

Product Manual

8330ABX

Register Access Panel for the Allen-Bradley PLC-2

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The 8330ABX is a Register (Word) Access Panel specifically designed for use with the Allen-Bradley PLC-2 series of Programmable Controllers. The 8330 communicates with the PLC through the programming port on the processor or 1771-KA module thus requiring no input/output modules and additionally eliminating the need for ladder logic programming.

Operating in the "Open Mode" the 8330 can view and modify most of the data table registers (I/O image table is not accessible). Operating in the "Enhanced Mode" allows the system programmer to restrict the 8330 to view and/or modify a specific block of registers in the data table and also limit the write value. The addition of security locks, display segment control and program initiated error code display makes the 8330 the perfect choice for many control applications.

Notice! Word Address and Register Number are used interchangeably throughout this manual.

Fast Start




Every effort has been made to make the 8330 a simple product to apply and operate. Sometimes the best way to learn the operation of a new product is to hook it up and try it out. If this is your philosophy, then here's what to do.

1. Plug the 8569-10 communications cable (or equivalent) between the 8330 and the PLC-2.
2. Set all DIP switches on the 8330 to the off position.
3. Apply power to the programmable controller.
4. Connect the 8552 Power Supply (5 VDC at ½ AMP) or equivalent to the 8330.
5. Apply power to the Power Supply.

Important! Check the voltage at the terminals located on the 8330 and adjust to 5.1 VDC.

6. Proceed to the section titled Open Mode Operation (Page 5).

Key Definitions

	Assuming the CLOC function is selected - If unit is currently unlocked pressing the "LOCK" key will immediately lock the keypad and "CLOC" will be displayed. If the unit is currently locked the "LOCK" key must be pressed after all digits of the combination are entered to unlock the keypad. (Page 14).
	Pressing this key will temporarily toggle the unit from register data mode to register number mode or vice versa until the key is released.
	Negative key - does not function on this unit. CLR -Clears the display and key entry buffer which allows a new register number or new register data to be entered.

NEW REG

Operates as the register number enter key. If the unit is in the "REGISTER DATA" mode, pressing this key will toggle the unit to the "REGISTER NUMBER" mode.

This key will function in two different ways depending upon the setting of DIP Switch A6 (Auto Increment/Reduced Keystrokes).

When DIP Switch A6 in ON, the NEW REG key will function in an Auto Increment Mode. Let us assume that a register number has been entered, the contents of that register is being displayed and the "REGISTER DATA" LED is on; pressing the NEW REG key will toggle the display showing the register number currently being accessed. Two options are now available to the operator:

1. Pressing the NEW REG key a second time will increment the register number dependent on the setting of DIP Switch B2 and B4.

B2 off - Increment based on sequential word address. If current address is 030, then after increment B4 off it would become 031 then 032, 033 and so on.

B2 on - Increment based on sequential physical address. If current address is 030, then B4 off 130, 031, 131, 032, 132, 033, 133 and so on. This mode is useful when viewing timer/counter accumulator and preset values. The effect of DIP Switch B4 in the on position is explained in Section 17, Offset Addressing. The new address will be displayed for approximately one second. The 8330 will toggle to the Register Data mode and display the contents of that register.

2. Pressing the CLR key will clear the display, the 8330 is now ready for a new register number to be entered.

When DIP Switch A6 is off, the NEW REG key will functions in an ENTRY READY Mode. Let us assume that a register number has been entered, the contents of that register is being displayed and the "REGISTER DATA" LED is on; pressing the NEW REG key will toggle the display back to the "REGISTER NUMBER" mode and clear the display. The 8330 is now ready for a new register number to be entered.

NEW DATA

Operates as the "REGISTER DATA" enter key. If the unit is in the "REGISTER NUMBER mode, then pressing this key will toggle the unit to the "REGISTER DATA" mode.

LAST ENT

Pressing this key allows the operator to view the last data sent to the controller or the last register number entered depending upon the mode the unit is in. Releasing the key returns the unit to its previous condition.

Mode Indicators

Three LEDs are located just below the display window and indicate the current 8330 operating mode and status.

Register Number LED Indicates the value on the display is a register number. If an error code is being displayed, it is register number related.

Register Data LED Indicates the value on the display is a data value. If an error code is being displayed, it is data related.

Keyboard Locked LED Indicates the keypad is inactive unless "CLOC" is being displayed. During that time only a formatted entry relative to the combination entry is accepted.

Word Address / Physical Memory Address

The 8330 uses a communication protocol similar to the PLC programming terminal. Because of this it reads and writes to physical memory addresses within the processor. User programs in the PLC-2 family are built around octal word addresses. These octal word addresses correspond to physical memory addresses within the processor, however, the octal word address does not directly convert to a physical memory address. When programming a timer or counter, the word address of the preset value is always 100 (octal) above the accumulated value. In physical memory the preset immediately follows the accumulator.

	Word Address	Physical Address
T/C Accumulator	030	XXX
T/C Preset	130	XXX + 1
T/C Accumulator	031	XXX + 2
T/C Preset	131	XXX + 3

This concept remains true for the entire address range. Figure 1 below shows the layout of a PLC-2/15 with a factory configured data table based on both sequential word addresses and sequential physical memory addresses. Understanding the correlation between word addresses and physical memory addresses will allow you to select the operating mode which will best serve a particular application.

Sequential Physical Address		Sequential Word Address	
000 100 ⋮ 007 107	Processor Work Area	000 ⋮ 007	Processor Work Area
010 110 ⋮ 017 117	I/O Image Table	010 ⋮ 017	Output Image Table
020 120 ⋮ 027 127	Bit/Word Storage	020 ⋮ 027	Bit/Word Storage
030 130 ⋮ 077 177	T/C Accumulator & Preset Area	030 ⋮ 077	T/C Accumulators
200 ⋮	User Program	100 ⋮ 107	Processor Work Area
		110 ⋮ 117	Input Image Table
		120 ⋮ 127	Bit/Word Storage
		130 ⋮ 177	T/C Presets
		200 ⋮	User Program

Figure 1
PLC-2/15 Memory Configuration

The 8330 can access the general purpose data table and bit/word storage areas.





In its default mode of operation, referred to as OPEN MODE (DIP switches B6 - C8 off), the 8330 can view and

modify any of the word address above the I/O image table. On initial power up, the 8330 will display 6-X-X. The six indicates a Allen-Bradley PLC-2 compatible executive. The next two digits indicate the version level. During this display, default parameters are set and diagnostics are performed. If successful, the display will blank except for a cursor in the right most character position. The REGISTER NUMBER LED will be on. This will further be referred to as the register number ready mode. The operator may now enter a register number.




Example: Display register 030: Press [3] [0] [NEW REG].

If the operator enters a register number that is higher than the highest register used in either the OPEN or ENHANCED mode the 8330 will display -HI- and set the "REGISTER NUMBER" LED to on. Pressing the "CLR" key will clear the message and set the unit to the register number ready mode.

Once the desired register has been entered, the operator must press the NEW REG key. The REGISTER NUMBER LED will turn off, the REGISTER DATA LED will turn on and the display will show the numeric content of the register entered. The register is continually read offering real time display. At this point four keys are active on the keyboard, LAST ENT, VIEW, CLR and NEW REG. They function as follows:

-  When pressed, the display will show the last data value entered by the operator. If no value has been entered by the operator, the display will show "0". The display will continue as long as the key is held down.
-  When pressed, the REGISTER DATA LED will turn off, the REGISTER NUMBER LED will turn on and the display will show the register number currently accessed. When the key is released, the 8330 will return to the register data display mode.
-  When pressed, the display will blank except for a cursor in the right most digit position. This is referred to as the register data ready mode. The operator may key in a new value. Once the new value has been keyed in, the operator may press NEW DATA to send the new value to the PLC.
-  How the 8330s responds to this key is dependant on the setting of switch A6. Assume A6 is off: when pressed, the 8330 will go to the register number ready mode with a cursor in the units position. If on, the NEW REG key will function in an auto increment mode.

Assuming the operator presses the NEW REG key with all DIP switches off, the 8330 will go to the register number ready mode. The operator may key in a new register number, then press NEW REG to view its contents or press one of three active function keys LAST ENT, VIEW or NEW DATA. The 8330 response to the three function keys as follows:

-  When pressed, the display will show the last register number that was entered by the operator (at this point it is still the current register being accessed). When released, the 8330 will return to the Register Number Ready mode.
-  When pressed, the REGISTER NUMBER LED will turn off and the REGISTER DATA LED will turn on. The display will show the contents of the currently accessed register. When released, the 8330 will return to the register number ready mode.
-  When pressed, the REGISTER NUMBER LED will turn off and the REGISTER DATA LED will turn on. The display will show the contents of the currently accessed register.

Section 2: Open Mode Operation

The LAST ENT and VIEW keys are always active in open mode. These keys are both momentary and when pressed simply point the display to various display buffers and have no affect on the data. Pressing either of these keys during the middle of data entry will not affect the current data in any way.

The CLR key is always active in open mode. Pressing the CLR key simply clears the 8330 key entry buffer, it does not change any data. If the CLR key is pressed accidentally, recovery requires pressing either the NEW REG or NEW DATA key (opposite key to mode 8330 is then in).

NOTE: The LOCK key is never active in open mode.

Example: Assume that you want to change the data value of register 137 from 0 to 488.

1. With the 8330 in the register number mode (REGISTER NUMBER LED on and a cursor is the least significant digit position), press the keys 1, 3 & 7 in order. The display will show each number as it is entered with the cursor preceding the desired register number.
2. Press the NEW REG key. The REGISTER NUMBER LED will go off and the REGISTER DATA LED will now lite. The display will show the value 0.
3. Press the CLR key, the 0 will be replaced by a cursor, and press the 4, 8 & 8 keys in order. The display will reflect the entry of each of these keys in the order entered with a cursor in the most significant position.
4. After all of the digits have been entered, press the NEW DATA key to enter the data. The cursor will disappear indicating the data has been changed.
5. To select an new register to display, press the NEW REG key.

When operated in the open mode, the 8330 affects only the current register accessed and only if a new data entry is made. The enhanced mode offers the functions available in open mode plus additional functions including combination lock, soft lock, user defined read/write/data limits, PLC initiated error displays, selected register display and display segment control.

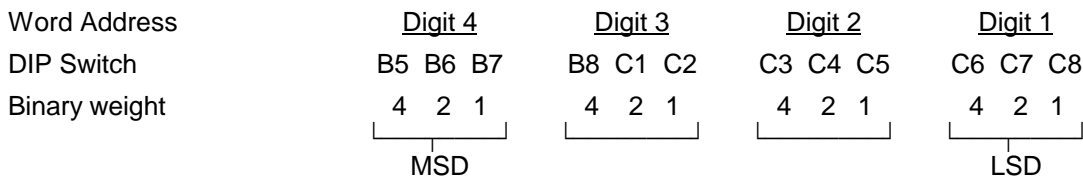
The enhanced mode is enabled by setting DIP switches B6 - C8 to a legal or valid address. This automatically enables the Command Register Block locations. During enhanced mode operation, data will be exchanged between the 8330 and PLC through the command register and reserved register block. Much of this exchange is controlled by ladder logic programs within the PLC written to take advantage of specific 8330 functions.

Reserved Register Block

When operated in the enhanced mode, a block of registers within the PLC, must be reserved for the exchange of data between the 8330 and the PLC. The number of reserved registers used is dependent on the enhance mode functions selected. The 8330 does however check to make sure that enough registers are available even if not all of them are used. The minimum number of registers reserved is three and are labeled "Command Register" and "Number Of Last Register Entered" (2 registers).

The Reserved Register Block is formed when a valid word address is set on DIP switches B5 through C8. The word address of the first word in the Reserved Register Block is a four digit octal value.

Notice! The value set for the two least significant digits (C3-C8) of the command register can not exceed 52. Values greater than 52 will cause an -Ed- error. The maximum command register address is 7752.

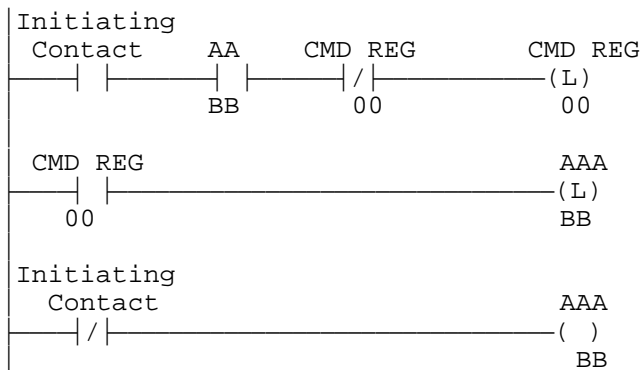


Example: Reserved Register Block located at register 237 - DIP switches C1, C4, C5, C6, C7 & C8 are ON.

The Reserved Register Block is read by the 8330 during power up based on various DIP switch settings. The values read will be retained by the 8330 as long as power is applied. If a change is made in the Reserved Register Block, the 8330 can be forced to reread it by two different methods.

1. Power the 8330 down then power back up.
2. Latch Bit 00 in the Command Register. The 8330 will unlatch the Bit when the update is completed. If Bit 00 is forced on continuously, the 8330 will continually update the Reserved Register Block. This will greatly slow the response of the 8330.

The ladder logic on the next page is recommended.



- Individual bits in the Command Register are monitored and/or modified by the 8330. This allows the PLC to force the 8330 into various modes and allows the 8330 to offer status information to the PLC.

The Reserved Register Block that is defined below is with DIP switch B3 OFF (Normal Reserved Register Block).

Reserved Register Block "X" is the address set on DIP switches B5 through C8

<u>Address</u>	<u>Assignment</u>
X	<p>BIT 00 Update limits Set by PLC after a limit or combination change is made. Not required if 8330 is powered off then on. Reset by 8330 after limits are read.</p> <p>BIT 01 Keypad soft lock (Page 13), Set by PLC to disable 8330 keys. Reset by PLC to enable 8330 keys.</p> <p>BIT 02 Data change made Set by 8330 to indicate a register was written to. Reset by 8330 in approximately 0.5 seconds.</p> <p>BIT 03 Display segment control (Page 16), Set by PLC to enter display segment control mode. Reset by PC to exit display segment control mode.</p> <p>BIT 04 Force display to ERR1 (Page 17)</p> <p>BIT 05 Force display to ERR2 Set by the PLC to activate the display. Reset by the</p> <p>BIT 06 Force display to ERR3 8330 as an acknowledgment.</p> <p>BIT 07 Forced Register Display (Page 15)</p> <p>BIT 10 Invalid combination (Page 14), Set by 8330 when operator keys in the wrong combination. Reset when the CLR key is pressed.</p> <p>BIT 11 Keypad combination lock on (Page 14), Set by 8330 whenever unit is in CLOC. Reset by 8330 when valid combination is entered.</p> <p>BIT 12 Decimal point 2 (Page 14)</p> <p>BIT 13 Decimal point 3</p> <p>BIT 14 Decimal point 4</p> <p>BIT 15 Decimal point 5</p> <p>BIT 16 Negative sign at digit position 5 (Page 14)</p> <p>BIT 17 Force four digit entry and display</p>

<u>Address</u>	<u>Assignment</u>
X+1	Number of last register entered (Least significant 3 digits of address), (Page 9)
X+2	Number of last register entered (Most significant 2 digits of address)
X+3	High write limit (Most significant 2 digits of address), (Page 9)
X+4	High write limit (Least significant 3 digits of address)
X+5	Low write limit (Most significant 2 digits of address), (Page 9)
X+6	Low write limit (Least significant 3 digits of address)
X+7	High read limit (Most significant 2 digits of address), (Page 9)
X+10	High read limit (Least significant 3 digits of address)
X+11	Low read limit (Most significant 2 digits of address), (Page 9)
X+12	Low read limit (Least significant 3 digits of address)
X+13	High data limit (Page 12)
X+14	Low data limit
X+15	Combination lock value (Most significant 2 digits), (Page 14)
X+16	Combination lock value (Least significant 3 digits)
X+17	Display Segment Control character 1 (Page 16)
X+20	Display Segment Control character 2
X+21	Display Segment Control character 3
X+22	Display Segment Control character 4
X+23	Display Segment Control character 5

When the Reserved Register block is formed, register numbers are allotted for all functions. If a particular function is not being used, i.e. display segment control, those register numbers assigned to that function may be used by the PLC for other purposes. A work sheet is provided in Appendix F. Using it along with the check list will step you through the implementation of these functions.

- When the enhanced mode is selected, two tests are performed by the 8330 on power up. First, the word address set on DIP switches B5 through C8 is compared to the default low read limit calculated by the 8330. If the DIP switch value is less than the low default value, the 8330 will display error "-Eb-".
- If the first test is passed, the 8330 will add the number of words required by the Reserved Register Block to the DIP switch value. This new value is compared to the default high read limit. If the new number is greater than the high default value, the 8330 will display error "-EC-".

As shown in the following table, the Reserved Register Block addresses are ascending values starting with the Command Register. The setting of DIP switch B3 determines if the ascending register numbers are based on sequential word addresses or sequential physical memory addresses:

- B3 ON - Sequential Physical Memory Addresses
(Compressed Reserved Register Block)
- B3 OFF - Sequential Word Addresses
(Normal Reserved Register Block)

The following example shows the Reserved Register Block assignments assuming DIP switch B5 through C8 are set to octal 0030.

Section 3: Enhanced Mode Operation

DIP B3 OFF Word Address	Description	DIP B3 ON Word Address
030	Command Register	030
031	Last Register Entered (LEAST SIG. 3 DIGITS)	130
032	Last Register Entered (MOST SIG. 2 DIGITS)	031
033	High Write Limit Hi 2 digits of address	131
034	Lo 3 digits of address	032
035	Low Write Limit Hi 2 digits of address	132
036	Lo 3 digits of address	033
037	High Read Limit Hi 2 digits of address	133
040	Lo 3 digits of address	034
041	Low Read Limit Hi 2 digits of address	134
042	Lo 3 digits of address	035
043	High Data Limit	135
044	Low Data Limit	036
045	Lock Combination Hi 2 digits of combination	136
046	Lo 3 digits of combination	037
047	Direct Segment Control Pos. 5	137
050	Pos. 4	040
051	Pos. 3	140
052	Pos. 2	041
053	Pos. 1	141

In most applications, the Reserved Register Block configuration shown with DIP switch B3 off, is the simplest to use. In cases where many timers and counters are programmed, the Reserve Register Block configuration shown with DIP switch B3 on may offer some advantage relative to word allocation. (Remember timers and counters use register pairs 100 Octal words apart).

Last Register Entered

If the 8330 is operated in the enhanced mode, the second and third locations in the Reserved Register Block are automatically enabled. When a register address is accepted by the 8330, that register number is put into the second and third Reserved Register Block location (X+1 & X+2). X+1 holds the least significant 3 digits of the address, X+2 holds the most significant 2 digits of the address. This feature is not enabled when the 8330 is operated in open mode.

Example: If address 031 is being viewed by the 8330, then Reserved Register Block location X+001 would hold 031 and location X+002 would hold 000.

If address 17777 is viewed, X+001 will hold 777 and X+002 will hold 017.

Read & Write Access Limits

The 8330 has restricted access to the processors memory. The processor work area, I/O image table and user program are not accessible by the 8330. Since the data table may be configured in the PLC-2 series, the 8330 must calculate access boundaries during power-up. The high access limit is always the last word in the data table. The low access limit is always the first word after the I/O image table.

Section 3: Enhanced Mode Operation

Example: Default access limits for Mini PLC-2/15.

Data Table Configuration

Number of 128-word D.T. blocks	01
Number of Input/output racks	2 *
Number of T/C (if applicable)	040
Data Table size	128

* T-3 Terminal will display 2; however, only one rack is assigned.

Default Low Read/Write Limit	020
Default High Read/Write Limit	177

When the 8330 Enhanced Mode is selected, the system designer may reassign the High and Low access limits providing they remain within the default boundaries. In addition, Read Access may be authorized while restricting Write Access. Eight registers are available in the Reserved Register Block for reassigning limit values. A few ground rules and options must be considered when limits are reassigned.

- Read and write limits must fall within the boundaries of the default limits. -E8- will be displayed if limit values fall outside the default boundaries.
- Write limits must fall within the boundaries of the read limits to be functional. A register can not be changed if it can not be first read.
- Read and write limits must be stored as octal word addresses. If the digits "8" or "9" are found the 8330 will display -E8-.
- A valid Command Register must be set on DIP switches B5 through C8.
- DIP switch A1 and/or A2 must be on to enable the desired limit to be acquired from the Reserved Register block. If write limits are to be the same as the read limits then DIP switch A1 may be left off and only read limits need be set on. Figure 2 indicates the affect DIP switch B2 has on limit boundaries.

If the register number selected by the operator is above or below the set limit, the 8330 will display -HI- or -LO- respective to the limits set and the "REGISTER NUMBER" LED will be on. Pressing the "CLR" key will clear the error and allow the operator to enter a new register number.

When register data is being changed, limit errors can be caused in two ways. First if the data value is above or below the set limits, the 8330 will display -HI- or -LO- respectively and the "REGISTER DATA" LED will be on. If the "CLR" key is pressed the unit will clear the display, go to the register data ready mode and a new value may be entered.

Second, if the current register accessed is not within the write limits the 8330 will display -HI- or -LO- respective to the limits set, turn off the "REGISTER DATA" LED and turn on the "REGISTER NUMBER" LED. Pressing the "CLR" key will clear the message and set the unit to the register number ready mode.

Any of the limits may be changed at any time. For example, you may wish to change the read or write limits based on the work shift. By using the PUT instruction of the PLC, you can move new limits into the Reserved Register block, then set bit 00 of the Command Register to force an update. To prevent writing, set the low write limit above the high write limit. Under this condition, the 8330 will not allow writing to any registers.

Notice!

If you are using this function, bit 00 must not be forced on continuously or it will slow the 8330 response time.

Example: User selected limits with data table configured for two racks.

Section 3: Enhanced Mode Operation

The limits stored in Reserved Register Block are shown below.

	High 2 digit address	Low 3 digit address	
High Read Limit	00	147	DIP switch A1, A2, and A5 are set on. DIP switches B5 through C8 are set to a valid Command Register address
Low Read Limit	00	040	
High Write Limit	00	143	
Low Write Limit	00	043	

DIP switch B2 determines whether Read and Write Limits are based on Physical Address or Word Address.

DIP B2 off

00037	Outside Limits	
00040		Reading Allowed
00041		
00042		
00043		
00044		
:		
:		
00100	Protected Area	
:		
:		
00127		
00130	Reading & Writing Allowed	
00131		
:		
:		
00142		
00143		
00144		
00145		
00146		
00147		
00150	Outside Limits	

Boundaries based on sequential Word Addresses

DIP B2 on

00137	Outside Limits	
00040		Reading Allowed
00140		
00041		
00141		
00042		
00142		
00043	Read/Write Allowed	
00143		
00044		
00144		
00045		
00145		
00046		
00146		
00047		
00147		
00050	Outside Limits	

Boundaries based on sequential Physical Addresses

Notice!

The Protected Area is part of the I/O Image Table and Processor work area. Access is never permitted to these areas. Boundaries based on Sequential Physical Addresses are most useful when access is limited to just timer/counter accumulator and preset values

Write Data Limits

In the PLC-2, timers, counters and most other functions use three digit data. The three digits are stored as BCD characters thus requiring 12 of the 16 bits that comprise one word. The remaining four bits are in many cases used as status or flag bits. When the 8330 is operating in the three digit data mode and a value is modified only the lower twelve bits are affected; the top four bits will retain their previous status. When four digit data mode is enabled, the 8330 will affect all 16 bits.

Warning!

If the word modified is relative to a function that utilizes the top four bits as status or flag data, then undesirable effects may occur in the PLC program.

Two registers are available in the Reserved Register Block to store high and low write data limits. When write data limits are not selected the 8330 sets default values; High = 9999, Low = 0.

If the operator enters a write value into the 8330 that is outside the selected write data limit boundaries, the REGISTER DATA LED will light and the display will show -HI- or -LO- depending on the value entered. Pressing the "CLR" key will clear the display allow the operator to key in a new value.

To set user write data limits, the following three items must be considered:

1. DIP switches B5 - C8 must be set to a legal or valid address.
2. DIP switch A3 must be set on enabling the desired limits to be acquired from the Reserved Register Block.
3. Valid values (0 - 9999) must be stored in the Reserved Register Block (X+13, X+14).

NOTE: Setting the low write data limit greater than the high write data limit will prevent writing to any register regardless of the write access limits.

The ability to change the data limits for each register that the operator selects is an often useful application. This may be accomplished with logic by watching the Last Register Entered (X+1 & 2), when it equals the register that will have new limits, you move the new data limits into the high and low data limit registers (X+6 & 7) and then call for an update by setting Bit 00 in the Command Register high.

Three or four digit entry/display is allowed by the 8330. The number of digits authorized is controlled by the switch A5 and bit 17 in the Command Register.

DIP A5 on = four digit entry & display.
off = three digit entry & display.

When DIP switch A5 is on, 4 digit data is accepted and displayed by 8330. Bit 17 in the Command Register will have no affect. The maximum value that can be entered will be 9999. However, this may be restricted by the high write data limit. The maximum value that can be displayed is FFFF hexadecimal.

When DIP switch A5 is off, three digit data is accepted and displayed by the 8330. The maximum value that can

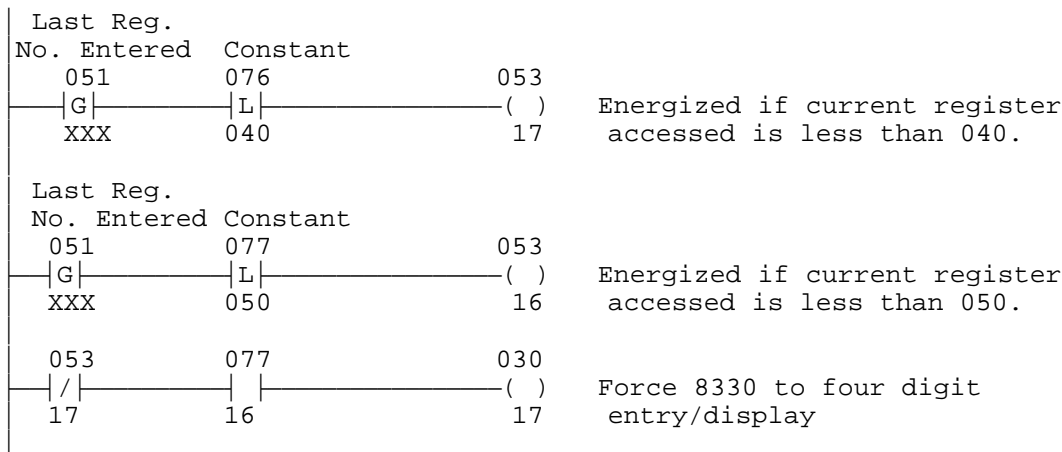
be entered will be 999. However, this may be restricted by the high write data limit. The maximum value that can be displayed is FFF hexadecimal.

When DIP switch A5 is off, setting bit 17 in the Command Register will override causing four digit entry and display.

The following ladder logic will allow four digit data modification to a defined group of word address leaving the balance of the accessible word address as three digit entry and display.

Note: DIP switch A5 and B3 are off.

Assume: Command Register address is 0050 (C3 & C5 are on).



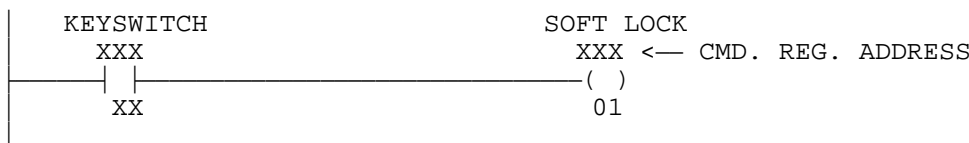
Four digit entry and display is enabled for word address 040, 041, 042, 043, 045, 046 and 047.

Security Locks

Two methods of locking the 8330 are available: soft lock and/or combination lock. Either or both methods may be used as the application requires. Security locks are part of the enhanced mode functions and so require DIP switches B6 - C8 set to a valid register number.

SOFT LOCK:

When bit 01 in the Command Register is set, the 8330 keypad will become inactive immediately and the "KEYBOARD LOCK" LED will be on. The 8330 will remain in its current mode unless changed by the processor. When bit 01 is reset, the keypad will become active and normal operations will resume. This lock is called soft lock because it is controlled by program software, however, when applications require a key switch, a simple solution is to bring the key switch into the PLC via an input module and use the contact from that input to control bit 01 in the Command Register. The following circuit is recommended:

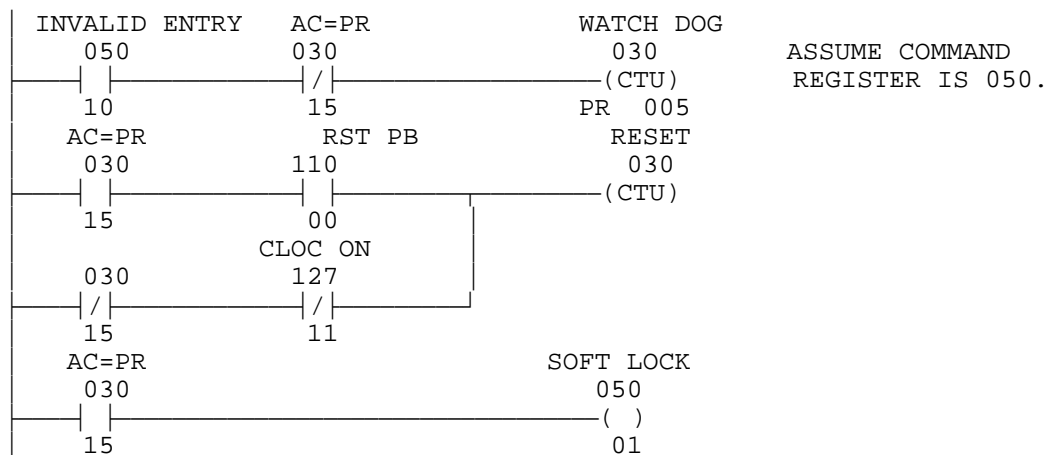


COMBINATION LOCK:

During Power-Up, the 8330 will test for a combination lock. Enabling the combination lock requires setting DIP switch A4 on and storing a combination value in the Reserved Register Block. If the combination lock is correctly enabled, the 8330 will display "CLOC", set the "KEYBOARD LOCKED" LED on, set bit 11 (keypad combination lock on) in the Command Register then wait for a combination entry. The combination must be entered including leading zeros until all five digits are entered. The digits are not displayed as they are entered. After five digits have been entered the operator must press the LOCK key. If the combination is incorrect, the 8330 will set bit 10 (invalid combination lock) in the Command Register and begin flashing CLOC on the display. Pressing the CLR key will stop the flashing, clear bit 10 and allow a new value to be entered.

The combination may be changed at any time by moving a new value into the Reserved Register Block then setting bit 00 in the Command Register.

The following example shows how to soft lock the 8330 after a particular number of incorrect combination entries by using a counter incremented by bit 10 of the Command Register and setting bit 01 in the Command Register when the preset is reached.



Decimal Points and Negative Sign

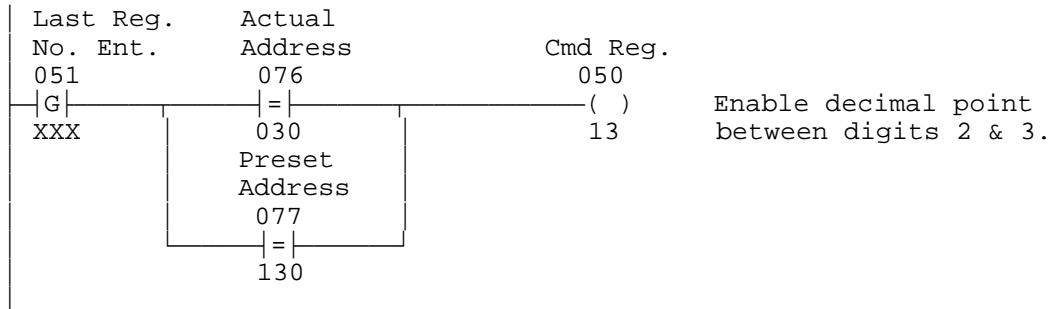
In many cases it is advantageous to display a value to the operator with a decimal point or a negative sign. This is accomplished by setting one or more bits in the Command Register to achieve the desired display.

COMMAND REGISTER BIT NUMBER	FUNCTION
12	Decimal Point Between Digit 1 & 2
13	Decimal Point Between Digit 2 & 3
14	Decimal Point Between Digit 3 & 4
15	Decimal Point Between Digit 4 & 5
16	Negative Sign at Digit position 5

The ability to set decimal points and negative sign for each register that the operator selects is useful. This may be accomplished with logic by watching the last register entered (X+1 and X+2), when it equals the register that will display the data with a decimal point, you set the bit that corresponds to the desired location for the decimal point. The bit must be cleared when a new register is viewed or the decimal point will appear in every data register displayed.

Section 3: Enhanced Mode Operation

In the following example, lets assume timer 030 has been programmed with a time base of 0.01 seconds. The Command Register is at 050 (C3 & C5 ON) and DIP switch B3 is off.



When the 8330 views the actual or preset, a decimal point will appear between digits 2 & 3.

Forced Register Display

This feature allows the 8330 to be forced to a particular word address under PLC program control. The desired word address must first be put into the last register entered location of the Reserved Register Block. Next bit 07 in the Command Register must be set to a logic one. The desired word address may be any location in the data table excluding the I/O image area. If DIP switch B4 is off (absolute addressing), the 8330 will display the selected address number for approximately one second then display its contents. If DIP switch B4 in on (offset addressing), the appropriate offset address will be calculated and displayed. If the address is below the low read limit, a zero will be displayed.

Two possible condition may exists depending on how bit 07 is set:

- A. Set by "One Shot" logic.
- B. Held on.

If one shot logic is used...

If bit 07 in the Command Register is momentary set by "One Shot" logic, the display is moved to the new location and the current data is displayed. The operator may, depending upon the write limits and the write data limits, change the value in the location. The operator may also select another register to view. The new register selected will have to fall within the read/write limits or an error code will be displayed.

If held on.....

If bit 07 in the Command Register is held on, the NEW REG key will be kept inactive preventing the operator from selecting another register. In addition writing will be allowed with a data range of 0-9999 (3 or 4 digits based on DIP switch A5 or bit 17 in the command register). If bit 07 is cleared to zero, the operator may select another register.

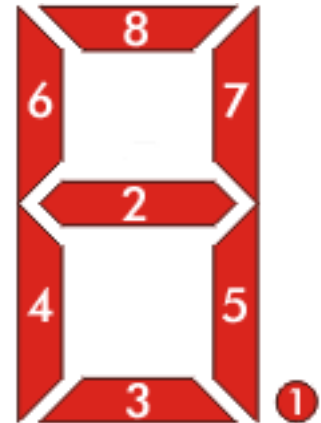
The example on the next page will force the 8330 to register 200 and hold it there until a new value has been entered. Assume 8330 command Register is at word address 250.

Section 3: Enhanced Mode Operation

NOTE: If data is being entered using the bit manipulate function, the decimal value must be converted to BCD (not binary).

Example: Decimal value = 122,
enter 0000 0001 0010 0010

Example: Display the word HELLO.
Assume the Command Register is at 50

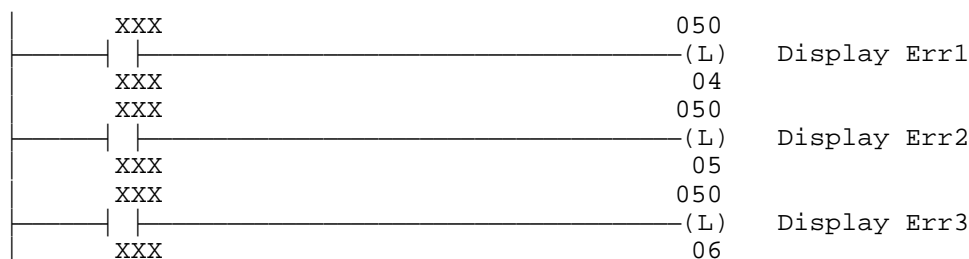


Word Address	8	7	6	5	4	3	2	1	Decimal Value	Digit Position	Character
067	0	1	1	1	1	0	1	0	122	5	H
070	1	0	1	0	1	1	1	0	174	4	E
071	0	0	1	0	1	1	0	0	44	3	L
072	0	0	1	0	1	1	0	0	44	2	L
073	1	1	1	1	1	1	0	0	252	1	O
	128	64	32	16	8	4	2	1	Binary Weight		

PLC Initiated Error Display

When the 8330 is operated in the enhanced mode, three bits in the Command Register allow the processor the ability to force three error numbers on the display. The error display takes the form Err1, Err2, or Err3 dependant on the Command Register bit set. The error display will remain on the 8330 until the CLR key is pushed. After the CLR key is pressed, the 8330 will reset the respective error bit in the Command Register then go to the register number ready mode. If more then one error bit is set simultaneously, the 8330 will display first the error with the lowest bit number. If the error bit is held on by the PLC, the CLR key will not be able to clear the display.

Example (Assumes Command Register is at 050)



Offset Addressing

Up to this point all register numbers have been referred to as Absolute Addresses. For example; if you enter 040 and press NEW REG, the 8330 will display the contents of word address 040 which will directly correspond to word 040 used in the ladder logic program. A second method of accessing registers is available in the 8330 and is referred to as offset addressing and is enabled by setting DIP switch B4 on.

DIP switch B4 on - Offset Addressing
 off - Absolute Addressing

In offset addressing, register numbers are decimal numbers beginning with the number one. Register one is always equal to the low read limit currently stored in the 8330.

Example: If the low read limit stored in the 8330 is register number 040, then entering 1 and pressing the NEW REG key will display the contents of word address 40.

As with other 8330 functions, sequential word addresses and sequential physical memory addresses affect the behavior of the offset addressing mode. Beyond decimal register number one, the correlation between decimal register numbers and absolute octal register numbers is determined by the setting of DIP switch B2. The affect of DIP switch B2 is best illustrated by the following tables.

Assume the data table is configured with one rack which sets the default low read limit of the 8330 to word address 020. Lets further assume the 8330 is in the enhanced mode and the low read limit has been set to 040.

In the column labeled B2 off notice the jump from word address 077 to word address 120. Word address 100 through 117 are processor work areas and I/O image area.

Register Number	Absolute Word Address	
	B2 Off	B2 On
1	040	040
2	041	140
3	042	041
4	043	141
:	:	:
31	076	057
32	077	157
33	120	060
34	121	160
35	122	061

To further clarify this action, lets assume the data table was configured with two racks. This sets the default low read limit of the 8330 to word address 030, however, the 8330 is in the enhanced mode and the low read limit has been set to 040.

The 8330 will now jump from word address 077 to word address 130 because word address 120 through 127 are now part of the I/O image table.

Register Number	Absolute Word Address	
	B2 Off	B2 On
1	040	040
2	041	140
3	042	041
4	043	141
:	:	:
31	076	057
32	077	157
33	130	060
34	131	160
35	132	061

Section 3: Enhanced Mode Operation

A second specific condition exists when DIP switch B2 is on. Lets now assume the low read limit is word address 200. Our table would be as follows:

Register Number	Absolute Word Address	
	B2 Off	B2 On
1	200	200
2	201	300
3	202	201
4	203	301
5	204	202
6	205	302
7	206	203

Now lets assume the low read limit is word address 300. Our table would be as follows:

Register Number	Absolute Word Address	
	B2 Off	B2 On
1	200	200
2	201	300
3	202	201
4	203	301
5	204	202
6	205	302
7	206	203

The pattern that is followed is determined by the third digit of the low read limit. If the third digit is even the first pattern will be followed. If the third digit is odd the second pattern will be followed.

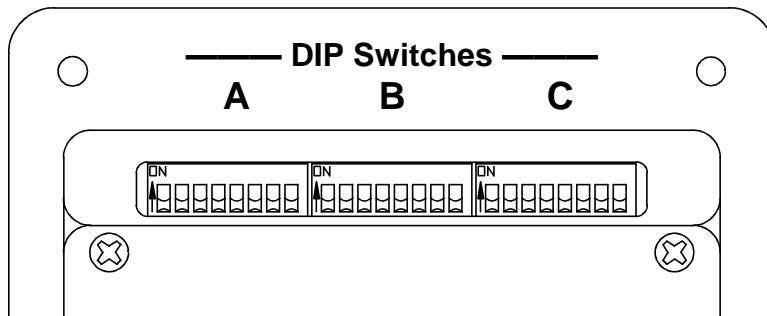
Appendix A: DIP Switch Assignments

Switch	Function
A1	Assigned Write Limits, enable/disable
A2	Assigned Read Limits, enable/disable
A3	Assigned Write Data Value Limits, enable/disable
A4	Combination Lock Enabled
A5	On = 4 digit entry & display, Off = 3 digit entry & display
A6	On = Auto increment register number, Off = Reduced keystroke mode
A7	Not assigned
A8	Not assigned
B1	Not assigned
B2	On = Physical address limits, Off = Word address limits
B3	On = Compressed Reserved Register Block, Off = Normal
B4	On = Offset Addressing, Off = Absolute Addressing
B5	Binary Weight 4
B6	Binary Weight 2
B7	Binary Weight 1
B8	Binary Weight 4
C1	Binary Weight 2
C2	Binary Weight 1
C3	Binary Weight 4
C4	Binary Weight 2
C5	Binary Weight 1
C6	Binary Weight 4
C7	Binary Weight 2
C8	Binary Weight 1

— most significant digit

— least significant digit

Rear View of 8330ABX



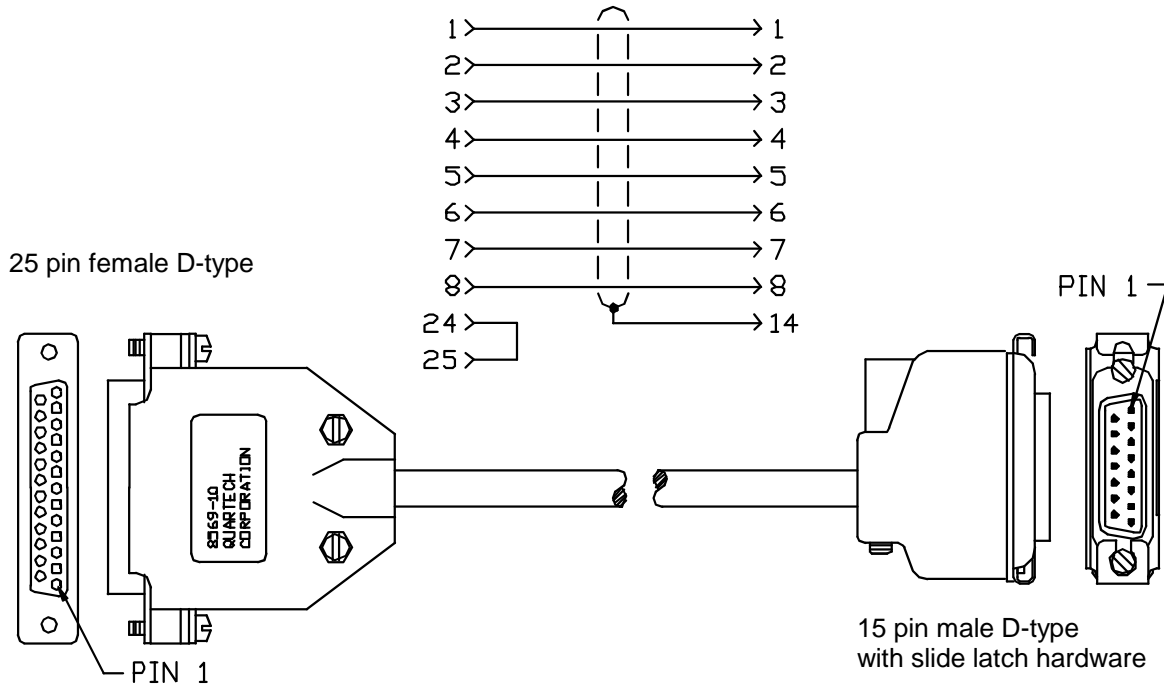
Appendix B: Operating Fault Indicators

On initial Power Up and during normal operation diagnostics are executed at key points. If an error occurs, the 8330 will display an error code indicating the type of failure or error. These include hardware failures, communication errors, Reserved Register Block set up errors and operator entry errors.

Code	Description	Possible cause and/or solution
-E1-	RAM memory failure	Re-power unit. If fault continues contact Quartech for replacement or repair authorization
-E2-	ROM checksum error	
-E3-	UART failure	
-E4-	PLC fault	PLC reports fault. Clear PLC fault then reconnect 8330
-E5-	No PLC response	PLC does not respond to 8330 request. May be hardware failure in PLC or 8330, incorrect cable, or broken wire.
-E7-	No Acknowledge	PLC responds with NAK byte. Recycle power on PLC & 8330
-E8-	Illegal limit value	Limit value in Reserved Register Block is outside allowed boundaries or an invalid value (not octal)
-E9-	Cable Disconnected	Cable is not connected at 8330 end or incorrect cable is used
-EA-	Cable Disconnected	Cable is not connected at PLC end or PLC has lost power
-Eb-	Command Register Low	Command Register address set on DIP switches B5 through C8 is not valid.
-EC-	Command Register High	
-Ed-	Command Register Error	Lower 2 digits of Command Register address exceed 52
-EE-	Forced Register Fault	PLC has attempted to force the 8330 to an illegal address
-HI-	Entry above limit	Operator has attempted to enter a data value or register number that is outside the assigned limits
-LO-	Entry below limit	
-PL-	Protected location	Operator has attempted to access a word address that is never allowed, such as I/O addresses

Error codes will remain on the display until the CLR key is pressed. If the code is -E1- through -EE- or -dAP-, pressing the CLR key will cause the 8330 to restart as though power were just applied. If -HI-, -LO- or -PL- are displayed pressing the CLR key will clear the display except for a cursor allowing for a new entry.

The following schematic and mechanical drawings describe the cable required to connect the Model 8330ABX Register Access Panel to the PLC-2 Programmable Controller. This cable, in a standard ten foot length, is available from Quartech - Order as Model 8569-10 Communication Cable. Longer cable lengths are available; please consult Quartech.



Cable Type: Multi-Conductor shielded, 20 - 24 AWG. Example: Beldon No. 9538, Alpha No. 1218

Appendix D: Specifications

- Display: 5 character seven segment LED Display,
 - . Red color, 0.57 inch character height
- Keypad: 16 tactile feedback keys rated for one million operations.
- Source Power 5.0 VDC -0/+5%, 50mv max ripple, 500ma (Model 8552)
- Communications Differential Driver, Opto-coupled input
- Temperature: 0°C to +60°C Operational, -20°C to +70°C Storage
- Humidity 10% to 95% (non-condensing), Operational or storage
- Vibration/Shock: 0.5mm displacement (X,Y,Z axis), 10-55Hz, 40G shock
- Weight: 3 pounds
- Mounting: Maintains NEMA 4 and NEMA 12 enclosure rating.

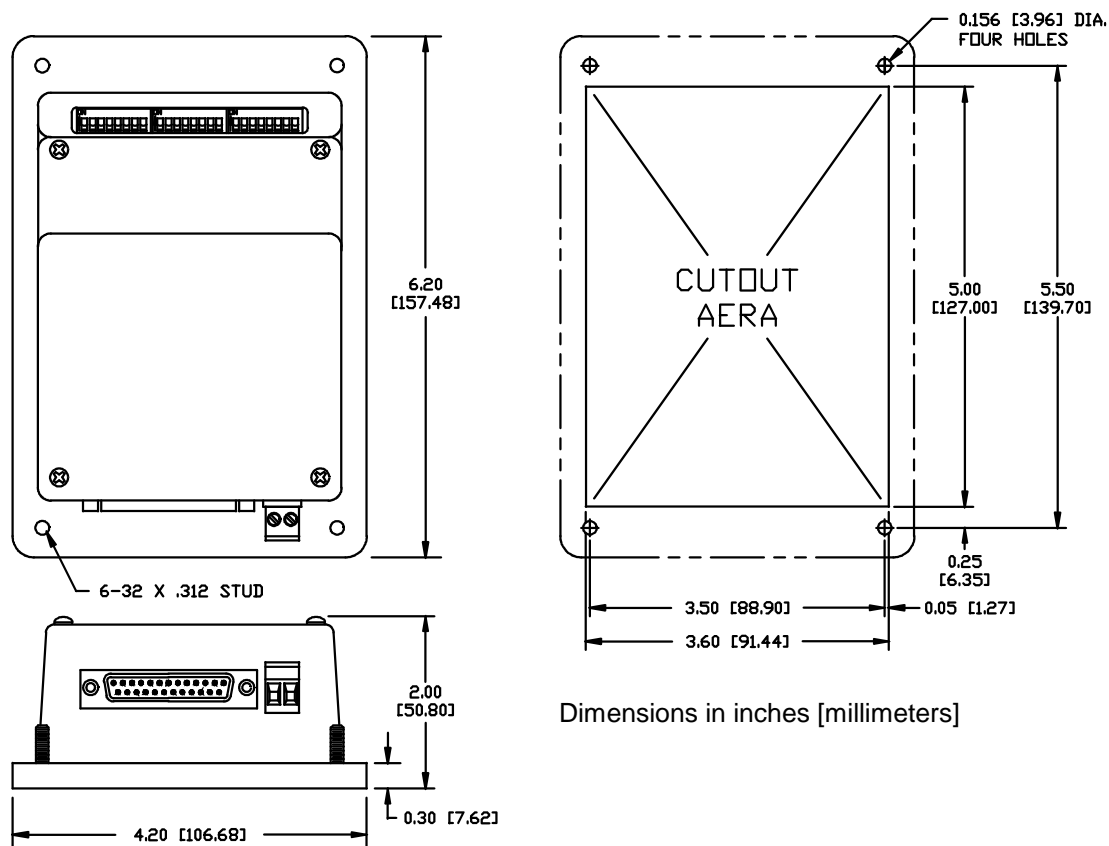
The 8330 is designed to be mounted in the door of an enclosure or on an operators console for ease of use. A template is provided to assist in the drilling and cutting of the mounting holes for the unit. Care should be taken to protect the unit from metal chips and conductive particles. Failure to protect the unit may cause damage when power is applied and may void warranty.

A minimum clearance of six inches should be kept between the unit and any other device that generates heat. In the event that the internal enclosure temperature periodically exceeds 55 degrees Celsius (131 degrees Fahrenheit), fans or a purge air system should be used to increase the air flow, and eliminate "Hot Spots" that occur within the panel.

Care should be taken when routing DC power supply cable and the communication cable. Follow these guidelines for a trouble free installation.

- The power supply should be mounted as close as possible to the 8330. If the 8330 is mounted a long distance from the PLC-2, the supply must be mounted local to the 8330 to allow short supply cables.
- Use at least 16 AWG wire for the 5 volt cable. If the cable must be longer than ten feet use 14 AWG wire. Do not make a power supply cable longer than 20 feet.
- The DC power lines and communication cable must be kept away from AC power lines. Keep both at least one foot away from 120 VAC lines, and two feet away from higher voltage lines. This especially applies to the communication cable. If the cables must cross power lines, cross them at right angles.
- Keep the cables away from sources of high energy fields such as arc welders, AC motors, motor starters, servo controllers, generators, induction heaters, and transformers.

Mounting Dimensions



Appendix F: Reserved Register Block Work Sheets

Normal Reserved Register Block

DIP Switch B3 is off. X is the address set on DIP switches B5 through C8.

Offset	Address	Value	Description
X+000		No Entry	Command Register
X+001		No Entry	Last register entered, least significant three digits
X+002		No Entry	Last register entered, most significant two digits
X+003			High write limit, most significant two digits of address
X+004			High write limit, least significant three digits of address
X+005			Low write limit, most significant two digits of address
X+006			Low write limit, least significant three digits of address
X+007			High read limit, most significant two digits of address
X+010			High read limit, least significant three digits of address
X+011			Low read limit, most significant two digits of address
X+012			Low read limit, least significant three digits of address
X+013			High data limit, four digit value
X+014			Low data limit, four digit value
X+015			Combination Lock, most significant two digits of combination
X+016			Combination Lock, least significant three digits of combination
X+017			Display segment control, position five
X+020			Display segment control, position four
X+021			Display segment control, position three
X+022			Display segment control, position two
X+023			Display segment control, position one

Compressed Reserved Register Block

DIP Switch B3 is off. X is the address set on DIP switches B5 through C8.

Even/odd under the off set refers to the third digit of the address. For example: if X = 0200, the third digit is even, X = 0300, the third digit is odd.

Offset		Address	Value	Description
Odd	Even			
X+000	X+000		No Entry	Command Register
X-077	X+100		No Entry	Last register entered, least significant three digits
X+001	X+001		No Entry	Last register entered, most significant two digits
X-076	X+101			High write limit, most significant two digits of address
X+002	X+002			High write limit, least significant three digits of address
X-075	X+102			Low write limit, most significant two digits of address
X+003	X+003			Low write limit, least significant three digits of address
X-074	X+103			High read limit, most significant two digits of address
X+004	X+004			High read limit, least significant three digits of address
X-073	X+104			Low read limit, most significant two digits of address
X+005	X+005			Low read limit, least significant three digits of address
X-072	X+105			High data limit, four digit value
X+006	X+006			Low data limit, four digit value
X-071	X+106			Combination Lock, most significant two digits
X+007	X+007			Combination Lock, least significant three digits
X-070	X+107			Display segment control, position five
X+010	X+010			Display segment control, position four
X-067	X+110			Display segment control, position three
X+011	X+011			Display segment control, position two
X-066	X+111			Display segment control, position one

