define the form of data (bit or word) and whether it is being "written to" or "read by" the PLC CPU. Register data (%R) is traditionally data internal to the PLC CPU, whose value is determined by the PLC ladder logic, or in some cases by an external serial device connected to the PLC programming port (CIMPLICITY™, MMI, etc.).

In order for data to be successfully passed back and forth between the DOS Coprocessor and the PLC CPU, the %R registers are sub-divided as two distinct types. Word data written by the DOS Coprocessor and read by the PLC CPU is "Register Input Words" (%RI). Word data written by the PLC CPU and read by the DOS Coprocessor is defined as "Register Output Words" (%RQ). A total of up to 198 %R registers, consisting of up to 99 %RI and up to 99 %RQ words may be assigned to the module. The %R addresses of the %RI and %RQ registers do not have to be contiguous. It is also legal to assign 0 %RI and/or 0 %RQ words to a module.

3.3 Hand Held Programmer Configuration



With the Hand Held Programmer Configuration, the following DOS Coprocessor parameters are configured:

- 1) Number of %RI words (1-99)
- 2) Starting %R address for %RI words
- 3) Number of %RQ words (1-99)
- 4) Starting %R address for %RQ words
- 5) Minimum Time the DOS Coprocessor will wait before turning off the "PC Application Running" Status bit (1-255 in 100mS increments)

If unfamiliar with the GE Fanuc Series 90-30 Hand Held Programmer, you may wish to consult its user's manual.

Make sure that the PLC is in "STOP" mode. Select "Configuration" from the HHP main menu. Cursor over to the slot containing the DOS Coprocessor with the DOWN key.

On the following page is an example configuration of the DOS Coprocessor. In this example, a DOS Coprocessor is installed in slot 5 of the CPU rack (Rack 0). Fifty (50) %RIs are assigned to %R1-50, and 10 %RQs are defined from %R51-60. The Minimum PLC Time is configured at 150ms.

Keystroke	Display
	R0:05 EMPTY <S
READ	R0:05 READ <S
ENTER	R0:05 PCCxxx <S I16:I _
1	R0:05 PCCxxx <S I16:I0001-0016
ENTER	
	R0:05 PCC %RIs<S IGNORE DEVICE
R	R0:05 PCC %RIs<S R
ENTER	
5	R0:05 PCC %RIs<S R0050: R
0	
ENTER	
1	R0:05 PCC %RIs<S R0001-0050
ENTER	
	R0:05 PCC %RQs<S IGNORE DEVICE
R	R0:05 PCC %RQs<S R
ENTER	

Keystroke	Display
