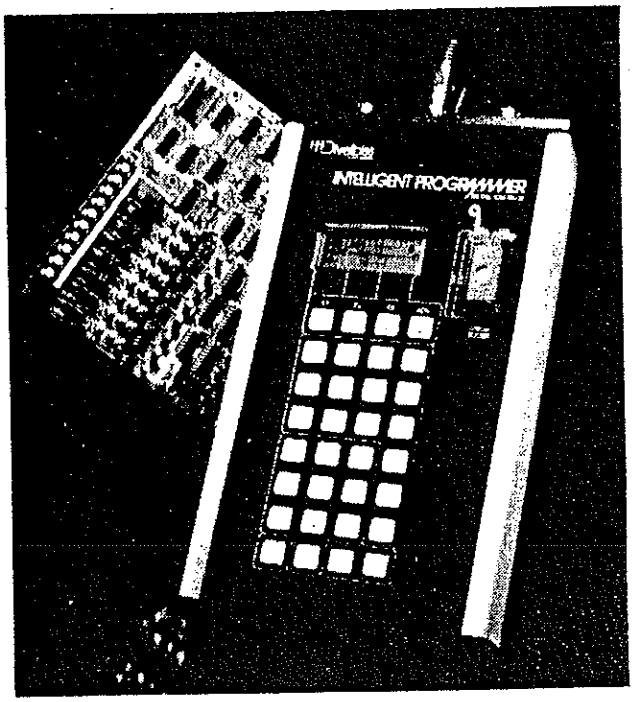
Divelbiss
CORPORATION

MODEL ICM PR-05 INTELLIGENT PROGRAMMER



FOR USE WITH DIVELBISS PROGRAMMABLE LOGIC CONTROLLERS:

USER'S MANUAL

DIVELBISS CORPORATION
9776 MT. GILEAD ROAD
FREDERICKTOWN, OHIO 43019

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The Divelbiss Corporation was organized in 1974 to provide quality electronic engineering, products and assembly services to original equipment manufacturers.

Since then, Divelbiss has evolved into a diversified supplier of sophisticated electronic industrial control modules. We have engineered many complex systems, developed several electronic products for organizations, and supplied assembly services to the commercial, industrial and military markets.

In recent years, we have become the small programmable logic control specialists of the industry. We have developed a line of small control modules to provide only as much controller as necessary for small machine control, sequencing, timing, drum stepper switch replacement, energy management, annunciator and relay replacement.

Having as few as 4 I/O to as many as 256 I/O, the Divelbiss ICM Series--called "Bear Bones"--provides system automation very economically. Since I/O is made up of interchangeable modular elements, a customer can select the controller suited to each application, yet have the versatility for easy expansion using plug-in analog function options or a variety of special function cards.

Divelbiss Programmable Logic Controllers are solid-state industrially hardened boards used to control operations of machines and processes. They are versatile, flexible, and far more cost efficient than "hard-wires" and relay board control systems. Divelbiss PLC's have 491 on board control relays to support your programming needs.

Each Bear Bones, Baby Bear Bones or PIC Baby Bear Bones can be driven directly by a Divelbiss Model ICM-PR-05 INTELLIGENT PROGRAMMER and Interface Model ICM-IF-BB. Each PIC Bear Bones can be driven by a Divelbiss Model ICM-PR-05 INTELLIGENT PROGRAMMER and Emulator Model PIC-EM-02. You can add cable ICM-CA-22 to the Emulator to support all Bear Bones products. You may also use a Divelbiss Erasable Programmable Read Only Memory Chip (EPROM) pre-programmed by the INTELLIGENT PROGRAMMER. The Model ICM-PR-05 INTELLIGENT PROGRAMMER is compatible with any Divelbiss Programmable Logic Controller.

The INTELLIGENT PROGRAMMER is a stand-alone device that can program and perform a number of functions at any work situation adjacent to an electrical outlet. It will also read, edit and program any hexadecimal program.

The INTELLIGENT PROGRAMMER can be used with an optional serial printer for hard copy documentation. An advanced personal computer documentation package is also available from Divelbiss. (See Section D for INTELLIGENT PROGRAMMER options and enhancements.)

NOTE: These introductory remarks deal primarily with the Divelbiss Model ICM-PR-05 INTELLIGENT PROGRAMMER. Complete information on Divelbiss Programmable Logic Controllers can be found in the data sheets distributed with the Controllers.

SPECIFICATIONS

Style	Portable, Stand Alone
Supply Voltage	85-130 VAC, 50/60 HZ
Serial Port	RS-232 to PLC or printer RS-422 to Interface or Emulator
Microprocessor	Z-80
Memory	CMOS RAM 4K up to Version 1.52 16k Version 1.70 & up
Battery Backup	Nickel-Cadmium
Keyboard	32 Multi-Function Membrane Keys
Display	Liquid Crystal (LCD) 4 Rows X 16 Columns
Programming Language	Standard Ladder
Programming Method	Symbol Transfer with Prompts
Security Password	3: OEM, User, Operator
Contact Matrix	8 Columns by 8 Rows per Rung
Error Indication	Messages & Beeper
Dimensions	11 3/4" High 6 5/8" Wide 1 3/4" Deep
Weight	2.2 Pounds
EPROM Socket	28 Pins ZIF

KEYBOARD AND CONTROLS

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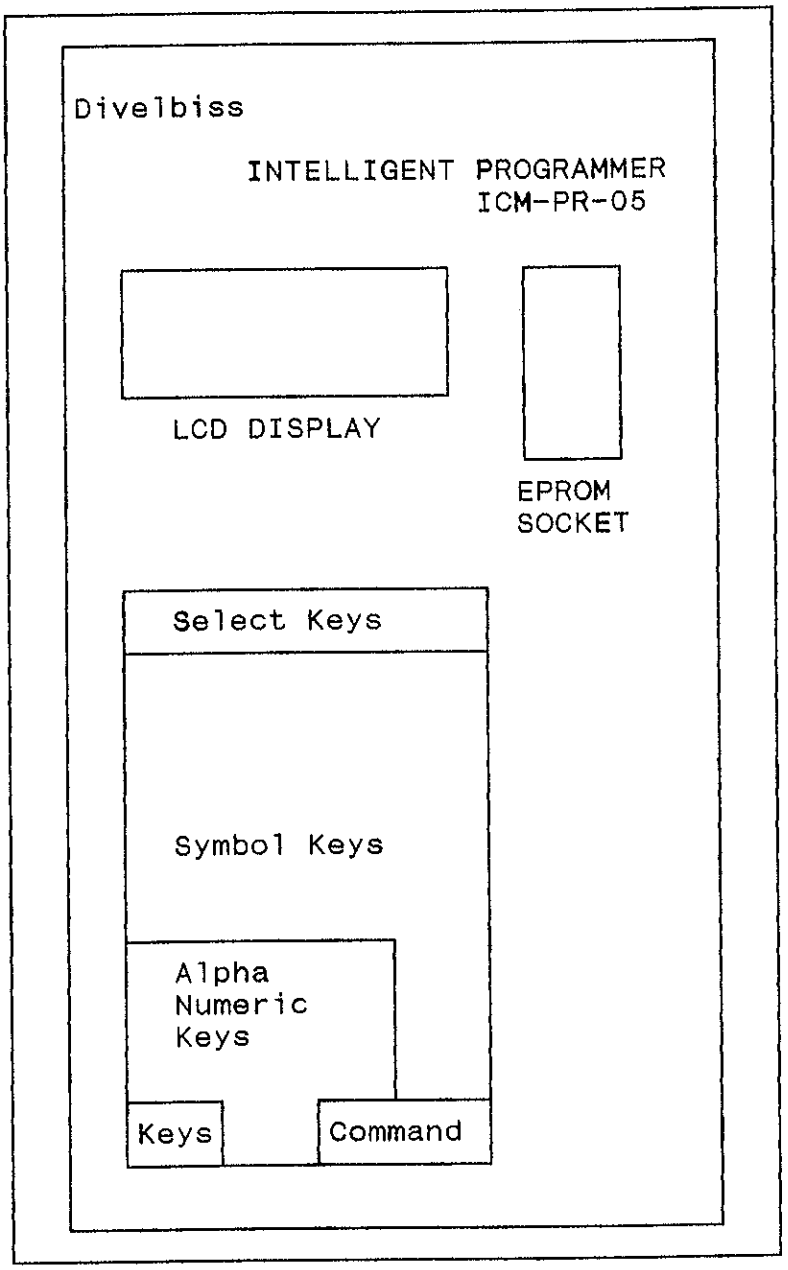
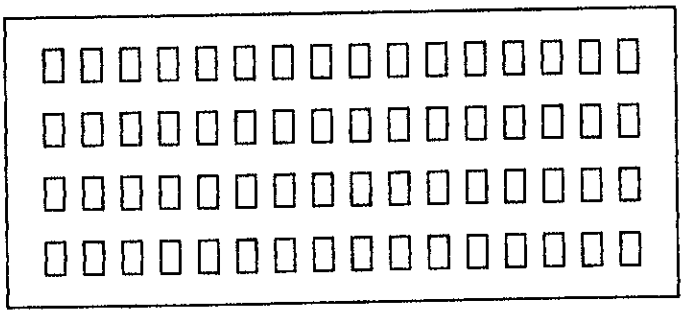
KEYBOARD

Here is the ICM-PR-05 keyboard. Section B contains descriptions of each of the key areas. These descriptions are introductory and are intended to offer a very general idea of how the keyboard is operated. Details of each key and its operation are contained in section C.

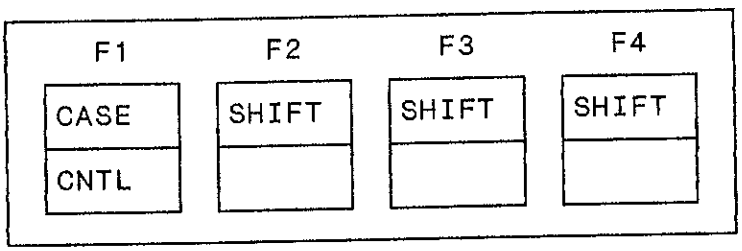


LIQUID CRYSTAL DISPLAY (LCD)



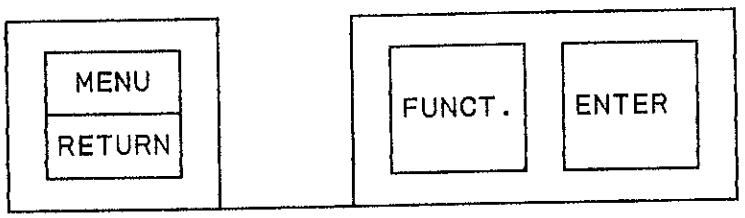
The LCD display is comprised of a format 4 lines by 16 columns. The total number of characters that can be displayed is 64. Ladder elements can be displayed in even numbered columns only. Connective artwork can be displayed in odd numbered columns only. The PR-05 will position the elements for you.

SELECT KEYS



The SELECT KEYS are used to select items from the menus that appear on the LCD display. These keys are also used to move the cursor and to shift between upper and lower case.

COMMAND KEYS



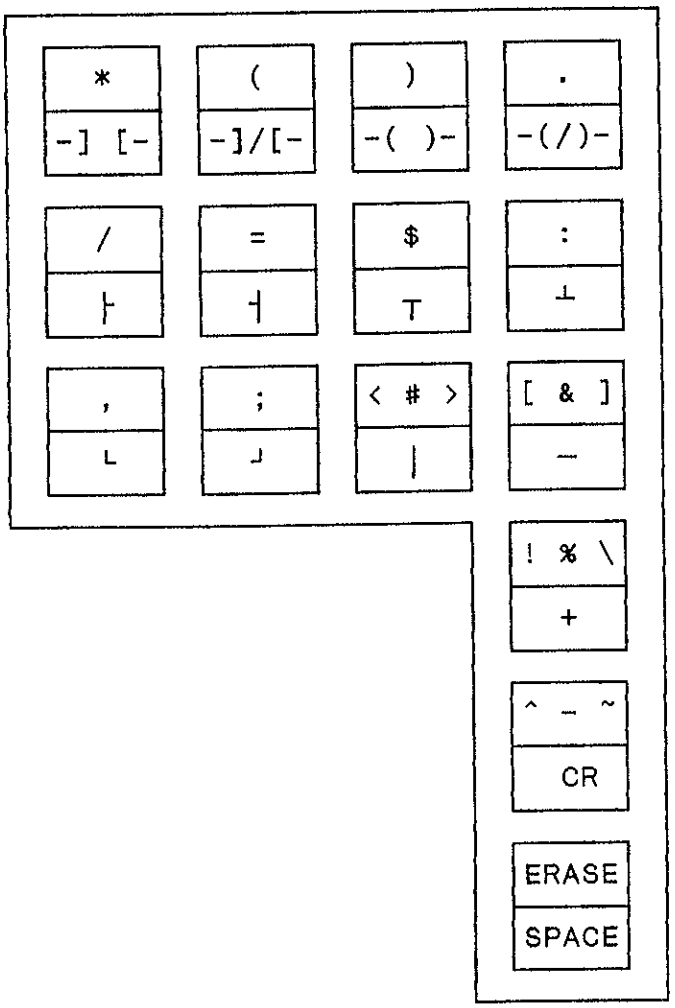
The COMMAND KEYS are used to cause the PR-05 to take a prescribed action.

MENU RETURN Causes the PR-05 to back step one position in the memory system. Pressing this key enough times will return you to the MAIN MENU.

FUNCT. Causes the function sub-menu to be displayed.

ENTER Whatever is displayed will be put into RAM memory when this button is pressed.

SYMBOL KEYS



The lower (white) half of the Symbol Key is used in the Programming Mode. The upper (blue) half is used in the Alpha-Numeric Mode.

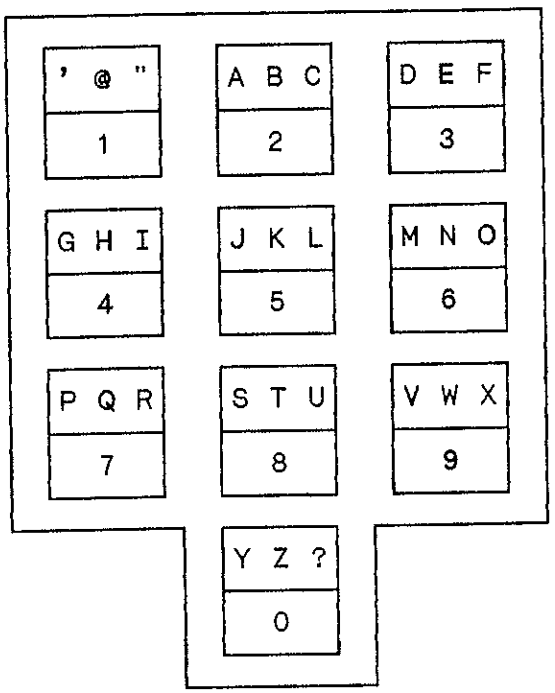
The programming mode is generally described as the ladder diagram part of programming. It includes contact elements, output symbols, numeric addresses, and associated connective artwork.

The Alpha-Numeric Mode is generally described as entering names, revision numbers, passwords and any other items requiring alpha characters.

The table below offers a translation of the ladder elements and artwork symbols.

-] [-	Normally Open Contact or Element		
-]/[-	Normally Closed Contact or Element		
-( )-	Standard Output Symbol		
-(/)-	Complimented Output Symbol		
├	Branch Right	┤	Branch Left
┬	Branch Down	┴	Branch Up
└	Left End	┘	Right End
|	Vertical Line	—	Horizontal Line
		┼	Cross Branch
CR	Internal Control Relay.		
SPACE	Enters a blank space and moves right.		
ERASE	When used with F3 will enter a blank space and moves one column left.		

ALPHA-NUMERIC KEYS



The upper (blue) half of the key is used in the Alpha- Numeric Mode only. The lower (white) half is used in both the Alpha-Numeric and Programming Modes.

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Preliminary

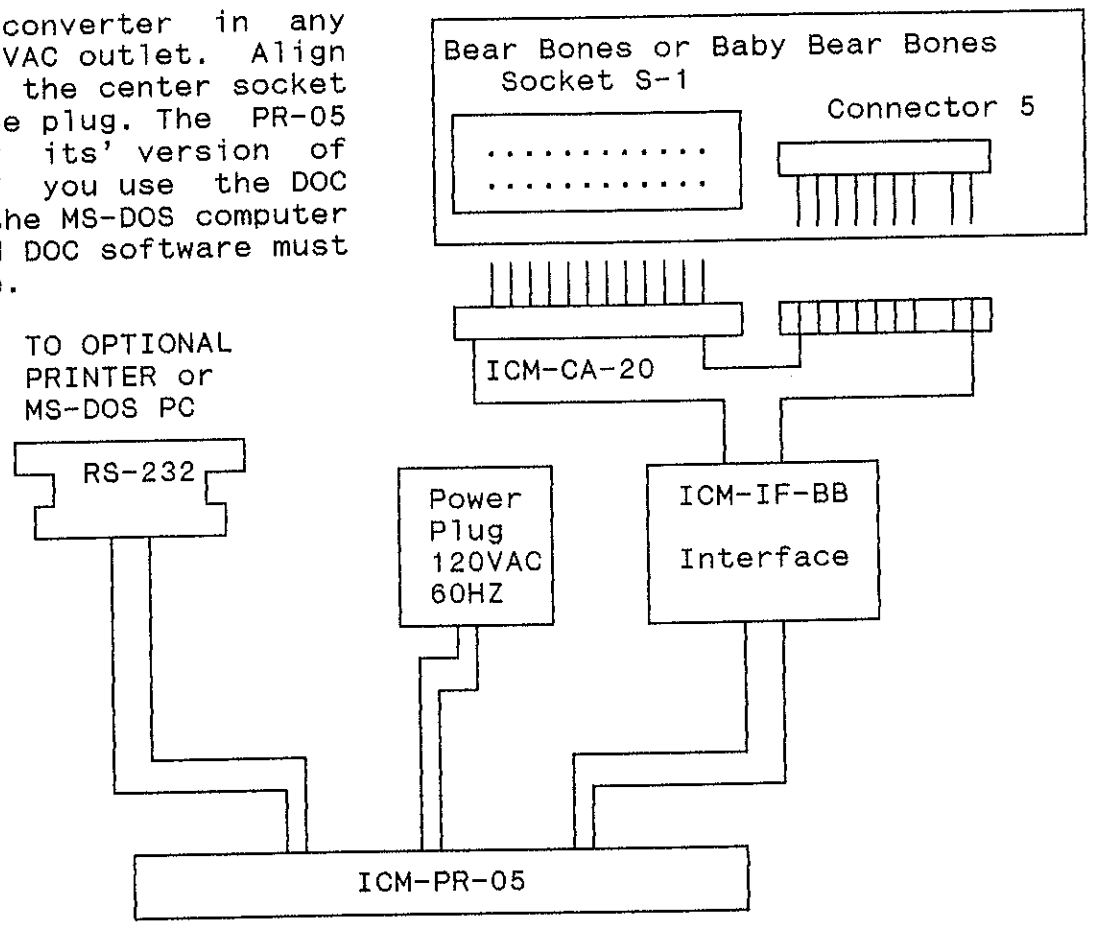
CAUTION: READ THE ENTIRE GENERAL INFORMATION SECTION BEFORE ATTEMPTING TO PROGRAM THE INTELLIGENT PROGRAMMER.

GENERAL INFORMATION for the Bear Bones or Baby Bear Bones

APPLYING POWER

The Intelligent Programmer is supplied with a power converter. Do not attempt to substitute another converter.

Install the converter in any standard 120 VAC outlet. Align the keyway of the center socket and insert the plug. The PR-05 will display its' version of software. If you use the DOC package for the MS-DOS computer the PR-05 and DOC software must be compatible.



Power and interface connections to the INTELLIGENT PROGRAMMER.

To de-energize the INTELLIGENT PROGRAMMER, remove the power cable plug.

NOTE: DO NOT connect the Programmable Logic Controller or Printer/Personal Computer interfaces at this time. These connections will be covered in the POST-PROGRAMMING portion of Section C.

The ICM-IF-BB Interface will work with the Bear Bones and Baby Bear Bones. It will not work with the PIC Bear Bones.

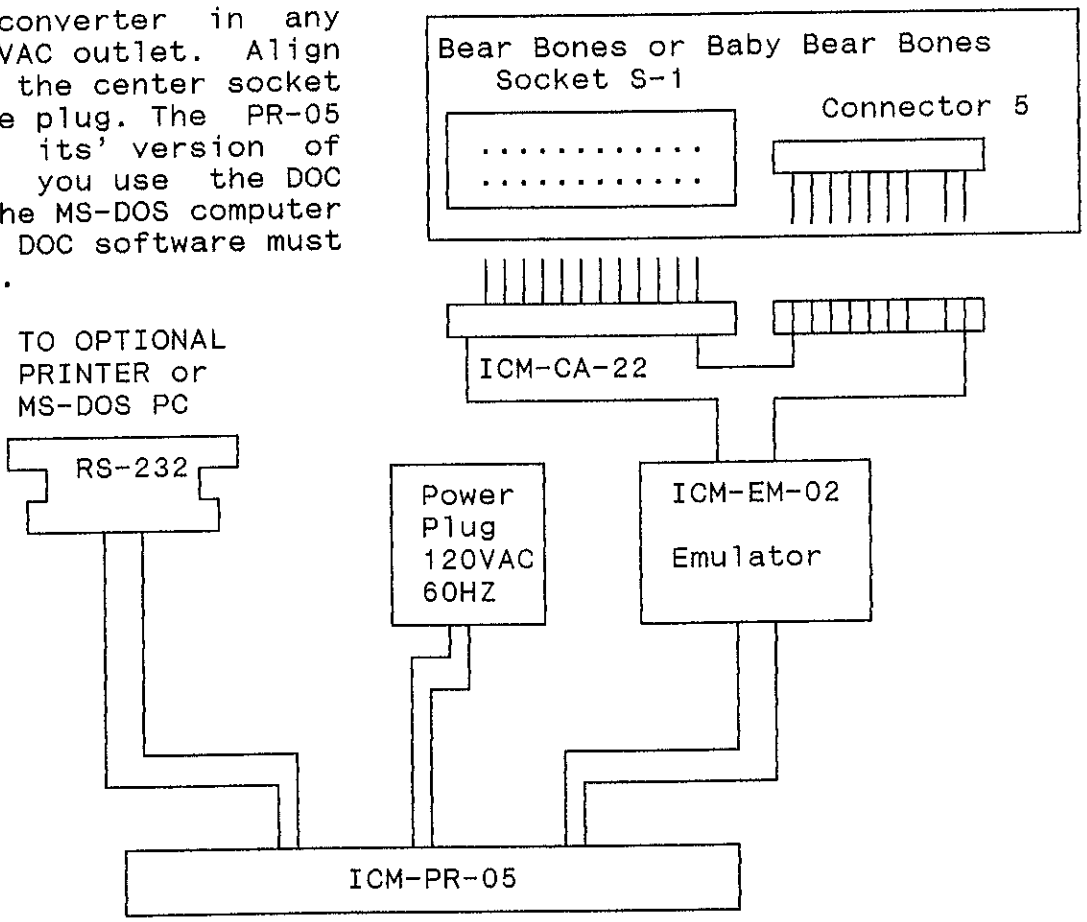
CAUTION: READ THE ENTIRE GENERAL INFORMATION SECTION BEFORE ATTEMPTING TO PROGRAM THE INTELLIGENT PROGRAMMER.

GENERAL INFORMATION for the Bear Bones or Baby Bear Bones

APPLYING POWER

The Intelligent Programmer is supplied with a power converter. Do not attempt to substitute another converter.

Install the converter in any standard 120 VAC outlet. Align the keyway of the center socket and insert the plug. The PR-05 will display its' version of software. If you use the DOC package for the MS-DOS computer the PR-05 and DOC software must be compatible.



Power and interface connections to the INTELLIGENT PROGRAMMER.

To de-energize the INTELLIGENT PROGRAMMER, remove the power cable plug.

NOTE: DO NOT connect the Programmable Logic Controller or Printer/Personal Computer interfaces at this time. These connections will be covered in the POST-PROGRAMMING portion of Section C.

The ICM-EM-02 Emulator will work with the Bear Bones and Baby Bear Bones. You must substitute cable ICM-CA-22 for ICM-CA-23. Always use the independent ground connector.

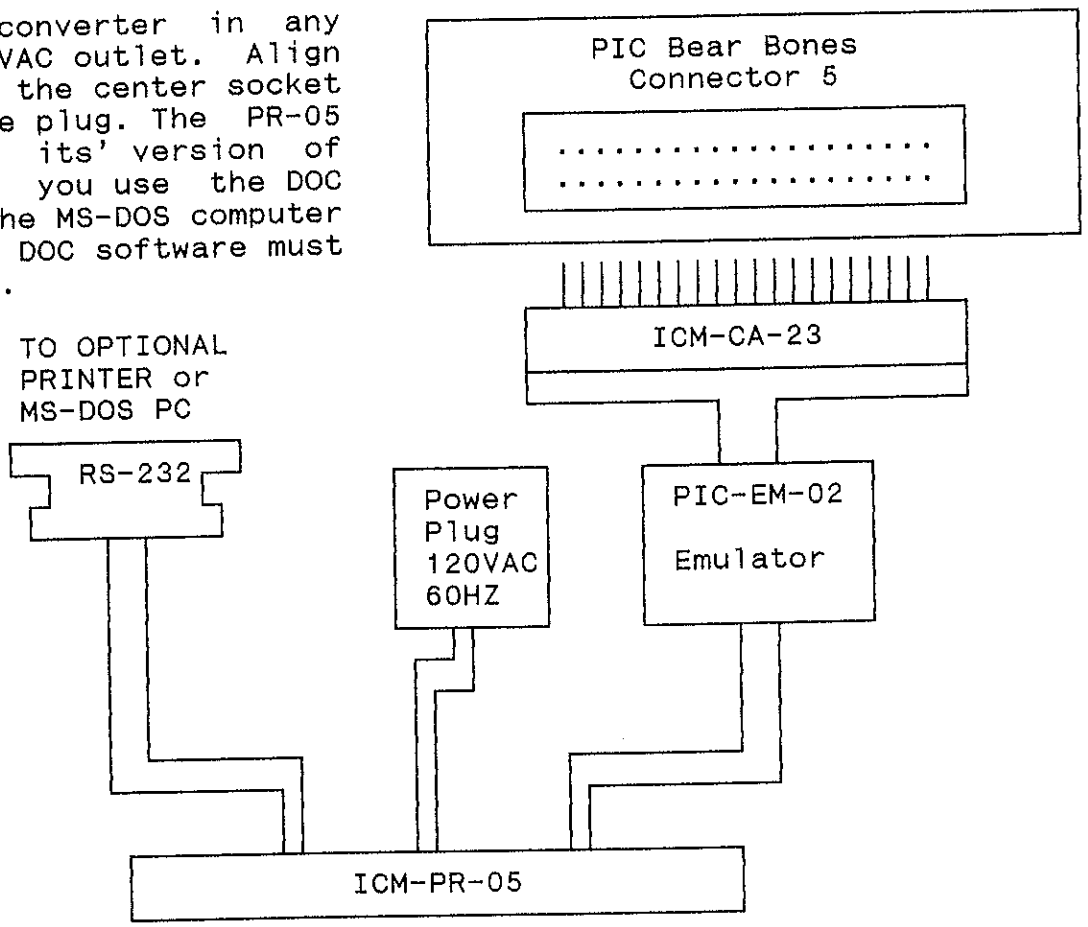
CAUTION: READ THE ENTIRE GENERAL INFORMATION SECTION BEFORE ATTEMPTING TO PROGRAM THE INTELLIGENT PROGRAMMER.

GENERAL INFORMATION for the PIC Bear Bones

APPLYING POWER

The Intelligent Programmer is supplied with a power converter. Do not attempt to substitute another converter.

Install the converter in any standard 120 VAC outlet. Align the keyway of the center socket and insert the plug. The PR-05 will display its' version of software. If you use the DOC package for the MS-DOS computer the PR-05 and DOC software must be compatible.



Power and interface connections to the INTELLIGENT PROGRAMMER.

To de-energize the INTELLIGENT PROGRAMMER, remove the power cable plug.

NOTE: DO NOT connect the Programmable Logic Controller or Printer/Personal Computer interfaces at this time. These connections will be covered in the POST-PROGRAMMING portion of Section C.

The PIC-EM-02 Emulator will work with the PIC Bear Bones. It can work with the Bear Bones or Baby Bear Bones see page 2. Always use the independent ground connector.

EPROM CHIP

The Erasable Programmable Read Only Memory (EPROM) chip is shipped separately from the INTELLIGENT PROGRAMMER with the pins protected by an anti-static sponge. When handling the EPROM, use care not to touch the pins. If the pins are bent, permanent damage could result. When the EPROM is not in use, store it in the sponge.

CAUTION: THE INTELLIGENT PROGRAMMER IS SPECIFICALLY DESIGNED TO OPERATE WITH EPROMS PROVIDED BY DIVELBISS CORPORATION. DIVELBISS CANNOT GUARANTEE THE OPERATION OF THE PROGRAMMER IF EPROMS FROM ANY OTHER SOURCE ARE SUBSTITUTED.

The EPROM is erasable through exposure of approximately one hour to a source of ultra-violet light designed specifically for that purpose. No special precautions need to be taken against casual exposure to natural or artificial light. The EPROM has a life expectancy of ten years or being reprogrammed 100 times.

The EPROM memory has a range of 2 to 16 kilobytes (2K or 16K) depending on the Divelbiss Programmable Logic Controller (PLC) being used. Memory is indicated by part numbers in the current Divelbiss Price List. Call and ask for Form 8210.

NOTE: DO NOT insert the EPROM chip at this time. Instructions for inserting the EPROM will be covered in the POST-PROGRAMMING portion of Section C.

ASCII CHARACTER SELECTION

KEY FUNCTION

The ASCII character (blue) section of the Symbol Keys are operative when the INTELLIGENT PROGRAMMER is in the Alpha-Numeric Mode (program titles, dates, passwords, etc.). In this mode, the symbol character (white) section is inoperative.

The characters (blue section) on the one-character Symbol Keys can be entered simply by pressing the key desired. Selection of the characters on the three-character Symbol Keys is made in conjunction with the Select Keys.

Both the white and blue sections of the Alpha-Numeric Keys are operative when the INTELLIGENT PROGRAMMER is in the Alpha-Numeric Mode.

In the Alpha-Numeric Keys, the numeric (white) section is the default, and will be entered when the key is pressed. Selecting and entering a character from the three-character alpha (blue) section must be done in conjunction with the Select Keys.

NOTE: The cursor will not respond to the Select Key direction arrows while in the Alpha-Numeric Mode.

In this mode, use the ERASE/SPACE Symbol Key to move the cursor from left to right; to move the cursor to the next line, advance the ERASE/SPACE key to the end of the current line. (The ERASE/SPACE Key will erase any character it passes over.)

To move the cursor from right to left, convert the ERASE/SPACE Key to back space (see BACK-SPACE in this section); to move the cursor to the previous line, move the back space ERASE/SPACE key to the beginning of the current line. (The back space ERASE/SPACE Key will also erase any character it passes over.)

UPPER AND LOWER CASE

When in the Alpha-Numeric Mode, the default mode for the alpha (blue) section of the Alpha-Numeric Keys is upper case. The keys can also be programmed to enter characters in lower case.

NOTE: After shifting, see ASCII CHARACTER AND BACK-SPACE SELECTION (following this Section) to enter characters.

To shift to continuous upper case, press and hold the F2 Select Key, then press the F1 Select Key. EXAMPLE: F2 HOLD + F1 = LOWER CASE.

To shift to continuous lower case, press and hold the ADV Select Key then press the F1 Select Key. EXAMPLE: ADV HOLD + F1 = LOWER CASE.

To shift between cases, press the F3 Select Key, then press the F1 Select Key; character will register in reverse of existing case, then mode will return to existing case. EXAMPLE: F3 HOLD + F1 = CHANGE CASE.

SELECTING A CHARACTER

The Symbol Keys and the Alpha-Numeric keys are selected and entered in conjunction with the Select Key arrows.

To select the left-hand character, press and hold the left-arrow Select Key (F2), and press the key with the character desired. EXAMPLE: F2 HOLD + ABC = A.

To select the center character, press and hold the up-arrow Select Key (F3), and press the key with the character desired. EXAMPLE: F3 HOLD + ABC = B.

To select the right-hand character, press and hold the right-arrow Select Key (ADV), and press the key with the character desired. EXAMPLE: ADV HOLD + ABC = C.

BACK SPACE

To convert the ERASE/SPACE Symbol Key to back space, press and hold the F3 Select Key and press the ERASE/SPACE key.

EXAMPLE: F3 + HOLD + ERASE/SPACE = BACK SPACE

SAMPLE ENTRY

The following sequence would be used to enter "DIVEL:#39" in response to the LCD prompt "Enter Prog Title".

SELECT KEY		ALPHA-NUM/ SYMB KEY		DISPLAY
F1 + F2			=	UPPER CASE
F2 HOLD	+	DEF/3	=	D
ADV HOLD	+	GHI/4	=	DI
F2 HOLD	+	VWX/9	=	DIV
F3 HOLD	+	DEF/3	=	DIVE
ADV HOLD	+	JKL/5	=	DIVEL
NONE		:/	=	DIVEL:
F3 HOLD	+	<#>/1	=	DIVEL:#
NONE		DEF/3	=	DIVEL:#3
NONE		VWX/9	=	DIVEL:#39

VERSIONS

There are three versions of the Intelligent Programmer.

Version 1.50

This is the oldest version and offers the fewest enhancements. It is compatible with DOC version 1.52 only. The recommended baud rate is 4800. This version cannot be used with PIC Bears.

Version 1.52 can be upgraded to 1.74 at a minimal fee. Call for the current cost.

Version 1.62

This version offers some enhancements over version 1.50. It is compatible with DOC version 1.61 only. The recommended baud rate is 9600. Use with any Bear.

Version 1.62 is replaced by version 1.74. Call for a free upgrade.

Version 1.74

This is the current version and offers significant enhancements over versions 1.50 or 1.62. It is compatible with DOC version 1.74 only. The recommended baud rate is 19.2K.

NOTE:

It is possible that version 1.74 may be enhanced even further so you version number could be 1.75 or higher. The numbers that indicate compatibility are the first two. The last number will not effect compatibility it only indicates enhancements.

NOTE:

Software upgrades for registered users are free of charge. Before requesting an upgrade be sure of your hardware compatibility.

THIS CONCLUDES THE PRELIMINARY SECTION

PRE-PROGRAMMING

CONTROLLING THE CURSOR

When in the Programming Mode, the ASCII (blue) sections of the Symbol Keys and Alpha-Numeric Keys are inoperative.

The cursor moves from left to right and automatically advances to the next line (wraps) at the end of the line.

Direction of the cursor can be controlled by the Select Key arrows. When moved by these arrows, the cursor will not erase or otherwise change any entry it passes over.

In the Programming Mode, the ERASE/SPACE Key moves from left to right, and automatically erases any entry it passes over.

When converted to back space the ERASE/SPACE Key moves from right to left, and in the Programming Mode will not erase or otherwise change any entry it passes over.

MAIN MENUS

There are four Main Menus which will give access to all the Sub-Menus of the INTELLIGENT PROGRAMMER.

When the programmer is energized, the following display should appear on the LCD:

Version 1.74 will support the IF-BB or the EM-02 and all Bear Bones or PIC Bear Bones products.

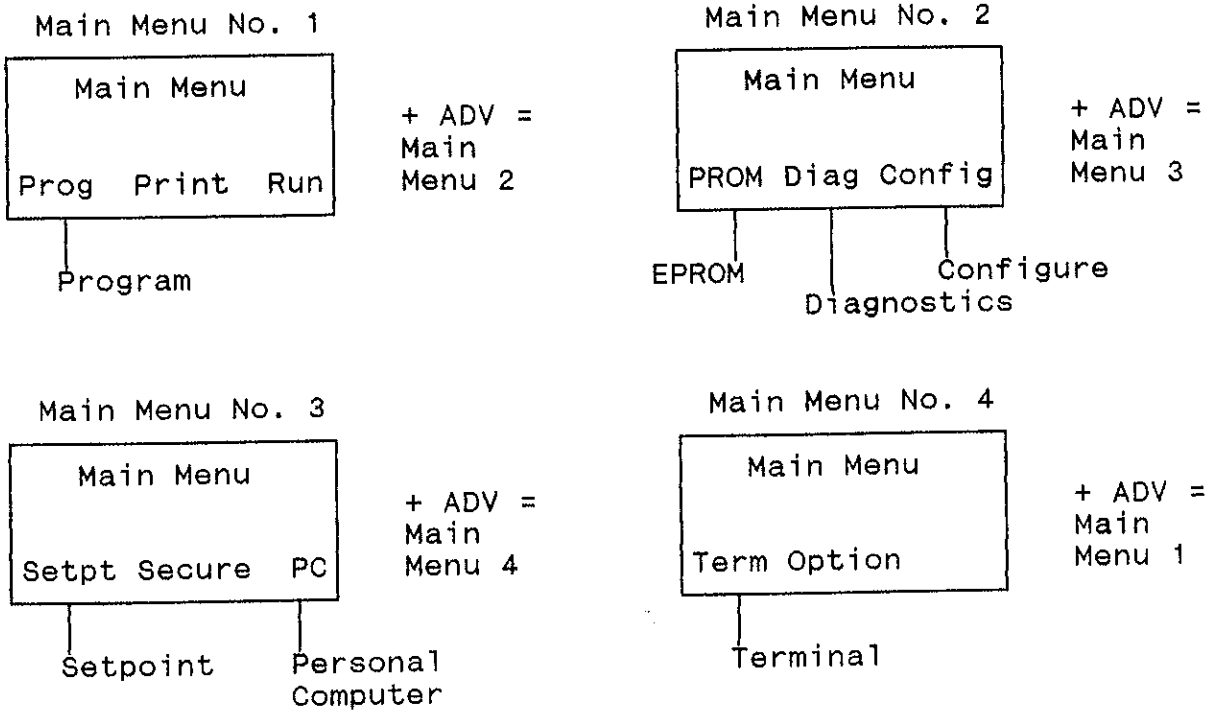
```
PR-05 Ver 1.xx
Programmer Ready

Press <ENTER>
```

Version 1.50 and under will support the IF-BB but not the EM-02. It supports Bear Bones but not PIC Bear Bones.

If nothing is displayed check your power supply connections and your power source. If everything appears to be correct your display may be set at the lowest level setting. Remove the power supply connector from the PR-05 and reinsert it. Now press the ENTER Command Key followed by ADV, F3, ADV, F2. These keystrokes allow you to change the illumination of the display. Press and hold F3 to increase, F1 to decrease. If you cannot change the intensity of the display call the factory at 614/694-9015 for assistance.

The version number tells you what software is installed. It also tells you what hardware is installed. PR-05s version 1.50 and earlier cannot support the PIC Bear products. A hardware change is required.

Press the Command Key ENTER. The first of the Main Menus will appear. Each of the menus provides different capabilities. To advance from one menu to the next press <ADV>. All the Main Menus are shown below.



To return to the Main Menu No. 1 from any of the other Main Menus press the MENU RETURN key. To enable any command of any of the Main Menus press the "F" key just beneath it. If you wish to program press F1, press F2 to print.

A preliminary check out of your Intelligent Programmer is recommended before you begin any ladder diagrams.

Plug in your programmer and press ENTER. Then press ADV to get to Main Menu No. 2. Now press Diag to display the Diagnostics Menu.

Press F1 for PR-05 to test the Random Access Memory (RAM). You will be allowed to Proceed or Exit. Press F1 for proceed. Once the RAM is tested you will be prompted to press ENTER, this will return you to the initial plug in prompt. Return to the Diagnostics Menu.

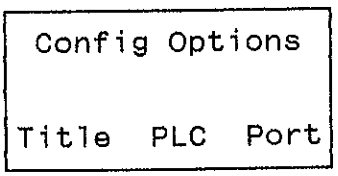
Press F2 for Keybrd to test the keys. Your display should be blank. Press F1 to get this display:

The single window means that the F1 key is working. As you press each key another window will appear. Once all the windows are on press Menu Return. Note that Menu Return will turn on its own window prior returning your to Main Menu No. 2.

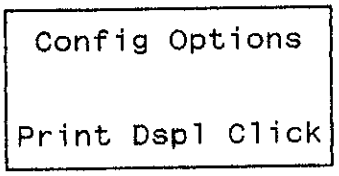
CONFIGURING

Press F3 for Config. The Configure Options has two menus as shown below.

Configure Options No. 1



Configure Options No. 2



This setup procedure will cover only those options necessary for the setup of your PR-05.

Press F2 for PLC. Under the displayed menus you will be allowed to choose the PLC you intend to work with. This choice determines the clocking speed of the interface or emulator. Do not intermix PIC and non-PIC product configurations. When completed press Menu Return to display Configure Options No. 1 menu.

Press F3 for Port. This choice determines the baud rate of the PR-05 serial port. The baud rate is critical in printing with the PR-05 or when the PR-05 is communicating with a computer. Press ADV to display Configurations Options No. 2 menu.

Press F1 for Print. This allows to furnish a line feed with carriage return when printing or not to furnish the line feed.

Press F2 for Dspl. Here you can change the display intensity to suit your particular needs.

Press F3 for Click. With this selection you can turn the audible clicker on or off.

All initial testing and setups are now complete.

THIS CONCLUDES THE PRE-PROGRAMMING SECTION

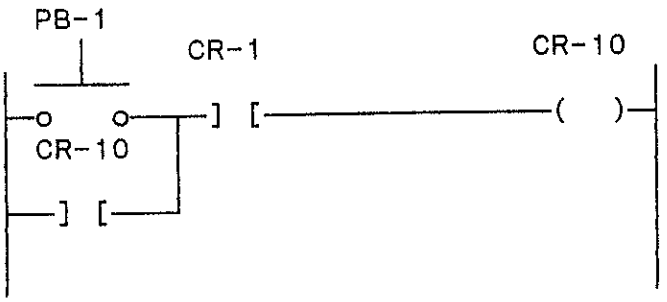
STANDARD PROGRAMMING

RELAY LOGIC TRANSFER

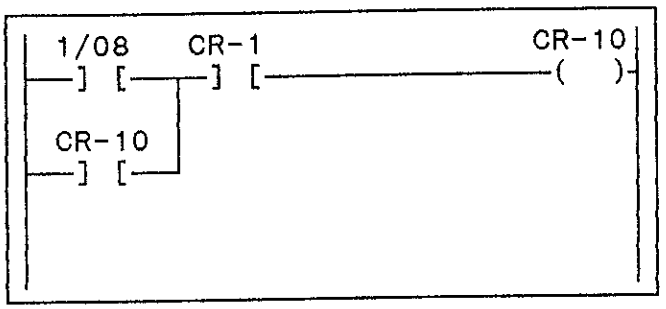
The INTELLIGENT PROGRAMMER will program a ladder logic diagram that is a direct translation of a relay logic diagram. The program is stored in RAM memory in the PR-05. This RAM is battery backed-up and can be transferred to an EPROM.

A typical relay logic diagram is shown below with the PR-05 equivalent.

RELAY LOGIC DIAGRAM



PROGRAMMER LADDER DIAGRAM



One of the first things you must learn to do is to list your Inputs and Outputs. This list allows you to convert your Ladder Logic pushbuttons and coils into Input and Output addresses that can be recognized by your Bear Bones.

PB-1 is assigned to Input 1/08, the CR numbers are not changed.

More details as we move through programming

PROGRAM TITLES, DATES and PASSWORDS

After preparing a list of your I/O address points enter Main Menu No. 1 by plugging in the programmer and pressing ENTER or by pressing MENU RETURN until Main Menu No. 1 is displayed.

NOTE: For demonstration purposes the Programmer Ladder Diagram used in the above illustration will be referred to throughout this section.

From MAIN MENU NO. 1, press the Program Select Key F1. The PROGram OPTions MENU NO. 1 will display.

Press the Current Key (F1). This takes you to the current program Rung 001. This is true if there is or is not a program.

PROG OPT MENU NO. 1

Prog Options	
Current	New

NOTE: A "rung" is a complete ladder diagram. It may be as simple as one input and one output. It may be as complex as 56 contacts and 8 outputs.

Press the New (F3) key; PROG OPT MENU NO. 2 will display.

This display allows you to save your program or to clear it. If your choose No you will go to Rung 001 of your old program. If you choose Yes your old program will be erased and you will be on Rung 001.

PROG OPT MENU NO. 2

```
Clear Program?

Yes          No
```

Return to Main Menu No. 1 by pressing Menu Return until the Main Menu No. 1 is displayed. Now press ADV to display Main Menu No. 2. Press Config, then Title. In this exercise we will enter a Title into the programmer. The Title gives you the opportunity to customize the program and make it identifiable and unique.

NOTE: If desired to leave any of the prompts blank in PROG OPT MENUs NOS 3, 4, and 5, press the ENTER Command Key at the prompt, and the display will move to the next prompt.

Up to 30 characters can be entered in the Program Title. The characters may be upper or lower case. They may be any number on the keyboard. You may also choose any of the symbols on the PR-05 keyboard. Refer to page C-4 SAMPLE ENTRY for the method of entry.

PROG OPT MENU NO. 3

```
Enter Prog Title
Divel:#39
```

When the Title is completed press ENTER to go to PROG OPT MENU NO. 4

Up to 6 characters can be entered under Revision Number. You may use any of the PR-05 keys. When finished press ENTER. The date prompt will be displayed. Enter month(mm), day(dd) and year(yy). We have included an example in the displayed menu. When finished press ENTER.

PROG OPT MENU NO. 4

```
Enter Revision
Number:01
Date  :010199
```

Passwords of up to 6 alph-numerical characters may be entered for each password.

There are three levels of password protection. Operator the lowest and OEM the highest.

PROG OPT MENU NO. 5

```
Enter Passwords
Oper: 01
User: 02
Oem : 03
```

If you enter a password be sure to record it. Divelbiss **WILL NOT** release any information about passwords without the signature of an officer of your company requesting such help.

The Operator Password permits the changing only "non-protected" areas such as Counter/Timer values or setpoints. The "protected areas" are the portions programmed under OEM and/or User passwords.

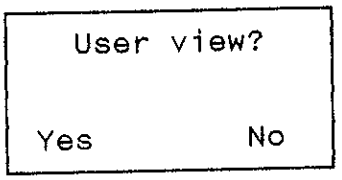
The User Password permits the programmer access only to programs added after OEM-installed programs. The User may also access the areas under the Operator password.

The OEM Password permits the programmer access to the entire program.

NOTE: The following two displays are for OEM input only.

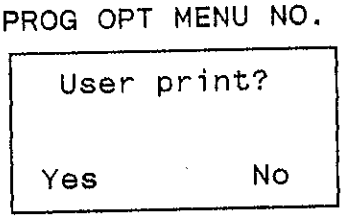
The answer to this prompt will give or deny the User visual access to LCD display of the OEM program. After your selection is made PROG OPT MENU NO. 7 will be displayed.

PROG OPT MENU NO. 6



The answer to this prompt will give or deny the User the ability to print out the program on optional auxiliary printer. After the response, Rung 001 will display, and the INTELLIGENT PROGRAMMER will be in the Programming Mode.

PROG OPT MENU NO. 7

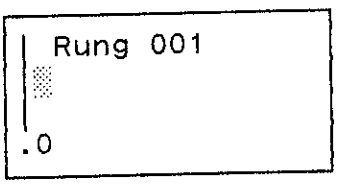


OPENING PROGRAM

NOTE: In the Programming Mode, only the white areas of the symbol keys and the Alpha-Numeric Keys are operative.

Here is Rung 001 with no program entered. We will now enter our example program in a step by step fashion to get you familiar with all the keys.

OPENING PROGRAM



During all the programming exercises you may note that not all the characters presented are exact replicas of the PR-05 screen. There are limits to what can be duplicated in this document. A good example is the blinking cursor. We cannot show that so we simulate it as closely as possible. The first programming example will be step by step. The other examples will not be so detailed, so be sure to learn the keystrokes now and save yourself a lot of frustration later.

Before proceeding take a moment to review **CONTROLLING THE CURSOR** in the PRE-PROGRAMMING section.

Use the following guidelines when entering the ladder diagram in the INTELLIGENT PROGRAMMER:

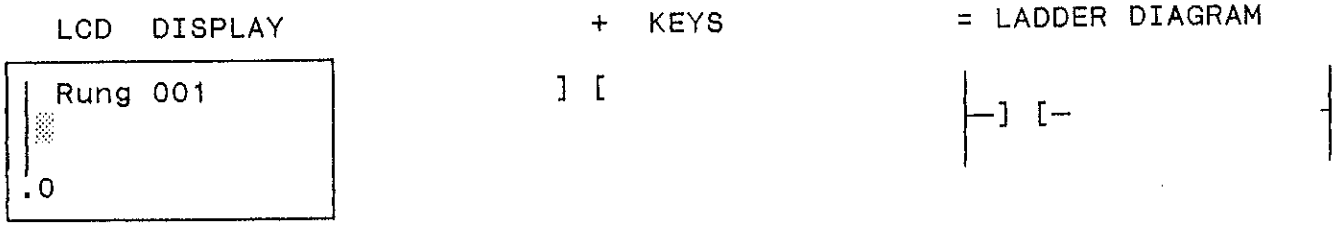
1. Normal cursor prompting is from left to right, top to bottom.
2. Always begin each line with the cursor at the top of the left rail.
3. After each logic address symbol is entered, an IN or OUT label prompt will appear; label must be entered before proceeding.
4. To complete a parallel diagram, the top, bottom, and middle connecting branch lines must be entered.
5. The INTELLIGENT PROGRAMMER will not accept two consecutive branches on the same line, or a line crossed without a connection.
6. Each rung will be numbered automatically as completed, and the LCD display will scroll to the next rung.

The following programming practices are recommended to reduce kilobyte (K) consumption:

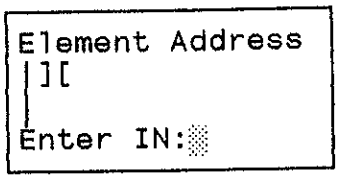
1. Use CR entries from the primary or lower registers of the Control Relays.
2. Use as few branches as possible.
3. Avoid entering single-line rungs if possible. Each rung entry uses from 2-5 bytes of memory storage.
4. A timer time base uses approximately 100 bytes; less memory is used up by using the 0.1 sec. time base and a counter.
5. If caution is used, reference can be made to the temporary CR.

When entering a program it is possible to make errors. Any instruction once entered can be written over. If you wish to change an entry while you are entering it such as an input address you may do so. Hold down the F2 key and press ERASE. This will back you up one position in the address. Suppose you had entered a normally open contact and you wanted to give it address 1/11 but had entered 1/0. Press and hold F2 then press ERASE. The display will show 1/ and you can now complete the address 1/11.

CREATING A RUNG IN A LADDER DIAGRAM

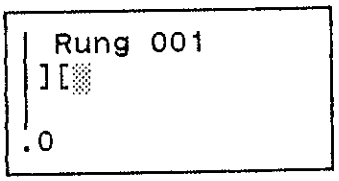


LCD DISPLAY + KEYS = LADDER DIAGRAM

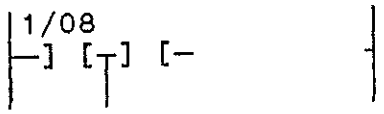


1/08 ENTER

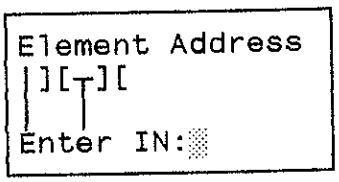
LCD DISPLAY + KEYS = LADDER DIAGRAM



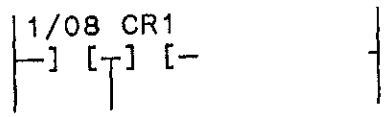
] [



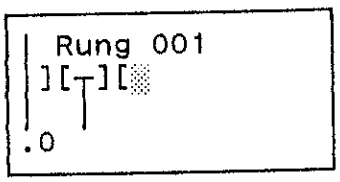
LCD DISPLAY + KEYS = LADDER DIAGRAM



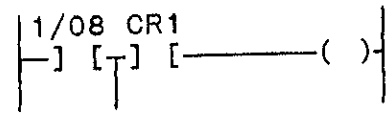
CR1 ENTER



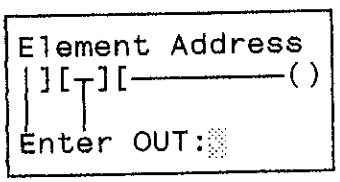
LCD DISPLAY + KEYS = LADDER DIAGRAM



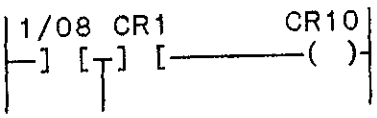
-O-



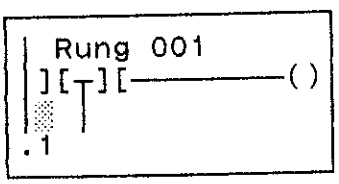
LCD DISPLAY + KEYS = LADDER DIAGRAM



CR10 ENTER



LCD DISPLAY + KEYS = LADDER DIAGRAM



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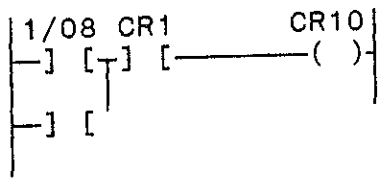
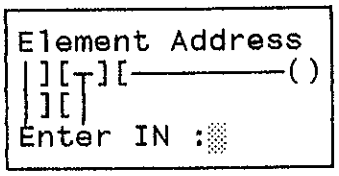
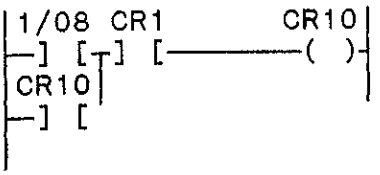


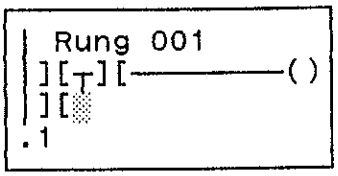
LCD DISPLAY + KEYS = LADDER DIAGRAM

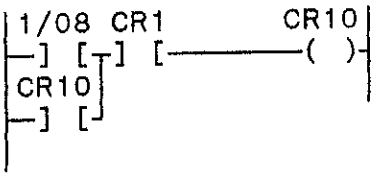


CR10 ENTER

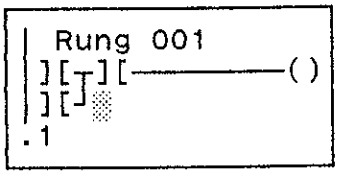


LCD DISPLAY + KEYS = LADDER DIAGRAM

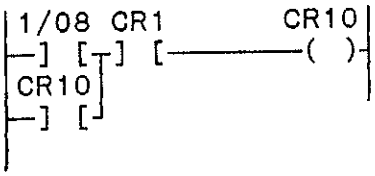




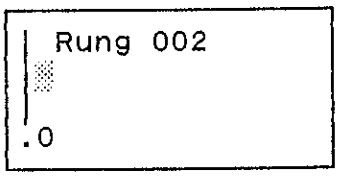
LCD DISPLAY + KEYS = LADDER DIAGRAM



ENTER

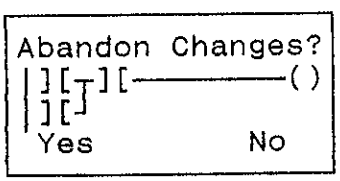


LCD DISPLAY + KEYS = LADDER DIAGRAM



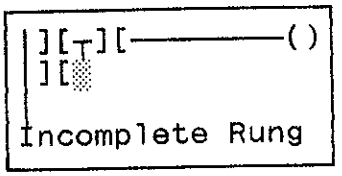
After the ladder diagram rung has been entered, the display will be scrolled to Rung 002. You must press ENTER after programming each rung. This causes the PR-05 to compile the program as entered. If you do not press ENTER you will not be allowed to return to the Main Menu.

LCD DISPLAY



Should you neglect to press enter after programming rung 001 you will get this display. If you select Yes (F1) the program in rung 001 will be erased. If you select No (F3) you will be returned to rung 001. You may now press ENTER to save rung 001 and go to rung 002.

LCD DISPLAY



While programming you may neglect to connect all the logic elements. If you do you will get a display similar to this with the cursor at the point that is a problem. Just press the correct key and the error prompt will go away. These first examples may appear very simple so you could be tempted to move on without trying them. This could be a mistake. These examples are intended to help you understand how to use our programmer. Take advantage of this opportunity and do all the programs.

After correcting the above display press ENTER to go to Rung 002.

THIS CONCLUDES STANDARD PROGRAMMING

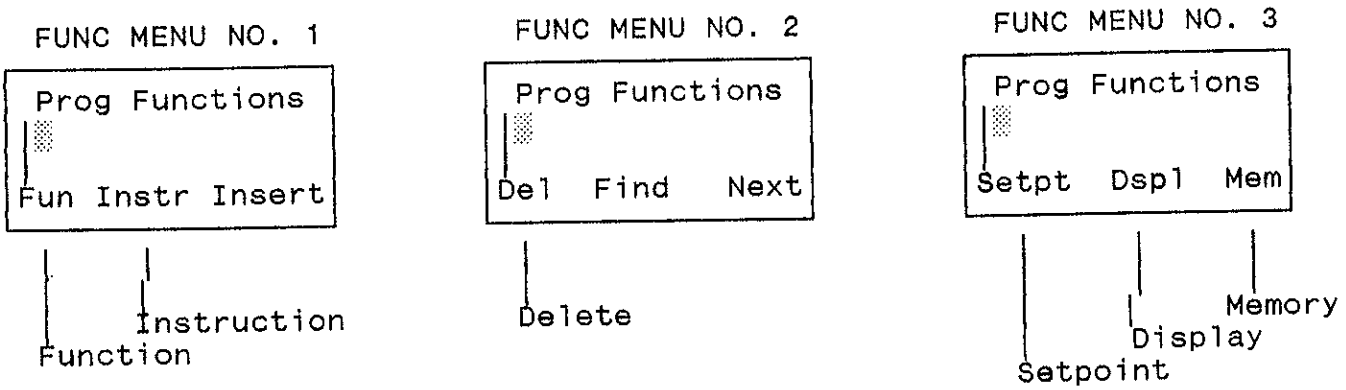
ADVANCED PROGRAMMING

NOTE: Detailed operations of the Advanced Programming Functions and Instructions are described in INTELLIGENT PROGRAMMER C APPENDIX.

Advanced Programming Functions and Instructions are accessible while in the Programming Mode. Press the FUNCT.ion Command Key to display FUNCT MENU NO. 1, and ADV again to display FUNC MENUS 2 and 3.

FUNCTION MENUS

NOTE: Pressing the FUNCT. Command Key or accessing the FUNCtion MENUs will not change the rung you are on or INTELLIGENT PROGRAMMER memory.



Definitions of the terms covered under the FUNCTION and INSTRUCTION commands are contained in C APPENDIX. Examples of all the menu items will be given as we progress through the manual.

After reviewing the FUNCtion MENUs, press the MENU RETURN Command Key to return to the Programming Mode. You will be returned to Rung 002.

Functions are the timers, counters, drums, pulse generators, shift registers and access bears. There are detailed definitions of each function in C APPENDIX.

FUNC MENU NO. 1 - Function Key

NOTE: Whenever possible, program the functions of coil elements before programming their contacts. If the control sequence requires programming a function contact before its coil, a substitute address must be given. Use any CR address (EXAMPLE: CR-100) in place of the function address while programming the function of the coil element; after completing programming, change the CR address to the true address.

NOTE: Once in the Function Mode, the Select Key arrows cannot be used to move the cursor or change the ladder diagram display. To program a function, position the cursor over the contact symbol before leaving the ladder diagram display, or press the

symbol for the contact while in the Function Mode. If the cursor is positioned at an incorrect address, "not found" will display.

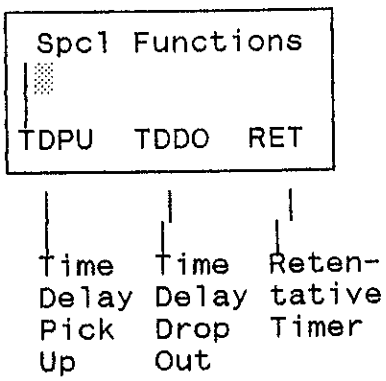
All Functions require at least one line of logic. This line of logic enables the Start/Reset buss for that function. If the Start/Reset line is low the functions data will be reset to zero except the drum which will be set to step 1. You are not required to program any elements in this line. A logic element in this line allows you to Start and/or Reset the function. For all these examples use input 1/08 as an element in the Start/Reset line.

SPecial FUNCtion MENUS

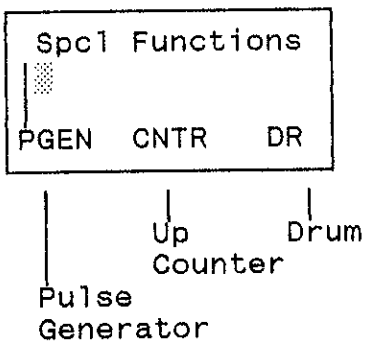
From the programming mode, press the FUNC. Command Key; FUNCtion MENU No. 1 will display.

From FUNC MENU No. 1, press Fun Select Key (F1) for access to the three SPecial FUNCtion Menus. SP FUNC MENU #1 will display; press ADV Select Key to display SP FUNC MENU #2, and ADV again to display SP FUNC MENU #3. Press ADV again to display SPecial FUNCtion #1.

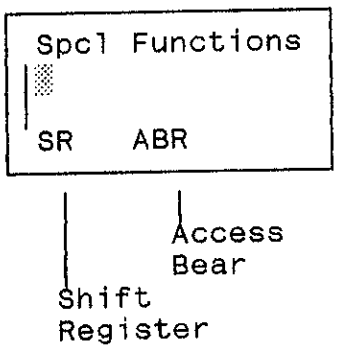
SP FUNC MENU NO. 1



SP FUNC MENU NO. 2



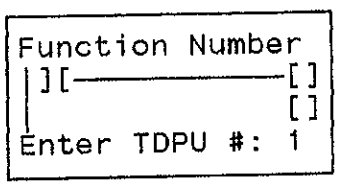
SP FUNC MENU NO. 3



SP FUNC MEN #1 - Time Delay Pick Up Coil

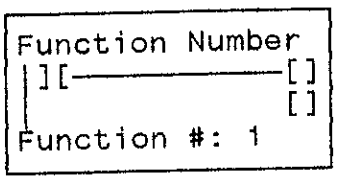
From SP FUNC MENU #1 press F1 to select TDPU, FUNC SCREEN #1 will display. The PR-05 defaults to the lowest available TDPU. If TDPU 1 had already been programmed we would have been taken to TDPU 2. There are two boxes displayed. The first is Start/Reset, the second is increment. Press ENTER.

FUNC SCREEN #1

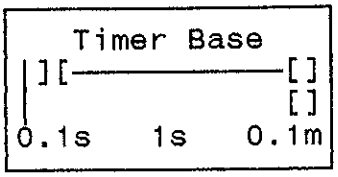


The display changes to show Function #1. This is where the data or setpoint will be stored. Usually it is best to accept the defaults as they are designed to keep you from making a mistake. The function numbers can be a valuable aid later when you have acquired a better understanding of the Bear Bones.

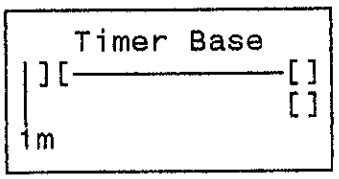
FUNC SCREEN #2



FUNC SCREEN #3



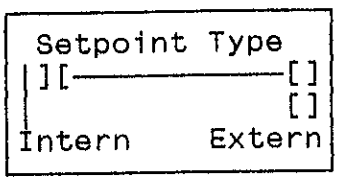
FUNC SCREEN #4



Screens 3 and 4 display the 4 time bases available to you. For our example press F1 to select a 0.1s time base. The s is seconds and m is minutes.

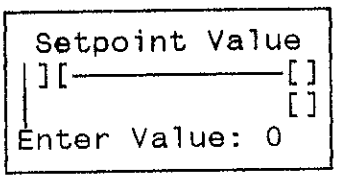
With screen 5 you may choose between an Internal or External setpoint. Internal stores the setpoint in memory. External requires a source other than memory. You could use inputs, CR's or the data from another function as an external setpoint. For this example choose Internal.

FUNC SCREEN #5



This is the next display in this exercise. Here you enter the number that becomes the setpoint for this function, use the number 125. Our timebase was 0.1 seconds, our setpoint value is 125 so the timer setpoint becomes 12.5 seconds. To arrive at that number multiply the timebase by the setpoint value. Press ENTER.

FUNC SCREEN #6

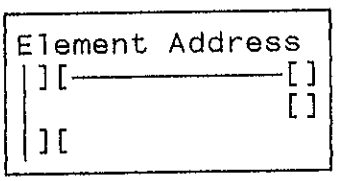


The screen now reverts to ladder logic with the cursor below the second timer block. No further logic is required to program the TDPU. All TDPU's will program just like this one.

Once the function is programmed it is possible to program contacts of that function that will help you. You may put these contacts anywhere in your ladder. Here is an example of how these contacts are entered.

Program a contact element either NO or NC to get this display. At the Enter In: prompt press FUNCT. and then TDPU 1. This names the contact as TDPU 1. Now press ENTER. You can program a coil with an address. The timer TDPU 1 now controls the output. No need to program an auxiliary CR, the TDPU contact can be used anywhere.

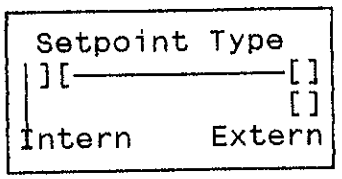
FUNC SCREEN #7



Use Select Key arrows to move cursor to the first box in Rung 001; "TDPU01" should display. Move cursor down to function display box (second box); "12.5s" should display.

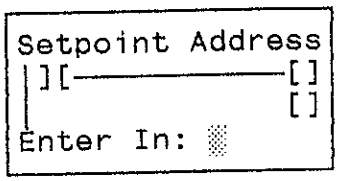
It is not necessary to write down the setpoint values or the function block numbers. The PR-05 will print them for you.

FUNC SCREEN #5



Here is our display from page 15, Function Screen #5. We originally choose Internal. This time we will choose External. Press F3 for external to get the next display.

FUNC SCREEN #6



Here is where you choose the first of eight addresses that will be the setpoint for TDPU #1. You may use Inputs, CR's, or data points from other functions. Inputs would allow using thumbwheels for your setpoint. CR's would allow changing the setpoint with ladder logic. Using data points from other functions would allow one function to act as a setpoint for another.

NOTE: For demonstration purposes, press the MENU RETURN Command Key after each demonstration entry; "Abandon Changes?" prompt will appear. Press Yes Select Key (F1) to erase function in memory and prepare ladder diagram for next demonstration. Display will return to MAIN MENU NO. 1.

SP FUNC MENU #1 - Time Delay Drop Out

Enter the Programming Mode, and press the FUNC. Command Key; press Function Select Key (F1).

See SP FUNC MENU #1, and press the Time Delay Drop Out Key (F2). Follow SP FUNC SCREENs 1-6 in TDPU and accompanying instructions, except change TDPU references to TDDO.

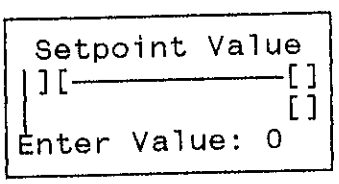
Program the input address in the same manner as in TDPU. Erase programmed function per procedure described at end of TDPU.

SP FUNC MENU #1 - Retentive Timer

Enter the Programming Mode, and press the FUNC. Command Key; press Function Select Key (F1).

See SP FUNC MENU #1, and press the Retentive Timer Key (F3). Follow SP FUNC SCREENs 1-5 in TDPU and accompanying instructions, except change TDPU references to RET.

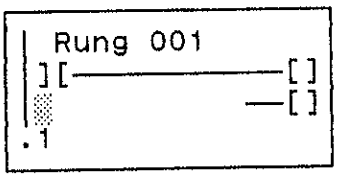
FUNC SCREEN #6



Up to this point everything looks exactly the same for RET as it did for TDPU or TDDO. After you enter your setpoint you will see a difference. You will need another contact. This second contact allows you to interrupt the time cycle without resetting it. Enter a value and press ENTER.

The cursor is now opposite the second box of the RET function. Enter the contact symbol for normally open and then the address 1/09. Now press ENTER. The contact is there just like in ladder logic, but you need to connect it to the second box. You do this by pressing and holding the (-) key until you hear a "beep".

FUNC SCREEN #7



Press the right arrow key to go to the next line of logic, or press ENTER to go to the next rung. Use the arrow keys to check the display boxes per TDPU. Erase programmed Function per procedure described at the end of TDPU.

SP FUNC MENU #2 - Pulse GENerator

Enter the Programming Mode, and press the FUNC. Command Key; press Function Select Key (F1). ADVance to SP FUNC MENU #2.

See SP FUNC MENU #2, and press the Pulse Generator Key (F1). Follow SP FUNC SCREENs 1-6 in TDPU and accompanying instructions, except change TDPU references to PGEN.

Program the input address in the same manner as in TDPU except ADVance to SP FUNC MENU NO. 2, and use PGEN Select Key; check display boxes per TDPU. Erase programmed Function per procedure described at the end of TDPU.

SP FUNC MENU #2 - Up Counter

Enter the Programming Mode, and press the FUNCT. Command Key; press Function Select Key (F1). ADVance to SP FUNC MENU #2. See SP FUNC MENU #2, and press the Up Counter Key (F2). Follow SP FUNC SCREENs 1, 4, and 5 in TDPU and accompanying instructions, except change TDPU references to CNTR. Since the Up Counter is an event-driven rather than time-driven device, SP FUNC SCREENs 2 and 3 are not used. The counter will require a second input, which is the count input (see Retentive Timer)

Program the input addresses in the same manner as in RET except ADV to SP FUNC MENU NO. 2 and use CNTR Select Key; check display boxes per RET. Erase programmed Function per procedure described at end of RET.

SP FUNC MENU #2 - Drum Sequencers.

Enter the Programming Mode, program your first input and press the FUNC. Command Key; press Function Select Key (F1). ADVance to SP FUNC MENU #2.

See SP FUNC MENU #2, and press the Drum Sequencers Select Key (F3). "Enter DR #: " prompt will display. Press ENTER and the "Function #: " prompt will display, press ENTER.

"Max Steps: " prompt will display. Up to 256 steps are possible; enter 8 for this example, and press ENTER.

"Max Channels: " prompt will display. Up to 16 channels are possible; enter 8 for this example, and press ENTER. The DRUM MATRIX TABLE will be displayed.

The drum matrix allows you to turn channels on and off in specific steps of a drum. A channel could be off in step 1, on in steps 2 and 3, then off again in step 5. This ability makes the drum very flexible.

FUNC SCREEN #5

```
00000000
00000000
00000000
DR   (1 x 1)
```

Here is the drum matrix displayed in your PR-05. This display is labeled screen #5 as it is the fifth in this series. All channels are 0's (OFF). The channels are numbered from left to right. Press ADV to move the cursor to the second 0, and note the bottom display changes to DR (1x2). The second number always shows the cursor position for the channel. Now press F1 and note the first number has changed. This is the number that shows step position.

Use the Select Key arrows to move the cursor from left to right and from top to bottom. The channel number will change as the cursor is moved right or left along the line. The step number will change as the cursor is moved up or down in the display.

To turn on a channel in a given step, follow the display at the bottom of the screen and position the cursor over the channel/step to be energized. Enter "1"; on the 0 will change to 1 in the display, and the cursor will move one square to the right.

The Drum Sequencer will require a second input, which is the step input (See Retentive Timer). When the Drum Sequencer Matrix has been completely programmed, press ENTER. You may now program input 1/09 just as you did for the other functions.

Since drums also advance on a timing basis you could enter a TDPU contact instead of input 1/09. You could also combine inputs, CR's and timers to sequence your drum.

Be careful of step one of the drum. This is the home position and any channel turned on will be on when the drum is reset to the home or reset position. This is a good place for a "Ready" light.

The drum will have a contact available for each channel programmed. The contact(s) will be in their shelf state if that channel is set to zero in a given step. The contact(s) will be opposite of their shelf state if that channel is set to one in a given step. When programming drum contacts you must enter the drum number, press ENTER, then enter the channel number and then press ENTER.

SP FUNC MENU #3 - Shift Register

Each Shift Register is capable of shifting 8 bits of information; each bit = 1 channel. The bits or channels are set while "running" the program, not when programming.

Enter the Programming Mode, program your first input and press the **FUNCT.** Command Key: Press Function Select Key. ADVance to SP FUNC MENU #2 and then to SP FUNC MENU #3.

See SP FUNC MENU #3, and press the Shift Register Select Key (F1). "Enter SR#: " prompt will display; enter number, and press **ENTER** Command Key.

"Function #: " will display; enter number, and press **ENTER** Command Key.

The shift register will require two additional inputs. The first of these is the clock input, and the second is the data input. The clock input must go from low to high to clock the register. The data input must be high when the clock goes high to enter a "1" into the first register channel. Each time clock goes high all channels are shifted one position.

After the ladder diagram has been re-programmed, press **ENTER** Command Key. Erase programmed Function per procedure described at end of TDPU.

SP FUNC MENU #3 - Access Bear

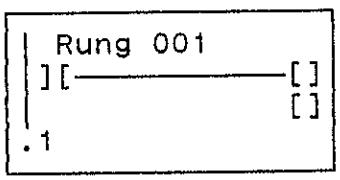
Each Access Bear channel is a function. You may program it as an On Delay Timer, Retentive Timer, or Up Counter. Programming of the Access Bear setpoints is detailed in data sheet 7809-48. All items function just as they do in the PR-05. The major differences are that you do not need to program an EPROM to change setpoints. You may also change setpoints while "running".

Enter the Programming Mode, program your first input and press the **FUNCT.** Command Key: Press Function Select Key. ADVance to SP FUNC MENU #2 and then to SP FUNC MENU #3.

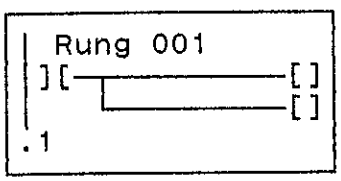
See SP FUNC MENU #3, and press the Access Bear Select Key (F2). "Enter ABR #: " will display; enter number, then press **ENTER** Command Key. Press ENTER to accept the default function number.

The following screens show what your display looks like while programming. ABR SCREEN #1 is the display right after selecting the function number. ABR SCREEN #2 shows how to program an on delay or TDPU timer. ABR SCREEN #3 shows how to program a RET timer or a CNTR counter.

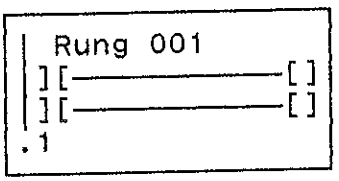
ABR SCREEN #1



ABR SCREEN #2



ABR SCREEN #3



THIS ENDS PROGRAMMING FROM THE FUNCTIONS MENUS

SPECIAL INSTRUCTIONS

Instructions give you expanded programming power not available with functions. There are definitions in C APPENDIX.

FUNC MENU NO. 1 - Instruction Key

NOTE: Once in the Instruction Mode, the Select Key arrows cannot be used to move the cursor or change the ladder diagram display.

From FUNC MENU No. 1, press **Instr** Select Key (F1) for access to the three SPecial INSTruction Menus. SP INST MENU #1 will display; press **ADV** Select Key to display SP FUNC MENU #2, and ADV again to display SP FUNC MENU #3.

```
SP INST MENU #1                SP INST MENU #2                SP INST MENU #3
Spcl Instruction               Spcl Instruction               Spcl Instruction
(L)    (U)     MCR             OEN    CMP     SKP             END
  Latch   Unlatch  Master        Output   Compare   Skip
                   Control       Enable
                   Relay
```

SP INST MENU #1 - Latch and Unlatch

Here is an example of programming the **Latch** and **Unlatch** instruction commands. These will act just like latch and unlatch relay coils.

Press --][--, 1, 0, 8, **ENTER** to program the input. Now press FUNCT., INSTR. (L), CR, 1, ENTER. Press --][--, 1, 0, 9, **ENTER** to program the input. Now press FUNCT., INSTR, (U), CR 1, ENTER.
Your PR-05 should look just like the one to the right.

```
INST SCREEN #1
 Rung 001
][————————————[]
][————————————[]
.1
```

When input 1/08 is closed, CR1 is energized. If 1/08 is now opened, CR1 stays energized since it is a latched coil. When input 1/09 is closed, CR1 is de-energized (unlatched). If both inputs are closed, the relay CR1 will latch and immediately unlatch.

Position the cursor just to the right of input 1/08 and enter -]/[- input 1/09. The cursor will be to the right of the input just programmed. Now position the cursor to the right of input 1/09 on line .1, and enter -]/[- input 1/08. The circuit is now interlocked. If input 1/08 is energized first then CR001 will stay latched. If input 1/09 is energized first then CR001 will stay unlatched.

SP INST MENU #1 - Master Control Relay

Press --][--, 1, 0, 8, ENTER. Press FUNCT., INSTR, MCR.

The Master Control Relay function is now programmed as a function of input 1/08. If input 1/08 is closed, the MCR will allow all following outputs to be turned on. If 1/08 is de-energized, all outputs following MCR will be turned off.

After programming a conditional MCR followed by your logic, you should program an unconditional MCR. With the cursor positioned at the left of the display, press FUNCT., INSTR, MCR. This is an unconditional MCR. No logic is required to enable it. The first MCR Instruction is conditional, it depends on the state of input 1/08.

SP INST MENU #2 - OUTPUT Enable

Press --][--, 1 ,0, 9, ENTER. Press and hold the "-" key until a "beep" is heard. Press FUNCT., INSTR, ADV, OEN.

The output enable function is now programmed as a function of input 1/09. If input 1/09 is closed, the OEN will allow all following outputs to change state. If the OEN is not enabled, the outputs following cannot change state.

After programming a conditional OEN followed by your logic, you should program another OEN. With the cursor positioned at the left of the display, press and hold the "-" key until a "beep" is heard. Press FUNCT., INSTR, OEN. This is an unconditional OEN. No logic is required to enable it. The first OEN instruction is conditional and depends on the state of 1/09.

The difference between the MCR and the OEN Instructions is that the MCR turns all of its outputs off when disabled. The OEN leaves the state of the outputs unchanged when disabled. This is sometimes useful to allow a bumpless transfer between one part of the program and the next.

SP INST MENU #2 - CoMPare

Press --][--, 1, 1, 0, ENTER. Press FUNCT., INSTR, ADV, CMP, 1, 1, 1, ENTER. Press --( )--, 1, 1, 5, ENTER.

This instruction allows you to compare the state of two or more contacts. If both 1/10 and 1/11 are in the same state, either open or closed, true or false, compare will be true, and output 1/15 will energize. You may program the first input normally closed. This will have the effect of complementing the compare. That is, the CMP will be true when 1/10 and 1/11 are in different states.

SP INST MENU #2 - Skip

Press --][--, 1, 1, 2, ENTER. Press FUNCT., INSTR, ADV, SKP. Now press

--( )--, 1, 1, 4, ENTER.

When input 1/12 is energized, output 1/14 will turn on. When input 1/12 is de-energized, output 1/14 remains on. the Skip Instruction allows you to skip the next Instruction in the program if the previous logic is false. Since this functions just like a latch, most programmers use the Latch Key. Note that if you have a program that used the --(/)-- coil, the SKP will function like an unlatch.

After programming the skip program press ENTER then return to Rung 001. The PR-05 has turned the skip into a latch.

In addition to skipping outputs you can enter a skip instruction in front of an input. You may find this capability useful after you have honed your programming skills.

SP INST MENU #3 - END

Press --][--, 1, 1, 0, ENTER. Press FUNCT., INSTR, ADV, ADV, END.
Press --][--, 1, 0, 8, ENTER, --( )--, 1, 0, 8, ENTER.

When input 1/10 is off, you may close and open input 1/08 to energize output 1/08. If you close input 1/10, input 1/08 is no longer able to control output 1/08. Note that this appears to function much like the OEN Instructions. This END Instruction has a much different purpose. The program stops its scan when it encounters the END Instruction and returns to the beginning of the program.

This allows you to create a very short loop at the beginning of a program and minimize scan time under controlled conditions.

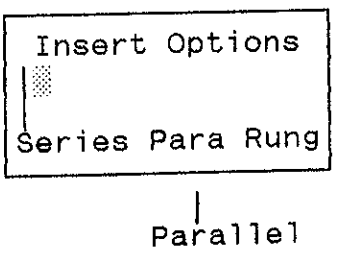
THIS ENDS PROGRAMMING FROM THE SPECIAL INSTRUCTIONS MENUS

OTHER FUNCtion KEYS

FUNC MENU NO. 1 - Insert

From the Programming Mode, press the FUNCT. Command Key.; Function Menu No. 1 will display. Press FUNC MENU NO. 1 Insert Select Key (F3); INSERT OPTIONS MENU will display.

INSERT OPTIONS MENU



To insert a series element, position the cursor at the point where the insertion is to be made, and press the Series Select Key (F1). The line will spread two spaces horizontally to the right. Revise ladder diagram

as required, and press ENTER Command Key to store.

To insert a parallel element, position the cursor at the point where the insertion is to be made, and press the Parallel Select Key (F2). An additional line will be added at the original position of the cursor. Revise ladder diagram as required, and press ENTER Command Key to store.

NOTE: If a parallel line is inserted on a line where a function display box exists multiple boxes may be displayed. For a single line function (TDPU, TDDO, PGEN) only the original two boxes will be displayed. For (SR) boxes will be displayed opposite each contact. Only those boxes connected to the logic or the left rail will be named, all others will be blank. For two line functions (RET, CNTR, DR) the first box connected to logic or the left rail will be named "Reset" followed by the function name. The second box will always be the setpoint and may be named with the type of increment (time). The second box connected to logic or the left rail will always be named with the increment type (time). Access Bear functions will be similiar to two line functions. The difference is the second box will be blank as the setpoint is in the ABR module.

To insert a rung between existing rungs, position the cursor anywhere in the rung where the insertion is to be made. Press Rung Select Key (F3) to spread or separate existing rungs. Enter elements as required, and press ENTER Command Key to store. The INTELLIGENT PROGRAMMER will automatically re-number the rungs. All cross-referencing will be updated.

FUNC MENU NO. 2 - Delete Key

Use the Delete Key to delete a Special Function or a complete rung from a ladder diagram. If you wish to delete a logic element it is easier to write over it with the (-) key or to remove it with the space bar.

In the Programming Mode, position the cursor over the function to be deleted, or anywhere in the rung to be deleted. Press the FUNCT. Command Key; FUNC MENU NO. 1 will display. ADVance to FUNC MENU NO. 2, and press the DELete Key; the DELETE OPTIONS MENU will display.

Note that after deleting a function some re-programming may be required depending on how you plan to execute your logic. After your changes are entered, press ENTER to exit the rung. The function group is now free to be re-used.

If the Rung Key (F3) is pressed, the contents of the rung in which the cursor is positioned will be erased. Functions in that rung will be deleted, as will CR and output coils. Check your cross reference listing to make sure you will maintain all necessary interlocking.

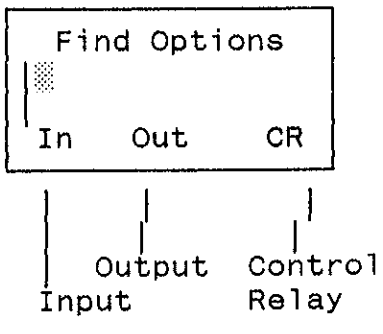
FUNC MENU NO. 2 - Find Key

The Find Key makes it possible to go directly to specific Inputs,

Outputs, CR's, Rungs, Special Instructions and Special Functions.

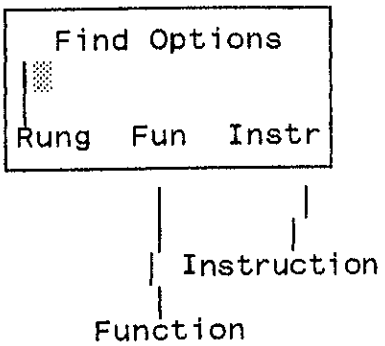
From the Programming Mode, press the **FUNCT.** Command Key; FUNC MENU NO. 1 will display. ADVance to FUNC MENU NO> 2, and press the **Find** Key (F2); FIND OPTS MENU #1 will display. Press **ADV** to see FIND OPTS MENU #2.

FIND OPTS MENU #1



+ ADV =

FIND OPTS MENU #2



FIND OPTS MENU #1:

Pressing Select Keys F1, F2 or F3 will call up an "Enter" prompt for the element address. After the address is entered, press **ENTER** Command Key; the cursor will position on the element <u>in the first rung in which it appears.</u> To find the <u>same</u> element and address in subsequent rungs, use the **Next** Key (following).

NOTE: If the **Next** Key will be used, leave the cursor positioned on the "found" element, and go directly to the Next Mode.

FIND OPTS MENU #2:

Pressing Select Key F1 will call up a "Rung #: " prompt. Enter the rung number and press the **ENTER** Command Key. The cursor will position on the first element on the rung number entered.

NOTE: Entering "999" at the "Rung #: " prompt and pressing the **ENTER** Command Key will position the cursor at the next blank rung available for programming.

Pressing Select Key F2 will call up SP FUN MENU NO. 1; use ADVance to see SP FUNC MENUs NO. 2 and 3. Press the Select Key for the Function to be found (TDPU, TDDO, etc.). A " Contact Coil" prompt will appear. Select the one needed; an "Enter _____#: " prompt will appear. Enter Function number, and press **ENTER** Command Key. Cursor will position on Function in the first rung in which it appears.

Pressing Select Key F3 will call up SP INST MENU NO. 1; use ADVance to see SP INST MENUs NO. 2 and 3. Press the Select Key for the Instruction to be found (MCR, CMP, etc.); cursor will position on Instruction in the first rung in which it appears.

FUNC MENU NO. 2 - Next

When used in conjunction with the Find Key (above), the Next Key will find the next element with the same address in the next programmed rung in which it appears.

After an element has been "found" and the cursor is still positioned on it, press the FUNCT. Command Key, then ADV and Next Select Key (F3); cursor will position on next occurrence of element previously "found".

Repeat the "Next" process--but not the "Find" process--to find additional occurrences of the same element and address. "Not found" will display if there are no more occurrences.

FUNC MENU NO. 3 - Setpoint

The Setpt Key permits changes in any Special Function setpoint value. In the Programming Mode, position the cursor on any display box of any Special Function. Press the FUNCT. Command Key; FUNC MENU NO. 1 will display. ADVance to FUNC MENU NO. 3.

Press the Setpoint Select Key (F1), and answer the prompts as they display. The setpoint mode is programmed just like programming the original setpoint. Press ENTER Command Key to store changes.

FUNC MENU NO. 3 - Display

The Dspl Key (F2) can be used to toggle on and off the "Current Symbol and Label" line (line 4) of the LCD.

When the INTELLIGENT PROGRAMMER is first energized, the "Current Symbol and Label" is the default display for the bottom line of the LCD in the Programming Mode. This display shows I/O addresses, Special Functions and Special Instructions, and Function and Instruction display box values as the cursor passes over these entries in a ladder diagram. Pressing the Dspl Key will replace this information display with a fourth line of the ladder diagram.

From the Programming Mode, press the FUNCT. Command Key; FUNC MENU NO. 1 will display ADVance to FUNC MENU NO. 3.

Press the Dspl Select Key (F2); the LCD will return to the ladder diagram with a fourth line of the ladder diagram displayed.

To restore the "Current Symbol and Label" display to the fourth line of the LCD, repeat the procedure outlined above.

NOTE: Whichever display is in effect at the time the INTELLIGENT PROGRAMMER is de-energized will become the default display. It will appear as the fourth line in the LCD program display each time the programmer is energized.

FUNC MENU NO. 3 - Memory Count

The **Mem** Key (F3) gives access to a display of the number of bytes which have been used in programming, the number of bytes still available in the INTELLIGENT PROGRAMMER and the minimum EPROM required to hold the program.

From the Programming Mode, press the FUNCT. Command Key; FUNC MENU No. 1 will display. ADVance to FUNC MENU NO. 3.

Press the **Mem** Key (F3); the "Program Memory" display will show the number of bytes used, the number free and the minimum EPROM size.

LCD DISPLAY

Program memory
Used: 1367 bytes
Free:15017 bytes
Min PROM: 2716

The byte count will always add up to 16,384 which is the size of a 27128. The largest we can program.

THIS ENDS PROGRAMMING FROM THE FUNCTION MENUS AND CONCLUDES THE PROGRAMMING SECTION

POST-PROGRAMMING

This POST-PROGRAMMING Section is devoted to the printing, running, EPROM, setpoint, secure, PC, terminal and Option sections of the Main Menu. You must program a rung of ladder logic before you can execute these options.

MAIN MENU NO. 1 - Print

PRINT MENU

Ready Printer at 9600 baud then press ENTER

The Print Select Key (F2) will access the print menu. To ready the printer you MUST set your printer at 0 parity bits, 8 data bits and 1 stop bit. Insure the baud rates are the same. If your printer has no RAM use a low baud rate. Connect with cable ICM-CA-16 and press ENTER.

MAIN MENU NO. 1 - Run

The Run Key will access the Run Functions of system checkout, forcing and monitoring I/O addresses, running and scanning the program, and checking power flow or continuity.

NOTE: The INTELLIGENT PROGRAMMER must be connected to the same type of Divelbiss Programmable Logic Controller as was CONFIGured (see CONFIGURATION) to be able to operate in the Run Mode. You must be VERY careful to not intermix a PIC product configuration with a non-PIC product configuration.

With the programmer de-energized, install the IF-BB interface or EM-02 emulator in the right-hand socket at the top of the programmer.

CAUTION: USE CARE WHEN INSTALLING THE TWO INTERFACE RIBBON-CABLE PLUGS IN THE PLC; THE CONNECTING PINS ARE EASILY BENT, AND THE PLUGS/OR SOCKETS COULD BE DAMAGED.

For the Bear Bones and Baby Bear Bones position the 24 pin connector so that the arrow on the connector faces the arrow on the CPU card. The 10 pin connector is keyed and has matching arrows. This applies to the ICM-IF-BB with the ICM-CA-20 cable and the PIC-EM-02 with the ICM-CA-22 cable.

For the PIC Bear Bones position the 40 pin connector so that the key aligns with the keying slot on the CPU card.

ICM-PR-05 programmers version 1.5X and earlier can be used with the ICM-IF-BB interface but not with the PIC-EM-02 emulator. Programmers version 1.70 and above may be used with either the interface or emulator.

Make interface &/or emulator connections with the line power removed to prevent the danger of electrical shock. This practice also protects the equipment from experiencing electrical problems.

See instructions accompanying the Programmable Logic Controller for details on connecting the PLC to a power supply, and energize the PLC.

After installing the PLC, review the pre-programming section of this manual. You must also program a rung of ladder logic before you can execute the Run program.

ICM-IF-BB

From MAIN MENU NO. 1, press the Run Select Key (F3). The message "Downloading Program to PLC BB - __ K" (per CONFIGURATION) will flash.

RUN PROMPT #1

```
Downloading
Program to PLC
BB-4k
Interface Error
```

It is possible to get one of these displays. Prompt #1 indicates a problem with the interface. Prompt #2 indicates no power.

RUN PROMPT #2

```
| Rung 001
]|[----------()
| Rung 002
  PLC No Power
```

If the error prompts do not appear you will be taken to RUN FUNC MENU #1. Press ADV to go to RUN FUNC MENU #2, and then RUN FUNC MENU #3.

PIC-EM-02 NOTE! Always use the ground connector

From MAIN MENU NO. 1, press the Run Select Key (F3). The message "Downloading Program to PLC BB - __ K" (per CONFIGURATION) will flash if the emulator is connected to a Bear Bones. The message "Downloading Program to PLC PIC-__K" (per CONFIGURATION) will flash if the emulator is connected to a PIC Bear Bones.

RUN PROMPT #1

```
Downloading
Program to PLC
BB-4k
PLC Comm Error
```

RUN PROMPT #2

```
Downloading
Program to PLC
PIC-8k
PLC Comm Error
```

RUN PROMPT #3

```
| Rung 001
]|[----------()
| Rung 002
  PLC No Power
```

It is possible to get one of the above displays. Prompts 1 and 2 indicate a problem with the emulator. Prompt 3 indicates that no power is applied to the PIC Bear.

EITHER

If the error prompts do not appear you will be taken to RUN FUNC MENU #1. Press ADV to go to RUN FUNC MENU #2, and then RUN FUNC MENU #3.

RUN FUNC MENU #1

```
Run Functions
|]|[----------()
|  Rung 002
Reset  Run  Scan
```

RUN FUNC MENU #2

```
Run Functions
|]|[----------()
|  Rung 002
Force Find  Next
```

RUN FUNC MENU #3

```
Run Functions
|]|[----------()
|  Rung 002
Dspl
```

RUN FUNC MENU NO. 1 - Reset

From MAIN MENU NO. 1, press the Run Select Key (F3); RUN FUNC MENU # 1 will appear.

Press the Reset Select Key (F1); this resets all outputs, CRs, and Functions. The program counter is reset to 000 and you are at the beginning of your program. If the watchdog LED was blinking it will be turned off. Press MENU RETURN Command Key; display will return to MAIN MENU NO. 1. Press FUNCT. Key to return to RUN FUNC MENU #1.

Reset is valuable when you are running a program and want to stop for a minor equipment adjustment. Press Reset to halt and reset, make your adjustment, then Run again. This keeps you from having to download your program every time you press Run.

RUN FUNC MENU NO. 1 - Run

From MAIN MENU NO. 1, press the Run Select Key (F3); RUN FUNC MENU # 1 will appear. Press the Run Select Key (F2); Rung 001 will display, and the program stored in memory will run continuously through the PLC connected the INTELLIGENT PROGRAMMER. Blinking elements in the ladder diagram will indicate power flow.

NOTE: If the watchdog LED on the PLC does not blink, check the configuration of the PLC and the PR-05, they must be the same to insure reliable operation.

ICM-IF-BB

The interface cannot warn you if you have selected the wrong PLC type.

Pressing the MENU RETURN Command Key while any of the Run Functions are in operation will turn the Function OFF, reset all the Outputs, CR's, Functions, and return the display to MAIN MENU NO. 1. Pressing the Funct. Key will display RUN MENU #1.

PIC-EM-02

The emulator will warn you if you have selected the wrong PLC type.

The ICM-PR-05 version 1.74 or higher when used with the PIC-EM-02 Emulator will blink the left vertical bar for any logic being scanned. If the logic is not being scanned the left vertical bar will not blink. This added feature is valuable when End instructions are inside the program. If an End instruction is enabled or true the following logic will not be scanned because the program counter has been reset to memory location 0000.

Pressing the MENU RETURN Command Key while any of the Run functions are in operation will bring up the prompt "Reset PLC Yes No". If you choose YES the PLC will be reset just as above. If you choose NO you will be returned to the MAIN MENU and the PLC will remain running.

C A U T I O N ! ! !

Exiting the RUN mode and leaving the CPU running should be done by experienced personal only. You must read and understand all the listed comments before you attempt to take advantage of this feature.

Program

You may edit the existing program or load in a new one. If any changes are made and you attempt to Run the Outputs, CR's and Functions will be reset before the revised or new program can be executed.

Print

You may Print your program while it is running without effecting CPU operation.

Run

You may re-initiate this mode without effecting operation providing no programming changes have been made. See Program and Setpt.

PROM

You may perform any EPROM function while running without effecting CPU operation.

Diag

PR-05: All Outputs, CR's, Functions reset, and program erased.

Keybrd: Does not effect operation.

PLC: All Outputs, CR's, Functions reset, program not effected.

Configure

Title: Does not effect operation.

PLC: All Outputs, CR's, Functions reset, program not effected. If you select a non-compatible PLC type you cannot Run the program.

Port: Changing the Baud rate will reset all Outputs, CR's, and Functions. The programmer thinks the PC link is missing.

Print: Does not effect operation.

Dspl: Does not effect operation.

Click: Does not effect operation.

Setpt

Changing the setpoint of any function will cause all Outputs, CR's and Functions to be reset when you re-run the program.

Secure

Does not effect operation. Will lock you out of the program if you enter the wrong password.

PC

Does not effect operation.

Term

Does not effect operation.

Option

Resets all Outputs, CR's, Functions, and erases the program.

EITHER

In the Run Function Mode, the cursor can be moved with the arrow keys. As the cursor is positioned on elements and display boxes in the ladder diagram, it will display their I/O addresses and/or values, and Function Setpoints and actual counts, in the "Current Symbol and Label" display (fourth line) of the LCD if that display has been toggled ON. If the information display has been toggled OFf, an additional line of the ladder diagram will appear instead in the fourth line of the LCD.

Run is an invaluable aid in testing your program prior to programming an EPROM. The Power Flow aids you in finding problems quickly. The on line monitoring of data points makes timers and counters much easier to fine tune.

RUN FUNC MENU NO. 1 - Scan

From MAIN MENU NO. 1, press the **Run** Select Key (F3); RUN FUNC MENU #1 will appear.

Press the Scan Select Key (F3); the program stored in memory will run for only <u>one</u> scan of the program and then stop. Power flow may be monitored and elements checked as in the Run Function Mode (above).

Scan helps you see the effect of one input on your program for one scan.

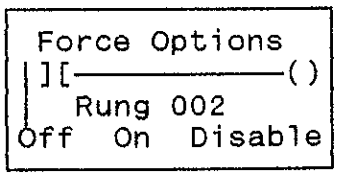
A PLC can scan very fast in the Run mode and individual points may be difficult to analyze without this feature.

RUN FUNC MENU NO. 2 - Force

From MAIN MENU NO. 1, press the Run Select Key (F3). RUN FUNC MENU #1 will appear. ADV to RUN FUNCT MENU #2.

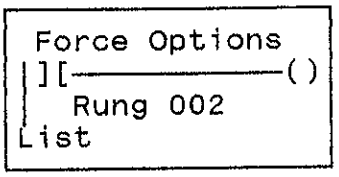
Press the Force Select Key (F1); FORCE OPTionS MENU #1 will appear. ADVance to see FORCE OPTS MENU #2.

FORCE OPTS MENU #1



The **On** or **Off** keys will force I/O, or functions regardless of their logical state. **Disable** will reset the on or off state.

FORCE OPTS MENU #3



Version 1.74 and higher

Force acts like a logical instruction. If a N.O. contact is forced on it acts like you had energized its input. If a N.C. contact is forced on it acts like you had opened its input.

All versions

It is very important for you to understand that once anything is **Forced** it must be **Disabled**. The **List** key allows you to list all **Forced** items. To force anything place the cursor over the item and then select the desired forcing action.

ICM-IF-BB

There is no power flow with the interface.

PIC-EM-02

There is power flow with the emulator.

EITHER

NOTE: The three remaining Run Function Menu Keys have been covered previously in Section C (see following), and are repeated in Run Functions only for the user's convenience.

RUN FUNC MENU NO. 2 - Find Key: See MAIN MENU NO.1, FUNC MENU NO. 2

RUN FUNC MENU NO. 2 - Next Key: See MAIN MENU NO. 1, FUNC MENU NO. 2

RUN FUNC MENU NO. 3 - Display Key: See MAIN MENU NO.1, FUNC MENU NO. 3

<u>THIS CONCLUDES POST-PROGRAMMING IN THE RUN FUNCTION MODE</u>

MAIN MENU NO. 2 - EPROM

EPROM MENU NO.1

EPROM Options
Read Write Blank

EPROM MENU NO.2

EPROM Options
Verify Type

ADVance to MAIN MENU NO. 2. Press PROM Key (F1); EPROM MENU NO. 1 will display. ADVance to see EPROM MENU NO. 2.

Press Type Key (F2), and from the three displays that follow, select EPROM being used. Display will return to EPROM MENU NO. 2 after selection has been made.

TYPE MENU NO.1

EPROM Type
2716 2732 2732A

TYPE MENU NO.2

EPROM Type
2764 2764A 27128

TYPE MENU NO.3

EPROM Type
27128A

Selecting the EPROM type 2716, 2732, or 2732A will return you to EPROM Menu #2. If you choose 2764, 2764A, 27128 or 27128A you will be taken to the speed menu.

SPEED MENU

Programming mode
Norm Fast Quick

Here is where you choose the programming speed of your EPROM.
Normal programs at 50ms per pulse
Fast programs at 1ms per pulse
Quick programs at 0.1ms per pulse

CAUTION: USE CARE WHEN INSERTING THE EPROM SOCKET: DAMAGE TO EITHER EPROM OR SOCKET MAY OTHERWISE RESULT.

Proper insertion includes lifting the locking arm, inserting the EPROM with the notch to the top of the PR-05. Make sure the bottom of the EPROM is flush with the bottom of the socket. Then close the locking arm.

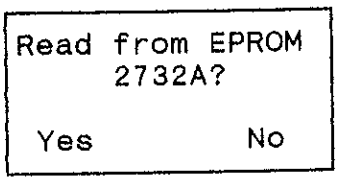
ADVance to EPROM MENU NO. 1, and press Blank Key (F3); display will confirm the p/n of the EPROM being used, and instruct you to insert it.

PROM MENU NO. 1 - Read

From MAIN MENU NO. 2, press the EPROM Select Key (F1); EPROM MENU NO. 1 will appear.

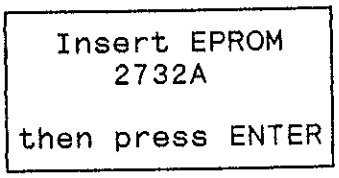
CAUTION: IF READ PROMPTS 1 OR 2 ARE EXECUTED, ALL EXISTING LADDER DIAGRAMS IN THE INTELLIGENT PROGRAMMER MEMORY WILL BE ERASED.

READ PROMPT #1



From EPROM MENU NO.1 select Read (F1) to get this display. The EPROM number is the same as the one you select under TYPE. No will return you to EPROM MENU NO.1, Yes will take you to READ PROMPT #2.

READ PROMPT #2



Each **Read** transfer is automatically verified. If the transfer fails verification, the INTELLIGENT PROGRAMMER memory will be cleared of all programmed logic.

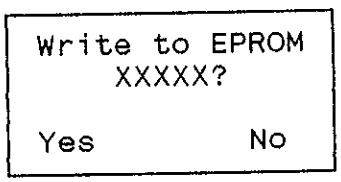
After successful verification, **Read Complete** will display. Press **ENTER** Command Key to complete **Read**, and see "VERIFY" Section after "WRITE".

If the transfer is verified, a Password (if assigned) will be requested. If an incorrect Password is entered, the request will be made two more times. If the Password is still incorrect after the third request, the INTELLIGENT PROGRAMMER memory will be cleared of the "read" material, and the display will return to MAIN MENU NO. 2.

EPROM MENU NO. 1 - Write Key

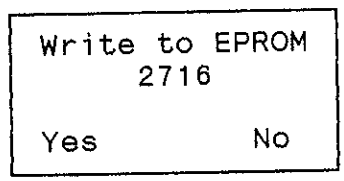
From MAIN MENU NO. 2, press the **EPROM** Select Key (F1); EPROM MENU NO. 1 will display.

WRITE PROMPT #1



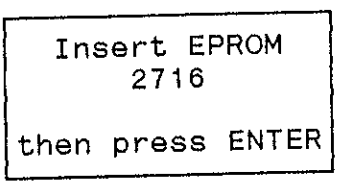
From EPROM MENU NO.1 select Write (F2) to get this display. The EPROM number is the same as the one you select under TYPE. **No** will return you to EPROM MENU NO.1, **Yes** will take you to WRITE PROMPT #2 (2716), #3 (2732 or 2732A) or #4 (2764, 2764A, 27128 or 27128A).

WRITE PROMPT #2A



No returns you to the EPROM options menu. A **Yes** takes you to 2B. Just insert the EPROM and press ENTER.

WRITE PROMPT #2B



Selecting No returns you to the EPROM options menu. A Yes takes you to menu 3B. Use **CAUTION** here. If you are using the Bear Bones or Baby Bear Bones choose **BB-4k**. If you are using the PIC Bear Bones choose **PIC-8k**.

Either selection takes you to menu 3C. A wrong choice in menu 3B will cause series problems when you attempt to run your program. The choices are the same for a 2732A. After choosing you will be taken to 3C. Insert your EPROM and press ENTER.

WRITE PROMPT #3A

Write to EPROM 2732	
Yes	No

WRITE PROMPT #3B

4k PLC type	
BB-4k	PIC-8k

WRITE PROMPT #3C

Insert EPROM 2732
then press ENTER

Press the **Write** Select Key (F2) to write the INTELLIGENT PROGRAMMER memory into the EPROM memory. WRITE PROMPT #1 will display.

WRITE PROMPT #4A

Write to EPROM 2764?	
Yes	No

WRITE PROMPT #4B

Write to EPROM i2764?	
Yes	No

For EPROMs 2764 and above you will be prompted with a code to remind you of your choice of programming speed. No prefix means **Norm**, a lower case i means **Fast**, a lower case q means **Quick**. If you find that when you are ready to program you need to change types just return to EPROM MENU #2.

NOTE: Programmed EPROMs cannot be re-programmed unless they are erased through exposure to an adequate ultra-violet light source for approximately one hour.

Press **ENTER** Command Key to begin transferring memory from INTELLIGENT PROGRAMMER to EPROM. During transfer, "Writing to EPROM" will display.

After successful verification, **Write Complete** will display. Press **ENTER** Command Key to complete **Read**, and see "VERIFY" Section following.

EPROM MENU NO. 1 - Blank Key

When you select Blank you will get a display like this. The only difference will be the EPROM number displayed. Just insert the EPROM and press ENTER. A Blank response allows you to program the EPROM. A Not Blank response requires you to erase the EPROM.

BLANK PROMPT

Insert EPROM 2732
then press ENTER

EPROM MENU NO. 2 - Verify Key

From MAIN MENU NO. 2, press the **EPROM** Select Key (F1); EPROM MENU NO. 1 will display, ADV to EPROM MENU No. 2.

After either **Read** or **Write** operations, verify that the memories of the EPROM and the INTELLIGENT PROGRAMMER are identical. Press the **Verify** Select Key (F1). Either "Passed Verification" or "Failed Verification" will display.

If "Passed Verification" displays, the EPROm and INTELLIGENT PROGRAMMER memories are identical, and the **Read** or **Write** transfer has been successful.

If "Failed Verification" displays, the EPROM and INTELLIGENT PROGRAMMER memories are not identical. Repeat the "READ" or "WRITE" and "VERIFY" operations. If "Failed Verification" displays again, replace EPROm and repeat operations. Consult Factory.

EPROM MENU NO. 2 - Type Key

Selecting **Type** allows you to determine the model number of the EPROM. This selection should be made before you perform any of the other EPROM functions.

THIS CONCLUDES PROGRAMMING FROM THE EPROM MENUS

MAIN MENU NO. 3 - Setpoint Key

The **Setpt** Key will permit the setpoint value of any function to be changed. This is the only mode that is accessible to anyone using the operator password.

From MAIN MENU NO. 1, enter the Programming Mode, and position the cursor on the function display box whose set point will be changed.

Return to MAIN MENU NO. 1, and ADV to MAIN MENU NO. 3. Press the **Setpoint** Select Key (F1). SP FUNC MENU #1 will display. Press ADV to see SP FUNC MENU #2 and SP FUNC MENU #3.

Press the key for the Function whose setpoint is to be changed. "Enter ___#: " will display. Enter Function number, and press **ENTER** Command Key; answer "Timer base" and "Setpoint Type" prompts, and enter new value at "Setpoint Value" prompt. Display will return to MAIN MENU NO. 3. Note that the word **Prog** does not display.

If you are running a program with the **EM-02** and exit the Run mode to change a setpoint the **NEW** setpoint takes effect only when Run is initiated again.

MAIN MENU NO. 3 - Secure Key

The **Secure** Key will "lock-out" the INTELLIGENT PROGRAMMER while still energized if the operator desires to do so while away from the programmer.

From MAIN MENU NO. 1, ADVance to MAIN MENU NO. 3. Press the Secure Select Key (F2).

The "Program Security" screen will display and prompt "Password:". The screen will remain in this display and will maintain the INTELLIGENT PROGRAMMER inoperative until the correct password is entered. If an incorrect password is entered "ACCESS DENIED" will flash. If you forget the password unplug the programmer and reconnect to display "Clear Program Yes No".

MAIN MENU NO. 3 - Personal Computer Key

The PC Select Key (F3) is used to establish a communications interface with a Personal Computer.

MAIN MENU NO. 4 - Terminal Key

The Term Select Key (F1) is an in-place facility for using the existing ASCII Symbol Keys and Alpha-Numeric Keys to interface with future Divelbiss Programmable Logic Controllers. This key also permits a quick check out of the PR-05 to computer or printer serial port interface. Connect the PR-05 to a computer that is acting as a terminal, press the PR-05 Term Select Key and send characters.

From MAIN MENU NO. 1, ADV to MAIN MENU NO. 4. Press the Term Select Key (F1). A blank screen ready for programming will appear.

MAIN MENU NO. 4 - Option Key

The option mode of the PR-05 allows you to program in the hexadecimal code recognized by many processors. This capability allows you to read, edit and program any EPROM. Many preprogrammed message displays use EPROMS. Now you can write your own messages.

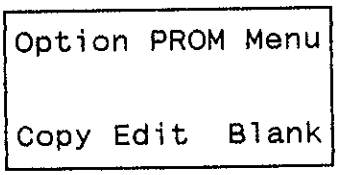
From MAIN MENU #4 press (F2) to choose the Option Mode. One of the following two displays is possible.

OPTION PROMPT

Ladder Program will be Destroyed
Proceed Exit

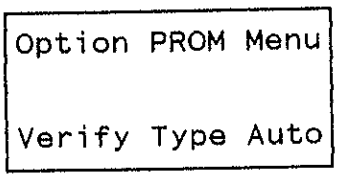
If you have a ladder program you may Exit back to Main Menu #4. Choose Proceed to get the OPTION MENU #1. This is the same display you get from the Main Menu with no ladder programmed.

OPTION MENU #1



Each item in the option menus will be detailed.

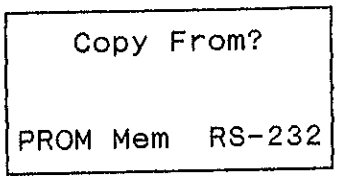
OPTION MENU #2



OPTION MENU #1 - Copy

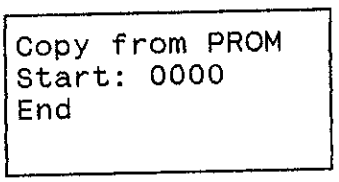
The Copy Select Key (F1) allows you to copy programs from the sources listed in COPY SCREEN #1. Copying from any of the sources will cause a COPY SCREEN 2 to be generated. Press PROM (F1). Copy allows you to read and write your programs.

COPY SCREEN #1



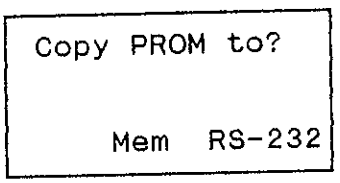
The only change in any of the screens would be the prompt "copy from". The display depends on the item chosen in screen #1. Once you select the starting address press ENTER. You will be prompted with an ending address. Once the starting and ending addresses are set you will get COPY SCREEN #3.

COPY SCREEN #2

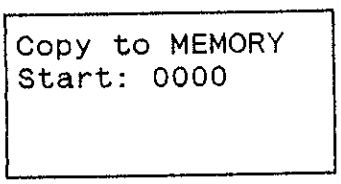


The display assumes that PROM was chosen as the source of the copy. When you get to the copy to display the source is never displayed. Once you select a source the display will prompt you for a starting address. You will not need to enter an ending address. Screens 4 & 5 show the balance of the copy cycle.

COPY SCREEN #3

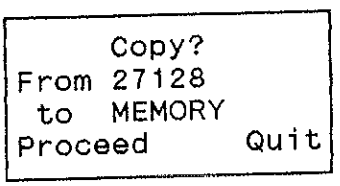


COPY SCREEN #4



Press ENTER at screen #4 to get screen #5. Press **Quit** to return to OPTION MENU #1. Press **Proceed** to copy from selected source to destination.

COPY SCREEN #5



OPTION MENU #1 - Edit

When you select Edit from OPTION MENU #1 you will be prompted to enter the starting address of your editing area. Whatever address you select when you press ENTER and go to screen #2 the selected address will **always** be the first address displayed in the upper left hand corner.

EDIT SCREEN #1

```
Edit Memory

Address: 0000
```

Edit screen #2 is shown assuming that the starting address selected was 0022 and that no program existed in memory. The cursor is controlled with the arrow keys. You can change any memory bit, but you cannot program an address from screen #2, go to screen #3.

EDIT SCREEN #2

```
0022 FF FF FF FF
0026 FF FF FF FF
002A FF FF FF FF
002E FF FF FF FF
```

Note that the addresses increment in steps of four. The first memory location to the right of 0022 is memory location 0022. The next location to the right is memory location 0023. The memory addresses are always displayed in the standard hexadecimal format. Use the arrow keys to step through locations.

EDIT SCREEN #3

```
0022 FF FF FF FF
0026 FF FF FF FF
002A FF FF FF FF
002E FF FF FF FF
```

In EDIT SCREEN #4 we changed the memory in memory address 0023 from FF to 37. This was done by positioning the cursor over memory address and entering the digits 3 and 7, then pressing ENTER. If you enter a single digit the PR-05 will enter a 0 in the first position and the selected digit next.

EDIT SCREEN #4

```
0022 FF 37 FF FF
0026 FF FF FF FF
002A FF FF FF FF
002E FF FF FF FF
```

Entering alpha characters has been simplified for you in the OPTION MENU mode. We only need 6 characters A thru F so we designated six keys to allow you a single key entry. For the following table use the blue area of the keys:

{*} = A; {/} = B; {,} = C; {(} = D; {=} = E; {;} = F

The alpha characters are entered just like numbers. You may mix the alpha-numeric sequence in any order. Just be certain of your codes. When you are finished programming or editing press MENU RETURN twice to return to OPTIONS MENU #1.

OPTION MENU #1 - Blank

Select BLANK. The display will remind of the EPROM size selected and prompt you to press ENTER. The display will be either "Blank" or "Not Blank". Press MENU RETURN to go back to OPTION MENU #1.

OPTION MENU #2 - Verify

The Verify Menus are similar but not identical to Copy. If you choose **PROM** as your source, then **Mem** will be your only destination. If you choose **Mem** as your source then **PROM** or **Mem** will be your destination. Choosing **RS-232** as the source allows you to select **PROM** or **Mem** as your destination.

Once the source and destination have been selected you will be prompted to **Proceed** or **Quit**.

OPTION MENU #2 - Type

Select TYPE. The displays are a little different from the EPROM displays because there is a little more capability in this mode. Here are the displays for **Type**.

TYPE MENU NO.1

EPROM Type
2716 2732 2732A

TYPE MENU NO.2

EPROM Type
2764 2764A 27128

TYPE MENU NO.3

EPROM Type
27128A 256-21V

TYPE MENU NO.4

EPROM Type
256-12V 27512

Here we have four EPROM type menus for 10 EPROM selections. The first 7 selections are just like the ones in EPROM. We have added the 32K EPROMs at both programming voltages and the 8 X 8K EPROM. For a choice of 2764 (8k) or above you will have to choose Norm, Fast or Quick.

OPTION MENU #2 - Auto

The Auto Mode allows copying, verifying, blank checking, and setting the EPROM type form your PC via the RS-232 port. You may use any communications program such as ProCom to enable your computer to talk to the PR-05. The current EPROM type will always be displayed.

COPY COMMAND Copy <Source> <Destination>

The Copy Command allows data to be copied from the source device (PROM, MEMORY, RS-232) to the destination device (PROM, MEMORY, RS-232).

Example:

2764> copy serial mem
or
2764> c s m

VERIFY COMMAND Verify <Source> <Destination>

The Verify Command allows data to be verified from the source device (PROM, MEMORY, RS-232) to the destination device (PROM, MEMORY, RS-232).

Example:

2764> verify prom mem
or
2764> v p m

BLANK COMMAND <Prom Type> >Blank

The Blank Command allows any of the supported PROM types to be tested for a blank or erased state. Be sure your PROM type printed on the screen matches the PROM being tested. If the correct type is not displayed see Type. Some PROM types have a prefix, make sure you set the type and prefix.

Example:

q27256-12.5V>B
or
q27256-12.5V>BLANK

TYPE COMMAND Type <Prom Type>

The Type Command allows the PROM type to be set. If there is no prefix before the PROM type it is a Normal PROM. If there is an "i" before the PROM type it is a Fast PROM. If there is a "q" before the PROM type it is a Quick PROM.

The PROM types supported in normal mode only are; 2716, 2732 and 2732A.

The PROM types supported in normal, quick and fast modes are; 2764, 2764A, 27128, 27128A, 27256, 27256-12.5V, 27256-21V and 27512.

Example:

2764>t q2756-12.5V
q27256-12.5V
or
2764>type q27256-12.5V
q27256-12.5V

THIS CONCLUDES POST PROGRAMMING
AND COMPLETES THE OPERATIONS SECTION OF THIS MANUAL

FUNCTIONS AND INSTRUCTIONS DEFINITIONS

GENERAL

All functions require a programmed reset line of logic. Functions operate when reset line is energized, and cannot operate when reset line is de-energized. When reset buss is enabled, all functions--with exception of Drum--have zero time, count or data. It is not necessary to program any logic in the reset line for the function to operate. If you want to be able to reset the function while executing the program then you must program a contact(s).

Some functions will require only one line of logic. This line will act as reset as well as operating the function. The TDPU, TDDO, PGEN fall in this group. Some functions require two lines of logic. One to act as reset and one to operate the function. The RET, CNTR, DR fall in this group. The SR function requires one line to act as reset and two to operate the function. The ABR function can operate with one or two lines of logic depending on its use in the program.

Input logic to any function can be as simple or complex as desired. Contacts are programmable as normally open or normally closed. They are given the same address as the coil (TDPU01).

Cascading:

By programming them in series to obtain greater preset values, timers and counters may be cascaded up to 32 times.

In cascading, when the first timer or counter in the series reaches its preset value and resets itself it also gives off a signal to start the second timer or counter.

With cascading, values of timers or counters multiply. EXAMPLE: A real-time clock would consist of a 60-second timer, feeding a 60-minute counter, feeding a 24-hour counter; this equals one day, or 86,400 seconds.

Compare:

To compare to a constant, program contacts in series to form either a Binary Code Decimal (BCD), or a Binary code (Normally Open = 1; Normally Closed = 0). The CMP Instruction is not required.

To compare to a value, program either an external BCD input from a thumbwheel or like device, or an internal Binary input compared to the last 8 Advanced Function CRs (first bit = least significant bit; last bit = most significant bit).

Counters:

It is possible to program up to 32 counters.

Internal/programmed setpoints can be 255 counts maximum, cascadable.

External/thumbwheel setpoints can be 99 counts maximun, cascadable.

External Setpoint:

An external setpoint to be entered via thumbwheels will require 2 groups of 4 (8 total) real world I/O addresses for thumbwheel Binary Code Decimal (BCD) input. Enter the I/O address for only the least significant bit of the least significant digit. EXAMPLE: In the number "24", "4" is the least significant digit; BCD 8421 will represent "4", the "1s" position being the least significant bit. When the I/O address for this bit is entered, the next 7 consecutive I/O addresses are automatically assigned.

FUNCTIONS

Drum Sequencer:

(DR) The Drum Sequencer function simulates an electromechanical rotary stepping drum with switch-actuating plug-in pins, tabs, plugs or adjustable cams which trigger sequential steps or outlets. The "1" and "0" entries in the Drum Matrix Display (see Section C) perform the same functions as mechanical triggering devices.

It is possible to program up to 8 Drum Sequencers, each with 256 steps and 16 channels.

If 12 or fewer outputs or channels are programmed, 2 consecutive normal function allottments will be required. If 13 or more outputs or channels are programmed, 3 consecutive normal function allottments will be required.

To use the drum sequencer from the programming Mode, enable-reset input logic must true in the programmed element, and step-input logic must true in the function display box below the element. (If the "Current Symbol and Label" display is not operative on the bottom line of the display, See Section C, and toggle the Display Key in FUNC MENU NO. 3.)

The Drum will sequence as long as the reset input line of the ladder diagram has continuity; if continuity is lost, the Drum will reset. Once the Drum completes its last step, it will revert to Step 1, and will recycle.

Pulse Generator: (PGEN) This timer is used for reset or clock pulse, and may be time- or event-driven. PG functions in the same way as TDPU except that when the setpoint times out the coil is energized only for a single cycle of the programmed ladder diagram, and then is automatically reset.

Retentive Timer: (RET) This timer functions in the same way as TDPU except that when input logic continuity to the setpoint is lost before the timer times out, the sequence is halted but the function is not reset to zero. The timer coil is energized when the setpoint is reached. An open circuit or no continuity at the reset input will reset the timer to zero.

Shift Register: (SR) Up to 32 cascadable Shift Registers may be programmed, each capable of shifting a total of 8 bits of information to one or more of 8 (maximum) positions on a continuous basis to such operations as an 8-station transfer line, conveyor, or work station assembly line.

Shift Registers may be programmed in either of two modes.
In the SYNCHRONOUS Mode, the clock and data inputs are connected to each other. The Shift Register segements load in response to a clock signal. Since data and clock are both high at the same time the register channels go high when clocked.
In the ASYNCHRONOUS Mode, the clock and data inputs are not connected to each other. The Shift Register segements load on response to a clock signal. The register output channels go high only if the data terminal is high.

Time Delay Drop Out: (TDDO) The timing sequence begins when the start/reset coil goes from a high to a low state. The time sequence begins at the setpoint and ends at zero. If the CPU is reset the timer remains at zero until the start/reset line goes high.

Time Delay Pick Up: (TDPU) The timing sequence begins when the start/reset coil goes from a low to a high state. The time sequence begins at zero and ends at the setpoint. If the CPU is reset the timer remains at zero until the start/reset line goes high.

Counter: (CNTR) The counter counts up. The start/reset line must be high to count. Each time the Count line goes high the counter increnents by one until the setpoint is reached.

Access Bear: (ABR) The Access Bear is a panel mounted timer/counter module. It offers the same functions as TDPU, TDDO, RET, and CNTR. The start/reset line must be high to allow the function to operate. The increment line allows the timers to time and counters to accumulate.

INSTRUCTIONS

Compare: (CMP) If a CMP Instruction is placed in the middle of a rung, the power flow results of those elements to the left of the Instruction are compared to the given address. If both are equal or have the same power flow, the output will turn ON. If they are not equal, the logic to the right of the CMP Instruction will cause the output to turn OFF.

End: (END) This Instruction causes the CPU's program counter to return to the start of the program. With elements to the left of the Instruction, it becomes a conditioned END. If END is the only Instruction in a rung, it becomes an unconditioned END or stop and repeat.

Latch: (L) If a rung logic path has power flow or continuity, the output coils will turn ON. If it is desired that once ON the coil should remain ON regardless of logic continuity, the LATCH output Instruction is used. The energized coil requires an UNLATCH instruction to de-energize or turn OFF.

Master Control Relay: (MCR) This Instruction is used to activate or de-activate a particular section of rungs within the ladder diagram. At the beginning of the section of rungs, MC preceeded with other elements, contacts, switches, etc. in the same rung becomes a conditional MCR. Therefore, the section will be activated or de-activated dependant upon power flow or continuity of that MCR rung. With power flow, the sections is activated; without power flow, it is de-activated (outputs OFF). For an unconditional end to this condition, place another MCR in a rung by itself after the controlled section.

Output Enable: (OEN) The Output Enable Instruction is similar to the MCR Instruction, except where MCR "activates or de-activates" everything in that section, the OEN will "maintain" the outputs' ON/OFF status regardless of power flow. (What was ON will remain ON; what was OFF will remain OFF.)

Skip: (SKP) This Instruction permits the next Instruction to be skipped, but only if there is no power flow up to the SKIP Instruction. Two consecutive SKIP Instructions are not permitted.

Unlatch: (U) This output Instruction is used to turn OFF a latched output coil of the same address.

INTELLIGENT PROGRAMMER OPTIONS AND ENHANCEMENTS

PRINTER

The INTELLIGENT PROGRAMMER will interface with an 80-column RS-232C Serial Printer to print out the program stored in memory. (See Fig. C-1, INTELLIGENT PROGRAMMER INTERFACE CONNECTIONS.)

NOTE: If your printer does not require a line feed on carriage return, see Print Line Feed in CONFIGURE, Section C, and toggle line feed OFF.

The following items will be printed out when the printer feature is activated:

- LADDER DIAGRAM
- COIL/CONTACT CROSS REFERENCE
- CONTROL RELAY CROSS REFERENCE
- COMPLETE LADDER DIAGRAM
- CROSS REFERENCE WARNINGS
- DRUM SEQUENCER TABLE
- ELEMENT LABELS (6 Characters)
- FUNCTION CROSS REFERENCE
- INPUT CROSS REFERENCE
- OUTPUT CROSS REFERENCE
- PAGE NUMBERS
- PROGRAM TITLE
- PROPRIETARY INFORMATION PAGE
- REVISION DATE
- REVISION NUMBER
- RUNG NUMBERS
- SPECIAL FUNCTIONS AND VALUES

PRINTING

You must use a serial ported printer.

To print the program, call up MAIN MENU NO. 1, and press the Print Select Key (F2); PRINT DISPLAY #1 will appear. Set your printer at 4800 baud, 0 parity bits, 8 data bits, 1 stop bit.

PRINT DISPLAY #1

```
Ready Printer
at 4800 baud

then press ENTER
```

When ready, press the ENTER Command Key; after a slight delay to down-load programmer memory to the printer, PRINT DISPLAY #2 will appear, and printing will begin. If desired to stop (abort) printing at any time, press the MENU RETURN Command Key.

PRINT DISPLAY #2

```
Printing
```

After printing is completed, PRINT DISPLAY #3 will appear. Press the ENTER Command Key to proceed with programming or go on to another menu.

PRINT DISPLAY #3

```
Printing
Complete
```

PERSONAL COMPUTER

The INTELLIGENT PROGRAMMER will also interface with a Personal Computer with a disk-drive MS-DOS operating system, a minimum of 64K of Random Access Memory (RAM), and an RS-232C serial port for printer connection.

Refer to Data Sheet 7809-46 for the details of connecting the programmer to the Personnal Computer. The Advanced Documentation Manual contains the details for software setup.

ADVANCED DOCUMENTATION PRINTING

Standard documentation for program printout is shown in PRINTER. Divelbiss also offers an optional Advanced Documentation Package in the form of a pre-programmed floppy disk and operating manual. With this software in place, the following data will print out in addition to the data contained in the standard documentation printout.

ADDITIONAL 21-CHARACTER DISPLAY OF ELEMENT DESCRIPTIONS.
INPUT AND OUTPUT WIRING DIAGRAM WITH WIRE NUMBERS, BOTH CAN BE PRINTED.
PROGRAMMERS NAME.
TABLE OF CONTENTS.
TEXT WITH EACH RUNG, UP TO 3,600 CHARACTERS PER RUNG.
YOUR COMPANY INFORMATION.

To use the Advanced Documentation Package insert the disk in the computer and type in "Docstart". Then follow the prompts on the screen. The programmer baud rate must be the same as the computers. The software revision numbers must be the same class. If the programmer is version 1.5 then the computer must be 1.5.

See the Advanced Documentation Manual disk for more details.

DATA ENTRY

The INTELLIGENT PROGRAMMER may be used as a keyboard to enter or receive data with a personnal computer. The data transfer takes place through the serial ports via ASCII characters. This is a quick way to check out both serial ports and the cable.

Set up your computer as a terminal and from the Main Menu 4 of the programmer select TERMINAL. Be sure both units are set to the same baud rate.

PR-05 VERSION 1.82 SUPPLEMENT TO 1.74 MANUAL

Version 1.82 of the PR-05 enables the Intelligent Programmer (PR-05) to be used with the Divelbiss High Density product line.

Divelbiss Corporation makes every effort to keep all our new releases downward compatible. Version 1.82 for the PR-05 is no exception to this rule. Version 1.82 will work with all the products & programs that version 1.74 did, the only changes made were for the addition of the High Density products.

DESCRIPTION OF HIGH DENSITY PRODUCT LINE

The high density product line programs the same as the ICM or PIC products. The major differences are listed below.

1. Smaller board size for same processing power.
2. All High density Controllers come standard with 16k Eprom
3. Available Retentive memory feature to save values of on board timers, counters, shift registers, drums & control relay states in the event of power loss.
4. Din Rail mounting.
5. No I\O on CPU. All I\O is done with expander boards for more flexibility configuring a system.

VERSION 1.82 ENHANCEMENTS FOR PR-05

1. There are two additional PLC types you can select in the configure menu. These are HD-16k & rHD-16k. The rHD-16k is the CPU with the retentive memory.

2. In the Diagnostics menu, the added diagnostics is labeled NOVRAM. This selection allows you to initialize the retentive memory. This will clear the retentive memory as well as the memory in the PR-05. MAKE SURE YOUR PROGRAM IS SAVED BEFORE USING THIS FEATURE.

SELECTING THE RETENTIVE OPTION

1. For Functions or Control Relays used for the first time.

   A. After entering a CR contact, type the number of the CR to be used. When the CR number is displayed, press the FUNCT key to select the retentive feature. After pressing the FUNCT key, the display will prompt you to press the F1 key to retain or the F2 key not to retain.

   For a CR, the state of the CR is retained when power is lost.

B. After selecting a function while the function number is displayed, press the FUNCT key to select the retentive feature. After pressing the FUNCT key, the display will prompt you to press the F1 key to retain or the F2 key not to retain.

2. Changing the retentive feature for functions or CRs already programmed.

A. To change a CR, position cursor over contact or coil to be changed. When the cursor is in position, press the FUNCT key and advance to the retain option by pressing the ADV key until RETAIN appears on the screen. Select retain and you will be prompted to press F1 key to retain or F2 key not to retain.

B. To change a function, position cursor over the reset box or the contact of the function. When the cursor is in position, press the FUNCT key and advance to the retain option by pressing the ADV key until RETAIN appears on the screen. Select retain and you will be prompted to press the F1 key to retain or F2 key not to retain.

NOTES: **On the status line of the LCD display on the PR-05 retentive CRs or functions will have a lower case r in front of the address.**

Example rCR-001 or rTDPU01

For EPROM 27C128 (12.5v), use the 27128A

REV.10/14/91