HE800JCM100

SmartStack™ Engine
Interface Module

First Edition
08 June 2001

PREFACE

This manual explains how to use the Horner APG SmartStack™ Engine Interface Module.

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

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG. ("HE-APG") warrants to the original purchaser that SmartStack™ Engine Interface Module manufactured by HE 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 SmartStack™ Engine Interface Module. THIS WARRANTY SHALL NOT APPLY TO THIS SmartStack™ Engine Interface Module 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 SmartStack™ Engine Interface Module IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

In no event, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, shall HE or its suppliers be liable of any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of original purchaser's customers for such damages.

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 SmartStack™ Engine Interface Module to appropriately design the end system, to appropriately integrate the SmartStack™ Engine Interface Module 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.

TABLE OF CONTENTS

NOTES

CHAPTER 1: INTRODUCTION

1.1   Scope

The supplement for the SmartStack™ Engine Interface Module provides information that is pertinent to the setup and operation of the HE800JCM100 (JCM100) module.

Chapter One covers the features and hardware description of the JCM100 module. Installation procedures are covered in Chapter Two. Chapter Three covers the functionality of the JCM100. Finally, Appendix A covers the wiring of the serial ports.

Installation and configuration procedures that are common to all SmartStack Modules are contained in the Control Station Hardware Manual (MAN0227).

1.2   Hardware Description

The JCM100 module utilizes state-of-the-art electronic components on a six-layer copper-clad printed circuit board for electrically quiet operation. **It uses the same hardware as the ASCII Basic module. HE800ASC100).** Two important precautions must be observed while handling the module:

WARNING
NEVER insert or remove the module into or out of the OCS/RCS unit while power is applied to the backplane.

WARNING
ALWAYS observe reasonable static discharge precautions while handling the module. Touch a grounded metal surface to discharge any static buildup before touching the module.

1.2.1   Primary Serial Port

The PRIMARY port located on the front of the JCM100 Module incorporates a 9-pin D-type connector for standard cable interface (See **Appendix A** for wiring diagrams).

There are two LEDs (Light Emitting Diodes) located on the end of the module. They are labeled according to the RS-232 signal name to which they are connected. The GREEN LED illuminates whenever data is transmitted from the module, and the RED LED illuminates whenever data is received by the module.

1.2.2   PLC Interface

Proprietary circuitry is used in the interface between the JCM100 Module and the OCS/RCS. This circuitry provides up to 128 WORDS (sixty-four 16-bit %AI input and sixty-four 16-bit %AQ output) for both the OCS/RCS and the JCM100. Circuitry and software are provided in the firmware to insure data integrity on both sides.

1.2.3   Secondary Serial Port

The JCM100 Module is equipped with a secondary serial port. This port is multiplexed between RS-232 and RS-485. The pin-outs/connections for both ports are shown in **Appendix A**. By default, the JCM100 module uses the RS-232 port (Port 1) for communication with an Engine Control Module. **The JCM100 does not use the RS-485 port.**

The module also has two LED's located on the module's front panel behind the plastic window (on the end of the module) for each auxiliary port. They are labeled according to the RS-232 or RS-485 signal name to which they are connected. The GREEN LED illuminates whenever data is transmitted from the Engine Interface MODULE while the RED LED illuminates whenever data is received by the Engine Interface MODULE.

1.3   Specifications

Table 1.1 – JCM100 Specifications			
Number of communication ports	3 ports (Two RS-232 ports), (Currently not used – reserved for future use: One RS-485/422 port)	**Status LEDs**	RXD/TXD for all ports
Required Power (Steady State)	34.0mA @ 5VDC	**CE**	Pending
Required Power (Inrush)	89.6mA @ 5VDC in 10μS	**UL**	Pending
Relative Humidity	5 to 95% Non-condensing	**Terminal Type**	9-Pin D-Subs
Operating Temperature	0° to 60° Celsius	**Weight**	9.5 oz. (270 g)

CHAPTER 2: INSTALLATION

2.1   Module Placement

The JCM100 is one of the many SmartStack Option Modules that are available for use in the Operator Control Station (OCS100/OCS200) and the Remote Control Station (RCS210). Compact and easy to install, up to four Smart Stack Modules can be placed into each device. Although Chapter Two contains pertinent installation information for the JCM100, consult the Control Station Hardware User Manual (MAN0227) for complete details covering panel box requirements and other key installation issues pertaining to SmartStack Option Modules, OCS, and RCS devices.
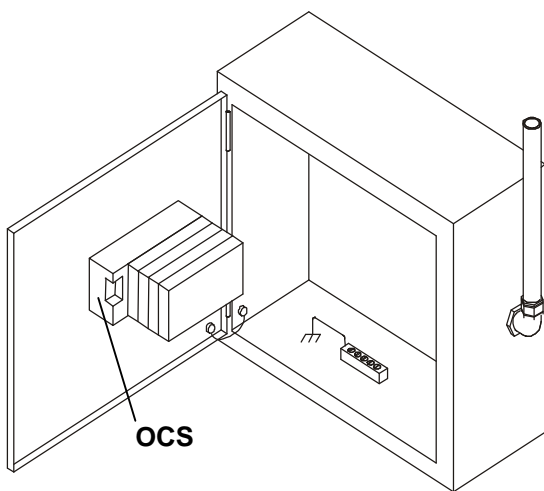
Figure 2.1 - Back View of OCS
(Shown with Four SmartStack™ Modules)
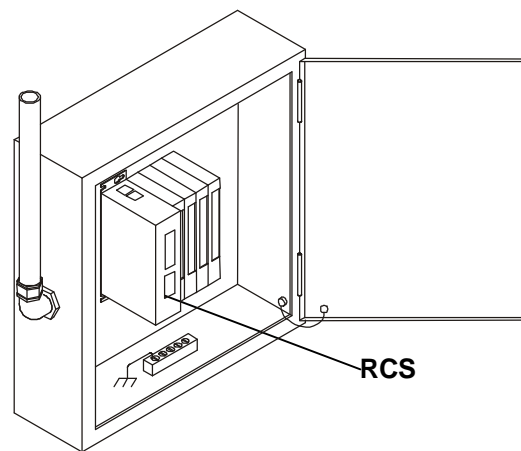
Figure 2.2 - RCS in Panel Box
(Shown with Four SmartStack™ Modules)

Caution: Do not install more than four SmartStack Modules per OCS or RCS. Improper operation or damage to the OCS, RCS, and SmartStack Modules could result.

2.2   Ports and Pin-outs

The PRIMARY or programming port (Labeled as P0 on the module) follows the RS-232 standard. This port is only used for **firmware upgrades**.

The SECONDARY port is RS-232 (Labeled as P1 on the module). This port (P1) is used for the connection to an Engine Control Module.

Table 2.1 – Port 0/1 Pin-out		
Direction	**Pin**	**JCM100**
		Port 0/1
Output	1	**DCD** (Data Carrier Detect)
Output	2	**RXD** (Receive Data)
Input	3	**TXD** (Transmit Data)
Input	4	**DTR** (Data Terminal Ready)
GND	5	**Signal Ground**
Output	6	**DSR** (Data Set Ready)
Input	7	**CTS** (Clear to Send)
Output	8	**RTS** (Request to Send)
Output	9	**RI** (Ring Indicate)

Note: For ports 0 and 1, the signal names reflect the EIA RS232 signal names for a DCE device.

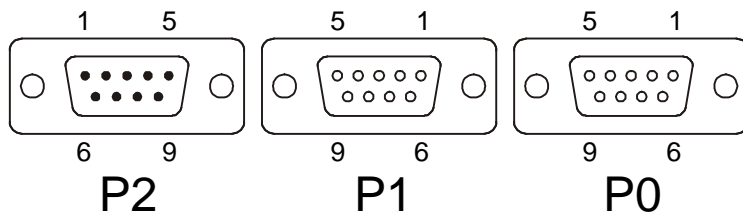The names do not necessarily reflect the signal direction with respect to the JCM100 module.

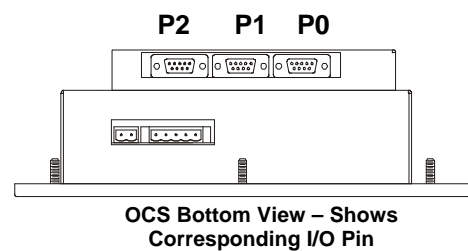Figure 2.3 – Close-up of Port Connectors

Figure 2.4 – Port Connectors

2.3   Installing and Removing a SmartStack Module (Shown with the OCS)

The following section describes how to install and remove a SmartStack Module.

Caution: To function properly and avoid possible damage, do <u>not</u> install more than four Smart Stack™ Modules per OCS or RCS.

a.   Installing SmartStack Modules

1. Hook the tabs. Each SmartStack Module has two tabs that fit into slots located on the OCS. (The slots on the OCS are located on the back cover.)
2. Press the SmartStack Module into the locked position, making sure to align the SmartStack Module fasteners with the SmartStack receptacles on the OCS.

b.   Removing SmartStack Modules

1.   Using a <u>flathead screwdriver</u>, pry up the end of the SmartStack Module (opposite of tabs) and swing the module out.
2.   Lift out the tabs of the module.
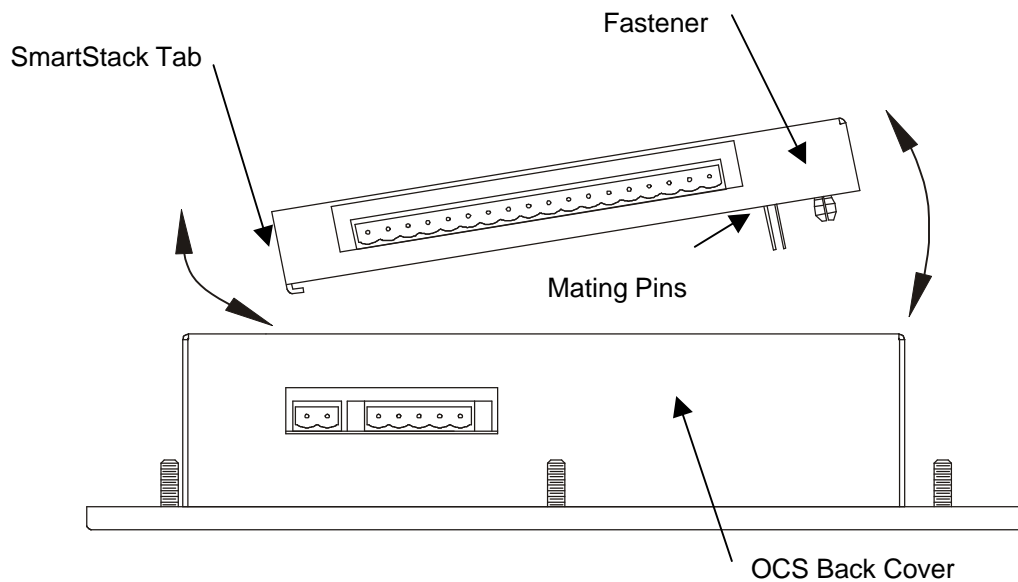
Figure 2.5 – Installing a SmartStack™ Module in an OCS.

2.4   Configuration Procedures Using Cscape Software

2.4.1   Preliminary Configuration Procedures

The SmartStack configuration is accomplished through the Configure Controller Type Dialog.

1. From the Main Menu, select `Controller|Configure` for the following dialog:
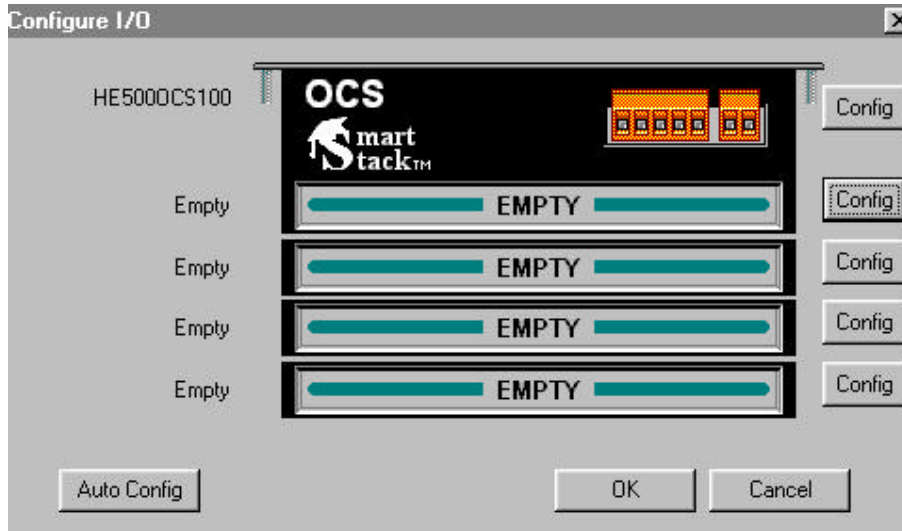
Figure 2.6 – Configure Controller Type Dialog

Note: Ensure that the proper controller is selected. If it is <u>not</u> selected, double-click on the box and select the desired controller from the pull-down menu. Press the OK button.

If the OCS/RCS has one or more SmartStack™ Modules already installed, the user can use <u>AutoConfig</u> to determine and set the I/O automatically. If the controller is <u>not</u> physically attached to Cscape or its SmartStack™ Modules are <u>not</u> available, use the <u>manual configuration</u>.

The user can choose to do the following:

a.   Add a SmartStack I/O Module

> **Caution: To function properly and avoid possible damage, do not install more than four Smart Stack™ Modules per OCS or RCS.**

1.   To place a SmartStack I/O module into an empty slot, ADD the module. From the CONFIGURE I/O Dialog, click on the **Config** button to the right of the desired module or double-click on the empty slot. Either method invokes the SmartStack Module Selection Dialog:
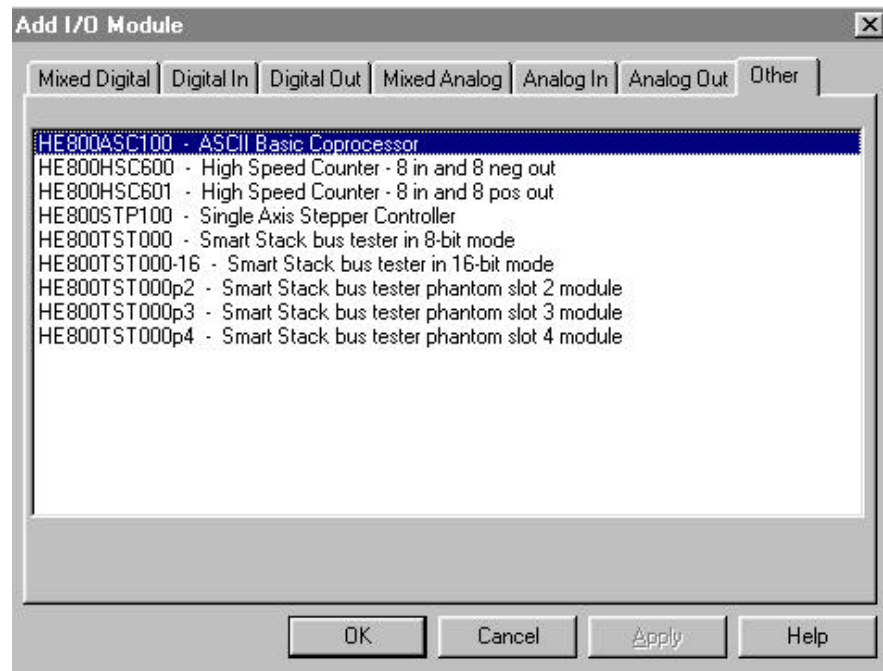

Figure 2.7 – Add I/O Module Screen
("Other" selections are shown.)

2. Use the mouse to select the type of module desired. The JCM100 is a specialty module. Select the **Other** tab. Select the desired module

> **Note: Because the JCM100 uses the same hardware as the ASC100, *select the ASC100 module*) and click the OK button.**

b.   Delete a SmartStack Module

If the desired SmartStack slot shows a module already installed, the module can be deleted.

1. Right-click on the picture of the configured slot. A floating menu appears.
2. From the menu, click on DELETE MODULE.

c.   Select a Different SmartStack Module

If the desired SmartStack slot shows a module already installed, the module can be replaced with a different module.

1. Right-click on the picture of the configured slot. A floating menu appears.
2. From the menu, click on 1. REPLACE MODULE. This invokes the SmartStack Module Selection Dialog.
3. Use the mouse to select the desired module and then click OK.

2.4.2   Configuration of JCM100 Module

The screen now depicts that the appropriate controller has been selected. It also depicts that the ASC100 has been selected, **although the actual module selected is JCM100**. Again, the *JCM100 uses the same hardware as the ASC100.*

The desired module is ready to be configured.

1. Double-click on the picture of the module or click on the **Config** button just to the right of the picture.
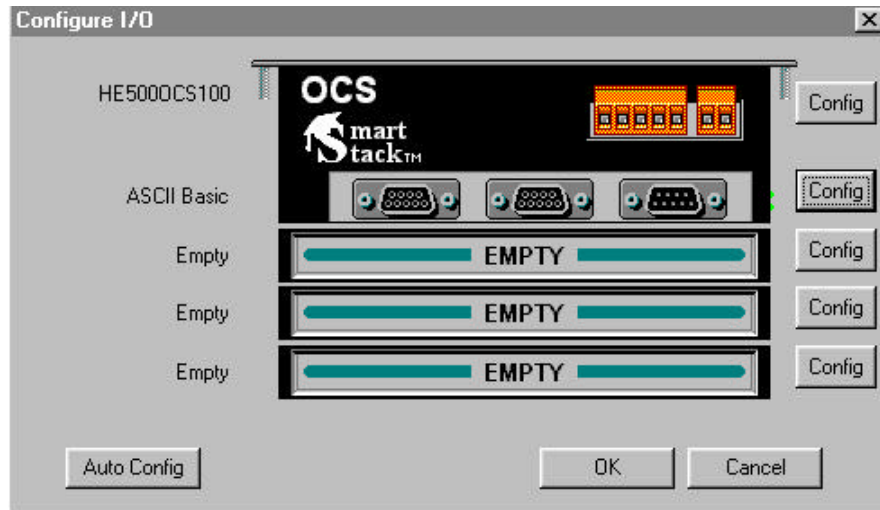
Figure 2.8 – Configure I/O Screen

The following screen appears:
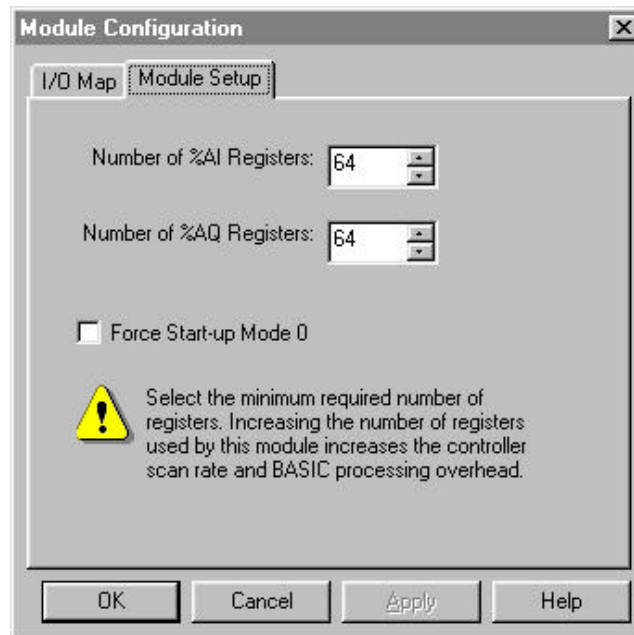
Figure 2.9 – Module Configuration Screen

Use the Default of 64 %AIs and 64 %AQs.

For Cscape configuration purposes, check the box labeled, **Force Startup Mode 0** to force the module into **Startup Mode 0** during the next power-up.

3. Select I/O Map for a summary of the I/O devoted to the module and where within the PLC register space the I/O is. The following screen appears:
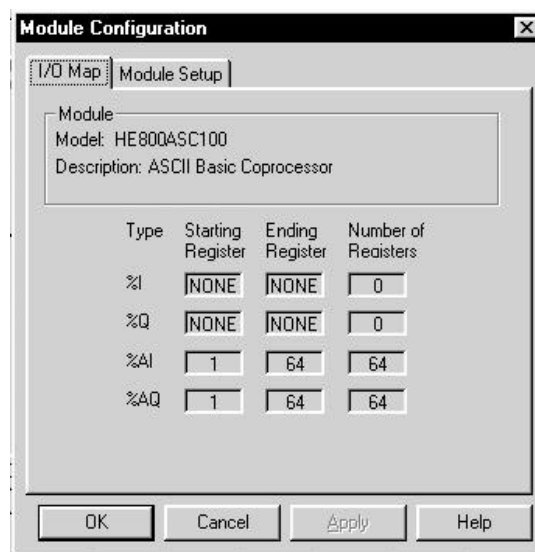
Figure 2.10 – I/O Screen

NOTES

CHAPTER 3: FUNCTIONALITY OVERVIEW

3.1   Overview

The HE800JCM100 module is an interface between an Engine Control Module, which uses the SAE J1587 protocol, and the OCS/RCS Programmable Logic Controller. The JCM100 listens to the J1587 link and provides the selective J1587 data in %AI registers devoted to the module. The values presented in the %AI registers are merely raw data coming from the J1587 link.

The JCM100 supports single data character PIDs 1 through 127 and double data character PIDs 128 through 191. It also supports the diagnostic PIDs and SIDs within PID 194 (when it is transmitted directly, as well as when it is sectioned using PID 192). Refer to SAE J1587 specifications for details on the PIDs such as Bit Resolution, Update Period, etc. JCM100 provides the PID values as Analog Inputs in the %AI registers in the OCS. Each PID is provided in a separate %AI register, so in case of single character PIDs, the data is put in the lower byte of %AI register and the higher byte is set to 0. The PID values are provided as Raw Values and may be scaled in the ladder program running in the OCS. The JCM100 does <u>not</u> currently support **'On Request'** parameters.

NOTE*: It is assumed that the user is familiar with the specifics of the SAE J1587 protocol specification. The J1587 specification is beyond the scope of this manual.*

3.2   Register Mapping

The JCM100 module uses 64 %AI registers, and 64 %AQ registers.

The register mapping is as follows: %AI1 – 45 ➔ Are used for regular PID values
%AI46 – 53 ➔ Are used for diagnostic PID values (Under PID194)
%AI54 – 60 ➔ Are used for diagnostic SID values (Under PID194)
%AI61 – 64 ➔ Diagnostic Data, not mapped to any PID

The default map for the PIDs is given in Table 3.1. **This map may be altered at run time by following procedure:**

1. Enter the regular PIDs (PID 1 to 191) that you are interested in, into registers AQ1 through AQ45. One PID value for each register.

2. Enter the diagnostic PIDs – REGULAR or EXPANSION - (PIDs within PID 194) that you are interested in, in to registers AQ46 through AQ53.

3. Enter the diagnostic SIDs – (SIDs within PID 194) that you are interested in, into registers AQ54 – AQ60.

4. AQ64 is the 'control register'. Enter a non-zero value in AQ64. When the firmware in the JCM100 receives a non-zero value in the control register, it goes into a Pause state, in which the it waits for the control register to be Reset again.

5. Enter '0' in the Control Register. After the control register is reset to 0, the firmware reads AQ registers 1 through 60 and maps the PIDs to the **corresponding** AI registers. You do not need to restart the module; the mapping immediately takes effect.

NOTE: *The register numbers in the above explanation are described as if the register base for the JCM100 module were at %AQ1 and %AI1. However the register base could be at a higher value, so those register numbers would be adjusted accordingly with respect to the register base.*

Table 3.1 – Default Register Map		
AI Register	**PID**	**Description**
1	85	Cruise Control Switch Status
2	84	Vehicle Speed
3	91	Percent Throttle
4	92	Percent Engine Load
5	93	Output Torque
6	94	Fuel Delivery Pressure
7	100	Engine Oil Pressure
8	102	Turbo Boost Pressure
9	108	Barometric Pressure
10	110	Coolant Temperature
11	111	Coolant Level
12	168	Battery Voltage
13	172	Air Inlet Temperature
14	173	Exhaust Gas Temperature
15	174	Fuel Temperature
16	175	Engine Oil Temperature
17	183	Fuel Rate
18	190	Engine Speed
19	98	Engine Oil Level
20	44	Atten./Wrn Indicator Lamp Status
21-45	N/A	Not mapped to PID
46	Diag PID - 94 (REGULAR or EXPANSION)	Fuel Delivery Pressure (if regular PID)
47	Diag PID - 100 (REGULAR or EXPANSION)	Engine Oil Pressure (if regular PID)
48	Diag PID - 102 (REGULAR or EXPANSION)	Boost Pressure (if regular PID)
49	Diag PID - 110 (REGULAR or EXPANSION)	Engine Coolant Temperature (if regular PID)
50	Diag PID - 111 (REGULAR or EXPANSION)	Coolant Level (if regular PID)
51	Diag PID - 172 (REGULAR or EXPANSION)	Air Inlet Temperature (if regular PID)
52	Diag PID - 174 (REGULAR or EXPANSION)	Fuel Temperature (if regular PID)
53	Diag PID - 175 (REGULAR or EXPANSION)	Engine Oil Temperature (if regular PID)
54	Diag. SID – 1	Injector #1 response time
55	Diag. SID – 2	Injector #2 response time
56	Diag. SID – 3	Injector #3 response time
57	Diag. SID – 4	Injector #4 response time
58	Diag. SID – 5	Injector #5 response time
59	Diag. SID – 6	Injector #6 response time
60	Open (SID)	Not originally mapped to any SID
61	N/A	N/A
62	N/A	Processed Messages Index
63	N/A	Stuffing Messages index
64	N/A	Reset Counter

APPENDIX A: SERIAL PORT WIRING

A.1   Primary Port Wiring

The JCM100 Module features two serial ports. The PRIMARY or programming port (Labeled as P0 on the module) follows the RS-232 standard. This port is only used for **firmware upgrades**.

The SECONDARY port is RS-232 (Labeled as P1 on the module). This port (P1) is used for the connection to an Engine Control Module.

The PRIMARY port is typically connected to an IBM compatible personal computer. In this manual, all cable diagrams feature pin-outs are labeled according to function rather than the EIA standard. In the table below, the JCM100 Module's RS-232 pin-out is listed, with the designation used in the wiring diagrams of this manual. Also listed is the direction of the signal.

Table A.1 – Primary Port		
Pin #	Signal Name	Direction
1	(DCD) Always High	Output
2	(TXD) Transmit Data	Output
3	(RXD) Receive Data	Input
4	No Connection	N/A
5	(GND) Signal Ground	N/A
6	(DSR) Always High	Output
7	(CTS) Clear To Send	Input
8	(RTS) Request To Send	Output
9	(RI) Always High	Output

A.1.1   Primary Port Cable Pin-outs.

The following pin-outs show connections to the JCM100 Module's primary RS-232 port. These pin-outs are typical and do not represent all possible connections.
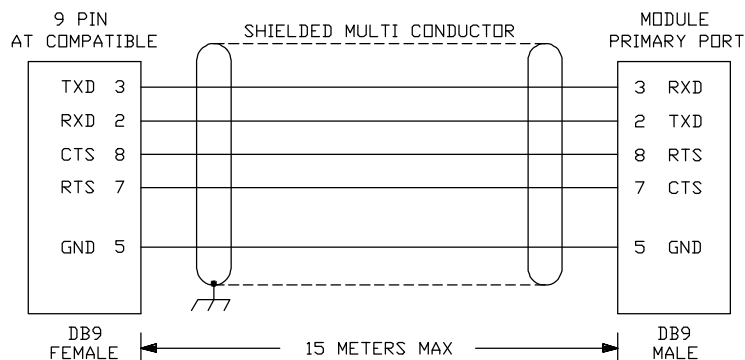

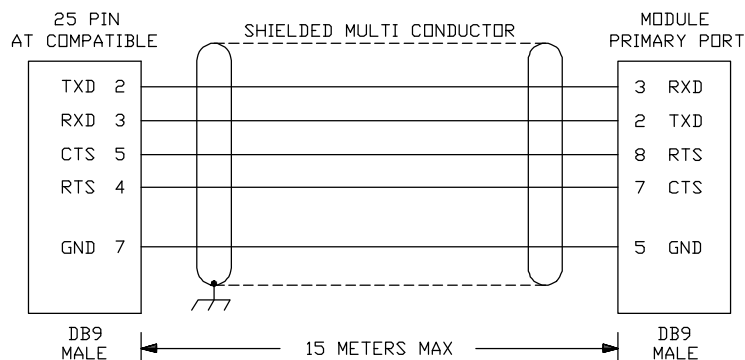**Figure A.1 – PC with 9-pin RS232 Port**

```
    25 PIN                SHIELDED MULTI CONDUCTOR              MODULE
AT COMPATIBLE          ------------------------         PRIMARY PORT

    TXD  2                                                  3   RXD
    RXD  3                                                  2   TXD
    CTS  5                                                  8   RTS
    RTS  4                                                  7   CTS

    GND  7                                                  5   GND


    DB9         |<--------- 15 METERS MAX --------->|       DB9
    MALE                                                    MALE
```

Figure A.2 – PC with 25-pin RS232 Port

A.2   Auxiliary Port Wiring

A.2.1   Pin-out

The Auxiliary serial port (P1) can be made point-to-point over a distance of 50 feet.

In this manual, all cable diagrams feature pin-outs are labeled according to function rather than the EIA standard. In the table below, the JCM100 Module's P1 pin-out is listed with the designation used in the wiring diagrams of this manual. Also listed is the direction of the signal.

Table A.2 – Port 0/1 Pin-out		
Direction	**Pin**	**JCM100**
		Port 0/1
Output	1	**DCD** (Data Carrier Detect)
Output	2	**RXD** (Receive Data)
Input	3	**TXD** (Transmit Data)
Input	4	**DTR** (Data Terminal Ready)
GND	5	**Signal Ground**
Output	6	**DSR** (Data Set Ready)
Input	7	**CTS** (Clear to Send)
Output	8	**RTS** (Request to Send)
Output	9	**RI** (Ring Indicate)
Note: For Ports 0 and 1, the signal names reflect the EIA RS232 signal names for a **DCE** device. The names do not necessarily reflect the signal direction with respect to the JCM100 module.		