Blue Ribbon Corporation

Installation and Operating Manual

Model BD100

Pump Controller

CE   BULL DOG   c UL us

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BLUE RIBBON

1. INTRODUCTION

1.1. Dimensions
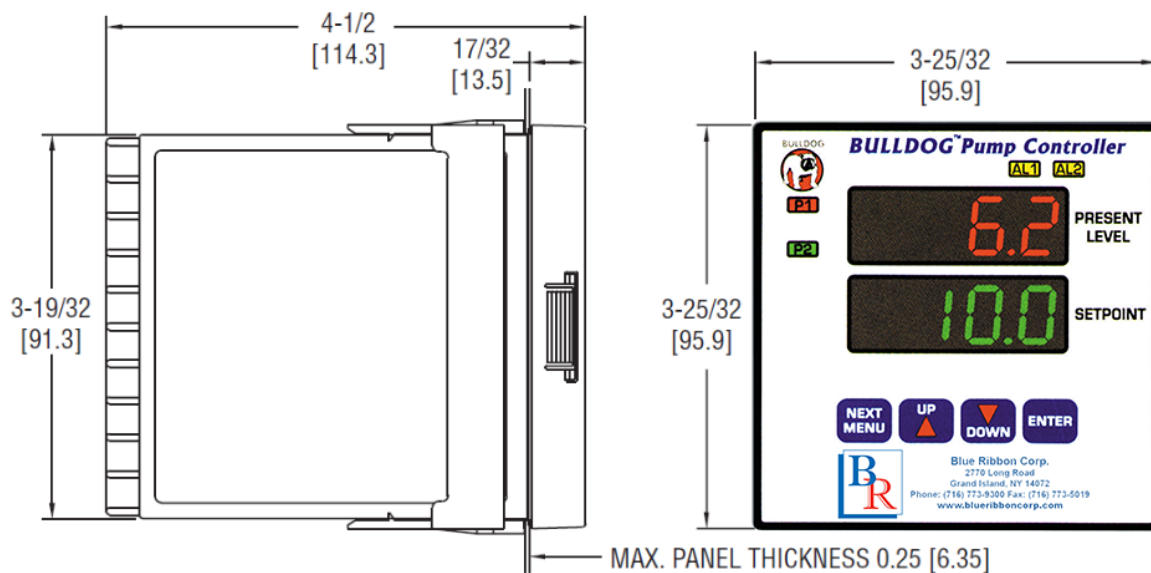
1.2. Specifications

Inputs	0 (or 4) to 20 mA DC or 0 (or 2.0) to 10.0 VDC selectable.
Input Impedance	Current input: 10 ohms, Voltage input: 5K ohms
Output Ratings	Control Relays: SPDT, rated 10A @240 VAC res., 1/4 hp @ 120 VAC, 1/3 hp @ 240 VAC; Alarm Relays: SPST, 3A @ 240 VAC res., 1/10/hp @ 120 VAC; Other : 15 VDC@ 20 mA for output one and output two.
Control Type	On/off, reverse or direct acting.
Power Requirements	100 to 240 VAC nominal, +10%-15%, 50 to 400 Hz, single phase; 132 to 240 VDC nominal, +10%-15%.
Power Consumption	7.5 VA maximum.
Accuracy	±0.25% of span, ±1 least significant digit.
Display	Two 4-digit, 7 segment 0.56" high LED's.
Display Resolution	1 count
Memory Backup	Nonvolatile memory (no batteries required).
Serial Communications	Optional RS-232 or RS-485 with Modbus® protocol.
Ambient Operating Temperature/RH	14 to 131 °F (-10 to 55 °C) non-condensing.
Weight	16 oz (454 g)
Front Panel Rating	Meets UL Type 4X (IP66).
Loop Power Supply (isolated)	24 VDC @ 50 mA, regulated.
Alarm On-Off Differential	1 count.
Set Point Range	Selectable.
Power Voltage Stability	0.05% over the power voltage range.
Temperature Stability	100 ppm / °C typical, 200 ppm / °C maximum.
Common Mode Rejection	140 db minimum at 60 Hz.

Normal Mode Rejection	65 db typical, 60 db at 60 Hz.
Isolation	Relay: 1500 VAC to all other inputs and outputs; 24 VDC Loop Power: 500 VAC to other inputs and outputs; Process Output: 500 VAC to other inputs and outputs.
Storage Temperature	-40 to 176 °F (-10 to 80 °C)
Agency Approvals	UL 508, CE.

1.3. Getting Started

1. Install the control as described on page 5.

2. Wire the control following the instructions on pages 6 through 8. Page 6 contains basic wiring for the control. If using the Series BD100 Power supply, follow the additional directions on page 8. Wiring instructions for the 232 and 485 series communication options is included on page 9.

3. Familiarize yourself with the front key pad functions and read the menu structure prior to starting the programming process. A programming chart with the menu structure and spaces to write your programming values is included on pages 26 through 27. This chart can be a helpful tool to save time in programming. For further assistance, programming examples are included on pages 28 through 30.

1.4. Model Identification

OPTIONS

232	RS-232 Modbus®-RTU Serial Communications. Allows remote computer to read and write all control parameters.
485	RS-485 Modbus®-RTU Serial Communications. Allows remote computer to read and write all control parameters.
RV	Analog retransmission of input, 0 to 10 VDC.
RC	Analog retransmission of input, 0 (or 4) to 20 mA.

INPUT RANGES
Process Input Types

The 0 to 20 mA DC, 4 to 20 mA DC, 0 to 10 VDC, and 2 to 10 VDC inputs are fully scalable from a minimum of 100 count span placed anywhere within the range of -1999 to +9999. Decimal point position is adjustable from the zero place (9999), tents (999.9), hundredths (99.99), or thousandths (9.999).

INSTALLATION

1.5. Mounting

Mount the instrument in a location that will not be subject to excessive temperature, shock, or vibration (see Specifications for specific tolerances). All models are designed for mounting in an enclosed panel.

Select the position desired for the instrument on the panel. Prepare the panel by cutting and deburring the required opening.

From the front of the panel, slide the housing through the cut out. The housing gasket should be against the housing flange before installing.

From the rear of the panel, slide the mounting collar over the housing. While holding the housing with one hand, use the other hand to push the collar evenly against the panel until the springs are compressed. The ratchets will hold the mounting collar and housing in place.

Figure 1 - Panel Cut Out Dimensions

Panel cut-out:
3.620 x 3.620 in,
+0.032/-0.000
92x92 mm,
+0.8/-0.0)

⚠️ **CAUTION:** It is not necessary to remove the instrument chassis from the housing for installation. If the instrument chassis is removed from the housing, you must follow industry standard practice for control an dprotection against Electro-Static Discharge (ESD). Failure to exercise good ESD practices may cause damage to the instrument.

1.6. Wiring

Do not run transmitter wiring or other Class 2 wiring in the same conduit as power leads. Use only the probe or transmitter for which the control has been programmed. Maintain separation between wiring of sensor, auxiliary in or out, and other wiring. See the "Secure Menu" for input selection.

Supply connections should be made in accordance with the National Electrical Code per Article 300, and local regulations. All line voltage output circuits must have a common disconnect and be connected to the same pole of the disconnect. Input wiring for probe or transmitter is rated CLASS 2.

Control wiring is as shown in Figure 2 next page.

Figure 2 - Wiring

Option RV, RC

⊕→ 1	21	22	23		24	25	26	11 →⊕	24 VDC @ 50 mA Isolated

Voltage — 2 · RELAY & SSR · 12 ←⊖

⊖→ 3 · CURRENT · N.C.→ 13 — Pump 1 Output

Current — 4 · ⊕—COM.→ 14

⊕→ 5 · ⊖—N.O.→ 15

Alarm 1 Contacts:
6 ←N.O. · N.C.→ 16 — Pump 2 Output
7 ←COM. · ⊕—COM.→ 17

Alarms 2 Contacts:
8 ←N.O. · ⊖—N.O.→ 18
9 ←COM. · 19

10 | 27 | 28 | 29 | 30 | 31 | 32 | 20

⊕ COM. ⊖ Pump1 ⊖ Pump2
15 VDC

Line Input ∿
100 to 240 VAC
50 - 400 Hz. Single PH
132 to 240 VDC 5VA
MAX. Output Ratings:
Relay: 10A. @ 240 VAC RES.
1/4 HP @ 120 VAC
1/3 HP @ 240 VAC
Alarm: 3A. @ 240 VAC RES.
P.D. 240VA, 120/240 VAC
SW. Volt.: 15 VDC @ 20 mA

NOTE:
1. For supply connections use No. 16 AWG or larger wires rated for at least 75°C, or in accordance with an equivalent national standard.
2. Maximum ambient temperature rating 131°F (55°C)
3. Use copper conductors only
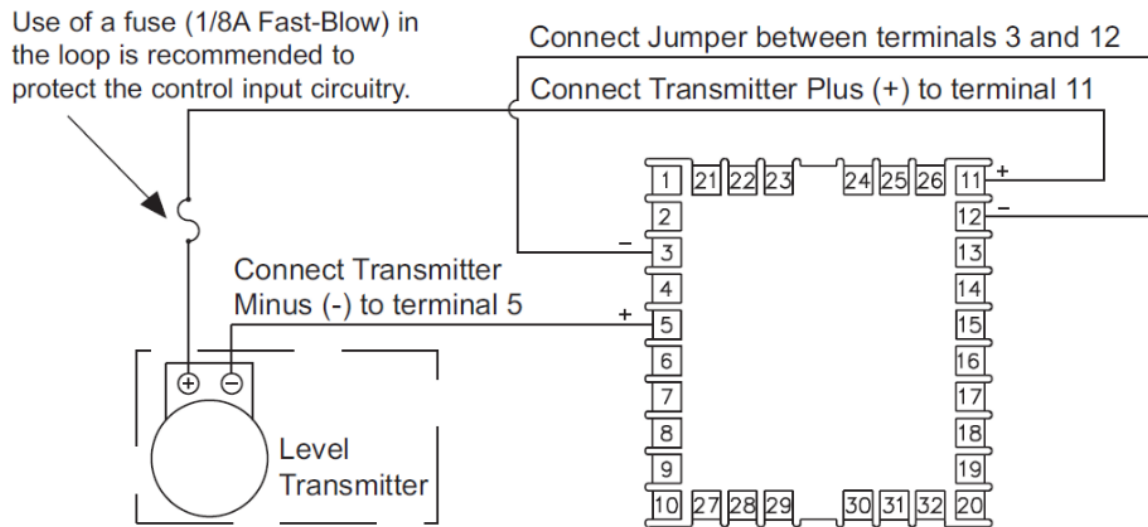4. Terminals 1-5, 10-12, & 21-32 are class 2 'SELV'.

290-3126

1.7.   Wiring for Transmitter Inputs Using Integral Power Supply

Wire power and outputs as shown on previous page. Wiring for two-wire transmitters shown below in Figure 3. All wiring shown in Figure 3 is Class 2.

Figure 3 - Transmitter Wiring

Use of a fuse (1/8A Fast-Blow) in the loop is recommended to protect the control input circuitry.

Connect Jumper between terminals 3 and 12

Connect Transmitter Plus (+) to terminal 11

Connect Transmitter Minus (-) to terminal 5

Level Transmitter

For three or four wire transmitters, follow the wiring instructions provided with your transmitter.

DO NOT wire the 24 Volt Power supply across the input of the control. **Damage to the control input circuitry will result.**

1.8. Use of Snubbers with Inductive Loads
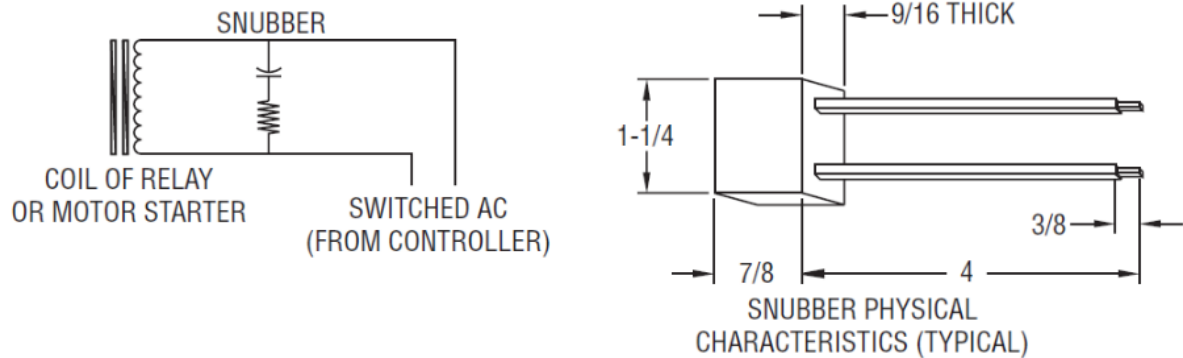
A snubber is a resistance/capacitance device that is used to reduce or eliminate high voltage spikes generated from inductive loads. For best effect, the snubber should be mounted as close to the coil as physically possible. Electrical and typical physical characteristics are shown above.

⚠ **Failure to use a snubber on an inductive load may cause erratic operation and/or premature relay contact wear.**

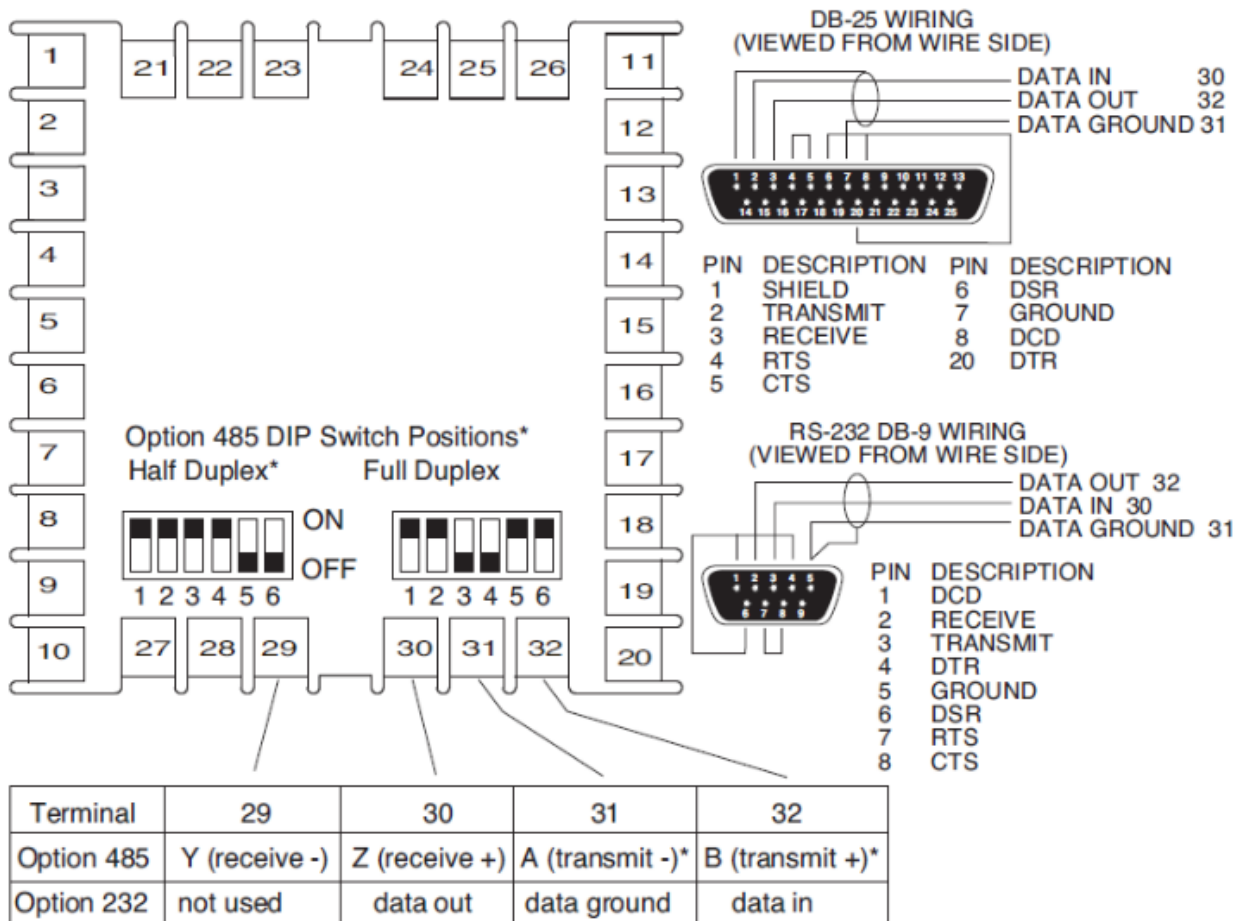## 1.9. Wiring for 485 and 232 Serial Communication Options

Wire power and outputs as shown in Figure 2, page 7. Wiring for options is shown in Figure 4 below. All wiring shown below is Class 2. Shielded twisted pair is recommended for Option 485.

⚠ **DO NOT run signal wiring in the same conduit or chase as the power wiring. Erratic operation or damage to the control circuitry will result.**

Figure 4 - Wiring for Options

DB-25 WIRING
(VIEWED FROM WIRE SIDE)

DATA IN   30
DATA OUT   32
DATA GROUND 31

PIN	DESCRIPTION	PIN	DESCRIPTION
1	SHIELD	6	DSR
2	TRANSMIT	7	GROUND
3	RECEIVE	8	DCD
4	RTS	20	DTR
5	CTS		

RS-232 DB-9 WIRING
(VIEWED FROM WIRE SIDE)

DATA OUT 32
DATA IN 30
DATA GROUND 31

PIN	DESCRIPTION
1	DCD
2	RECEIVE
3	TRANSMIT
4	DTR
5	GROUND
6	DSR
7	RTS
8	CTS

Option 485 DIP Switch Positions*

Half Duplex*   Full Duplex

ON / OFF 1 2 3 4 5 6   1 2 3 4 5 6

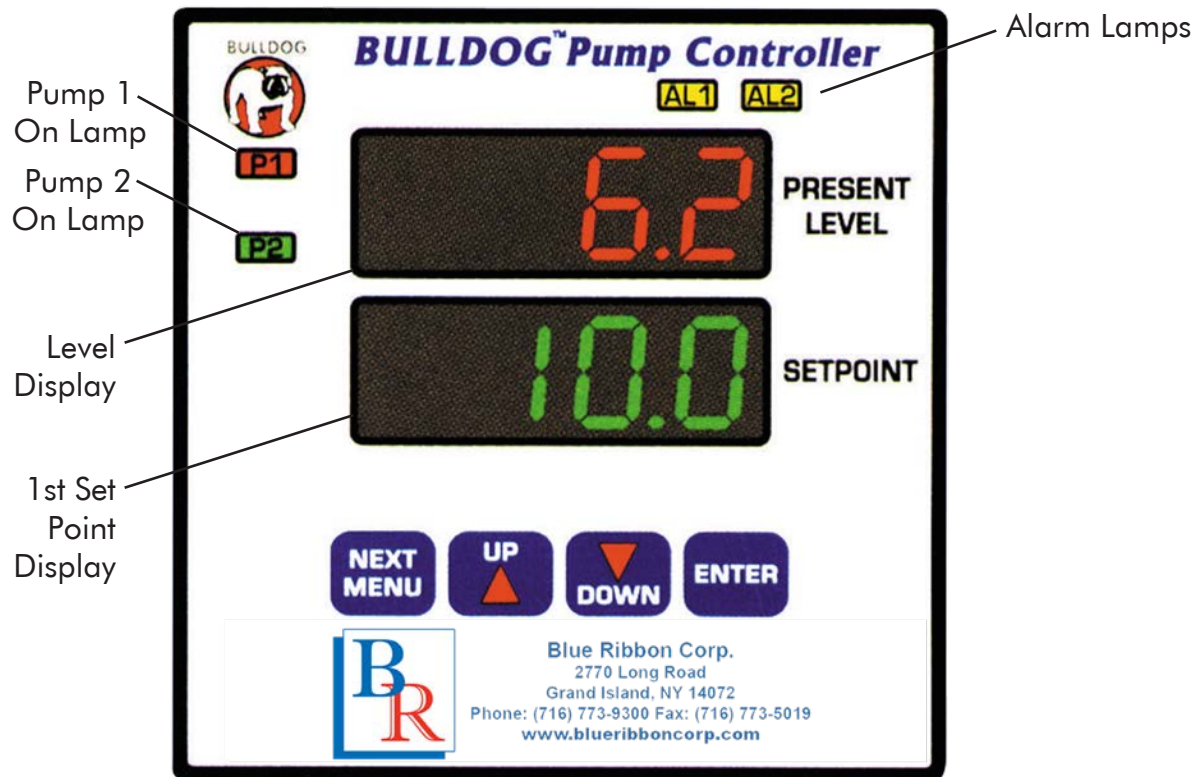| Terminal	29	30	31	32
Option 485	Y (receive -)	Z (receive +)	A (transmit -)*	B (transmit +)*
Option 232	not used	data out	data ground	data in

*For half-duplex operation wire only A and B. Do not connect to Y and Z.

2. FUNCTIONS

2.1. Front Panel Functions

2.2. Key Functions

NEXT MENU	**NEXT MENU:** Pressing the "NEXT MENU" key advances the display to the next menu item. May also be used in conjunction with other keys as noted below.
UP ▲	**UP ARROW:** Increments a value, changes a menu item, or seledts the item to ON. The maximum value obtainable is 9999 regardless of decimal point placement.
UP ▲ **ENTER**	**UP ARROW & ENTER:** Pressing these keys simultaneously brings up the secondary menu starting at the 5P IH menu item. Pressing these keys for 5 seconds will bring up the secure menu.
▼ DOWN	**DOWN ARROW:** Decrements a value, changes a menu item, or selects the item to OFF. The minimum alue obtainable is -1999 regardless of decimal point placement.
ENTER	**ENTER:** The ENTER key is used to store the value of menu items once they are changed to a new value. If the ENTER key is not pressed after changing the value, the item will revert to the previously stored value.
NEXT MENU **▼ DOWN**	**NEXT MENU & DOWN ARROW:** Pressing these keys simultaneously will allow backing up one menu item, or if at the first menu item, they will cause the display to return to the primary menu. If an alarm condition has occurred, these keys may be used to reset the alarm.
NEXT MENU **ENTER**	**NEXT MENU & ENTER:** Pressing these keys simultaneously and holding them for 5 seconds allows recovery from the various error messages. The following menu items will be reset:

AL I H: Alarm inhibit

CHEC CAL: Check calibration error

Correct the problems associated with the above conditions before using these reset keys. More than one error could be present. Caution is advised since several items are reset at one time.

2.3. The Home Display

The home display is the normal display while the control is operating. If no errors or functions are active, the HOME display will indicate the Process Variable (the level that is being measured) on the top display and the 5P IH value, Pump 1 On Set Point, on the bottom display.

Error messages may over-ride the HOME display. See ERROR MESSAGES on pages ? and ?.

While in the **Secondary Menu**, if no key is pressed for a period of 30 seconds, the display will return to the HOME position displaying the process value. While in the **Secure Menu**, if no key is pressed for a period of 60 seconds, the display will return to the HOME position displaying the process value. Outputs are disabled (turned off) when the **Secure Menu** is active.

3. SECURITY LEVEL SELECTION

Three levels of security are provided. The 5ECr menu item security level may be viewed or changed at any time regardless of the present security level in the Secure Menu. The display shows the current security level. To change security levels, change the password value using the UP or DOWN arrow keys and pressing the ENTER key. Refer to the password table below for the correct value to enter for the security level desired.

For example, to set the access level to 2, access the 5ECr menu item and press the UP ARROW key until the upper display shows the password, 1 10 1, and press the ENTER key. The display will blink, and return with the level value of 2 in the upper display window.

NOTE: The password values shown in the table cannot be altered. Retain a copy of these pages for future reference. This is the only reference made to password values in this instruction manual.

Password Table

Menu	Security Level Status	Display Value When Viewed	Password Value to Enter
Secondary Secure	Locked Locked	2	1101
Secondary Secure	Unlocked Locked	3	1011
Secondary Secure	Unlocked Unlocked	4	111

4. LEAD/LAG OPERATION

The Blue Ribbon Corp BD100 Bulldog® pump controller is designed to easily operate a pair of pumps in the most efficient manner possible. The controller has a 'lead/lag' feature that allows two pumps to operate in an alternating fashion to minimize wear.

The Blue Ribbon Corp BD100 Bulldog® pump controller has one pair of set points each for pump 1 and pump 2. If the lead/lag feature is turned off, *SP1H* and *SP1L* control pump 1 and *SP2H* and *SP2L* control pump 2. If the lead/lag feature is turned on, pumps 1 and 2 will be controlled in the alternating fashion described below. In all cases, the P1 lamp will indicate activity of pump 1 and the P2 lamp will indicate activity of pump 2. The lead/lag operation is set in the Secure menu with the item *LdLg*.

4.1. Lead/Lag On

After installation, set the *SP1H* to the high level (pump on point) for standard operation. Set *SP1L* to the low level (pump off point). Set the *SP2H* to the level where you want BOTH pumps to turn on (emergency pump on). Set the *SP2L* to the level where you want the second pump to turn off (emergency pump off).

The controller will not allow you to set *SP1H* below *SP1L*, *SP1L* above *SP1H*, *SP2H* below *SP2L*, or *SP2L* above *SP2H*. The controller will not allow you to set any set point or alarm point above or below the programmed scale. No error messages are generated. The displayed value will stop at an allowable point just above (or below, as the case may be) the maximum or minimum allowed.

In normal operation, when the *SP1H* point is reached, one of the pumps will turn on. When lead/lag is turned on, pumps 1 and 2 will alternate. If the level reaches the *SP2H* point, both pumps will be turned on until the *SP2L* point is reached, where one of the pumps will turn off. When *SP1L* is reached, the remaining running pump will turn off. The last pump off will not be the next pump on.

4.2. Lead/Lag Off

If lead/lag is turned off, *SP1H* and *SP1L* control pump 1 and *SP2H* and *SP2L* control pump 2. There is no alternating function.

5. OPERATION

5.1. Operation RV, RC Isolated Analog Retransmission

The analog retransmission option allows the Process Variable or the Set Variable to be sent as an analog signal to an external device. The signal may be either 0 to 10 VDC (Option RV) or 0 (or 4) to 20 mA DC (Option RC). The output may be changed in the field from one to the other by the toggle switch located on the top printed circuit board.

Wire the output as shown in figure 2, page 7.

To set up the analog retransmission, first determine the scale range that the analog signal will represent. The maximum scales is 9999 counts. In the Secondary Menu set POL for the scale value that will be represented by the low end of the analog signal (0 Volts or 0 mA). Set POH for the scale value that will be represented by the high end of the analog signal (10 Volts or 20 mA).

K= (Highest desired scale reading - Lowest desired scale reading)/(Maximum desired analog signal - Minimum desired analog signal).
POH= ((Maximum possible analog output - Maximum desired analog signal) *K) + Highest desired analog reading.
POL= Lowest desired scale reading - ((Minimum desired analog output) *K).

Operation is automatic. There are no further programming steps required.

5.2. Option 232, 485 Serial Communication Operation

The serial communications options allow the control to be written to and read from a remote computer or other similar digital device. Communication is allowed either through an RS-485 (Option 485) port, or an RS-232 (Option 232) port.

Wire the communication lines as shown in Figure 4, Page 10. Wiring for the RS-485 is run from control to control in a daisy chain fashion with a termination resistor (120 ohms) across the transmit and receive terminals of the last control in the chain. Set the RS-485 DIP switch for half or full duplex as appropriate for your application. The DIP switch is located on the communications board plugged into the center of the bottom board of the control.

Select the control address and communication baud rate with the $Addr$ and $bAUd$ menu items in the Secure Menu. THE BAUD RATE AND ADDRESS MENU ITEMS WILL TAKE EFFECT ON THE NEXT POWER UP OF THE CONTROL. BE SURE TO POWER CYCLE THE CONTROL BEFORE USING THE NEW BAUD RATE AND ADDRESS.

In operation, you have the option of preventing a write command from the host computer. To prevent the host from writing to the control, change the $LOrE$ menu item in the Secondary Menu to LOC. To allow the host to write commands to the control set $LOrE$ to rE. (The host does have the ability to change the $LOrE$ state, but it is not automatic.)

If your system depends on constant reading or writing to and from the host, you may wish to set the No Activity Timer (nAt) to monitor the addressing of the control. When the $LOrE$ is set to rE and the nAt is set to any value other that OFF, the control will expect to be addressed on a regular basis. If the control is not addressed in the time set by the value of nAt, then the control will display the error message $CHEC$ $LOrE$. To clear the message, set $LOrE$ to LOC.

6. MENU SELECTIONS

6.1. Notation Conventions for the Menus

Because of the number of features available in this control, information is included that may not apply to your specific control. All usable features are included in this book, but may not be used in your process. To increase clarity, the following conventions are used:

1. Certain features or functions shown in this book are contextual. This means that Menu Items may or may not appear, depending on other Menu Item selections. Whenever this occurs, a notation is made in the Menu Item that "controls" or "directs" other menu items. If you are looking for a particular menu item and can't find it, check the menu item that is its "control" for proper setting.
2. The "#" symbol is used in two ways. It is used inside a group of characters to indicate which set point function (SP1 or SP2) is being affected. It is also used before a group of characters of a menu item to indicate that there may be more than one selection or value for that Menu Item.

6.2. Secondary Menu

Press the "UP ARROW and "ENTER" keys to start the menu. Press the "NEXT MENU" key to advance to the next menu item. Press "UP ARROW" or "DOWN ARROW" to change the value in the display. Press "ENTER" to retain the value.

5P 1H	Pump 1 On Set Point. Factory Default	23.1 (feet).
5P 1L	Pump 1 Off Set Point. Factory Default	-5.7 (feet).
5P2H	Pump 2 On Set Point Factory Default	23.1 (feet).
5P2L	Pump 2 Off Set Point. Factory Default	-5.7 (feet).
A 1H1	Alarm 1 High: Factory Default	23.1 (feet).
A 1Lo	Alarm 2 Low: Factory Default	2.0 (feet).

6.3. Secure Menu

Press the "UP ARROW and the "ENTER" keys for 5 Seconds to start the menu. Press "NEXT MENU" to advance to the next menu item. Press "UP ARROW" or "DOWN ARROW" to change the value in the display. Press ENTER to retain the value. OUTPUTS ARE DISABLED (TURNED OFF) WHILE CONTROL IS IN THE SECURE MENU.

5ECr	Security Code: See the Security Level Selection and the Password Table on page 13, in order to enter the correct password. Factory Default is 4.
InP	Input Type: Select one of the following. Refer to the Input wirin section for the proper wiring. Factory Default is Curr. Curr DC Current Input 0.0 to 20.0 or 4.0 to 20.0 mA. UOLt DC Voltage Input 0.0 to 10.0 or 2.0 to 10.0 volts. ---- Reserved
InPC	Input Correction: Select ±500 counts. This feature allows the input value to be changed to agree with an external reference or to compensate for sensor error. Note: InPC is reset to zero when the input type is changed, or when decimal position is changed.
LdLg	Lead / Lag: Select On or OFF. Factory default is On. (See page 14). On The Lead/Lag function is enabled. The outputs of 5P 1 and 5P2 will alternate. OFF The Lead/Lag function is disabled.
OSUP	Zero Suppression: Select On or OFF. Factory default is OFF. OFF The input range will start at 0 (zero) Input. On The input range will start at 4.00 mA or 2.00 V.
dPT	Decimal Point Positioning: Select 0, 0.0, 0.00, or 0.000. All Menu items related to the input will be affected. Factory default is 0.0.

| *PEA*	The Peak feature stores the highest input the control has measured since the last reset or Power On. At Power On, *PEA* is reset to the present input. To manually reset the value, *PEA* must be in the lower display. Press the "ENTER" key to reset. *PEA* will be reset and display the present input value.
UAL	The Valley feature stores the lowest input the Controller has measured since the last reset or Power On. At Power On, *UAL* is reset to the present input. To manually reset the value, *UAL* must be in the lower display. Press the ENTER key. *UAL* will be reset and display the present input value.
SCAL	Scale Low: Select *100* to *9999* counts below *SCAH*. The total span between *SCAL* and *SCAH* must be within 11998 counts. Maximum setting range is *-1999* to *+9999* counts. Factory Default is *-5.7*.
SCAH	Scale High: Select *100* to *9999* counts above *SCAL*. The total span between *SCAL* and *SCAH* must be within 11998 counts. Maximum setting range is *-1999* to *+9999* counts. Factory Default is *23.1*.
SPL	Set Point Low: Select from the lowest input range value to *SPH* value. This will set the minimum *SP1L* or *SP2L* value that can be entered. The value for *SP1L* or *SP2L* will stop moving when this value is reached. Factory Default is *-5.7*.
S1St	Set Point 1 State: Select *P1n* or *POut*. Factory default is *POut*. *P1n* Pump In (Direct (Action). As the input increases, the output will increase. *POut* Pump Out (Reverse Action). As the input increases the output will decrease.
S1LP	P1 Lamp: Select *0 on* or *0oFF*. Factory default is *0 on*. *0 on* Lamp ON when Output is ON. *0oFF* Lamp OFF when Output is ON.
S2St	Set Point 2 State: Select *P1n*, *POut* or *OFF*. Factory default is *POut*. *P1n* Pump In (Direct Action). As the input increases the output will increase *POut* Pump Out (Reverse Action). As the input increases the output will decrease.
S2LP	P2 Lamp: Select *0 on* or *0oFF*. Factory default is *0 on*. *0 on* Lamp ON when Output is ON. *0oFF* Lamp OFF when Output is ON.

7. ALARM TYPE AND ACTION

⚠️ **CAUTION:** In any critical application wehre failure could cause expensive product loss or endanger safety, a redundant limit controller is required.

When setting an alarm value for an absolute alarm (𝐴𝐿𝑡 = 𝐴𝑏𝑆 or 𝐴2𝑡 = 𝐴𝑏𝑆), simply set the value at which the alarm is to occur.

When setting the alarm value for a deviation alarm (𝐴𝐿𝑡 = 𝑑𝐸 or 𝐴2𝑡 = 𝑑𝐸), set the difference in value from the Set Point (𝑆𝑃 1𝐻) desired.

Since the input for the MPCJR is driven from a transmitter, the input display can be programmed in different ways. Regardless of the position of the decimal point, a change of one in the right most digit is referred to as a count. For example, if there were no decimal point selected, a change from 235 to 236 is a change of one count. If the decimal point were selected at 0.0, a change of 23.5 to 23.6 is a change of one count.

The diagram below shows the action and reset functions for both absolute and deviation alarms.
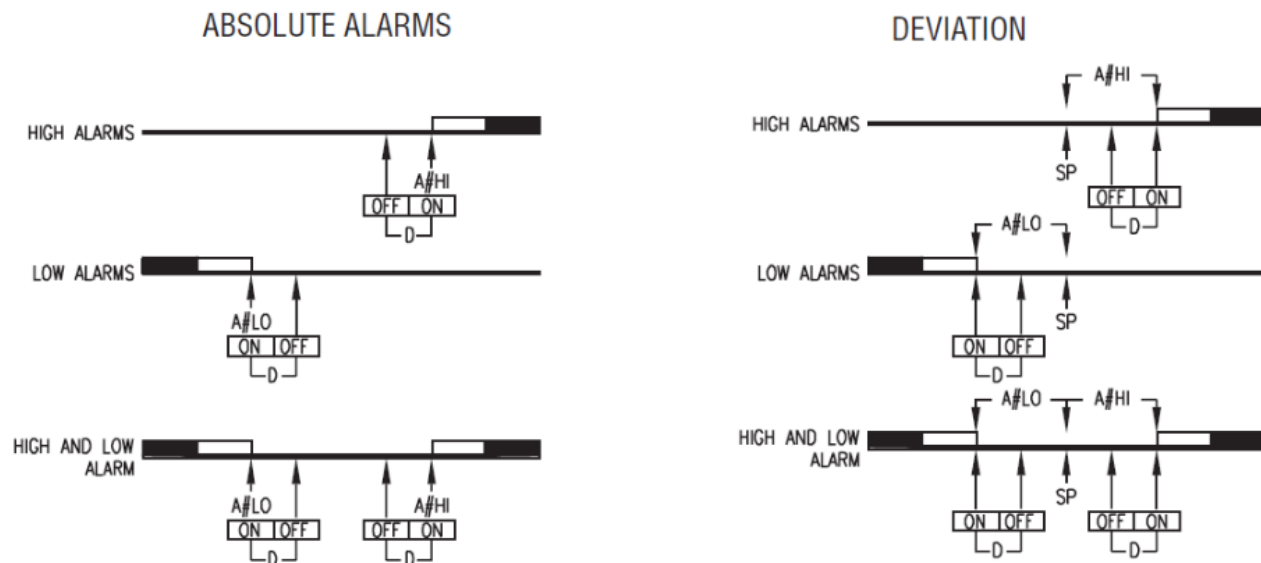
When setting up an alarm for deviation, the deviation is set in counts. For example, if a low alarm is required to be 5 counts below the $SP\,1H$, then set $A\#Lo$ to -5. If a high alarm is required 20 counts above the SP1H, then set A#Hi to +20. If SP1H is changed, the alarm will continue to hold the same relationship as originally set.

When Alarm Power Interrupt, $A\#PI$, is programmed ON and Alarm Reset, $A\#rE$, is programmed for Hold, the alarm will automatically reset up on a power failure and subsequent restoration if no alarm condition is present.

If Alarm Inhibit, $A\#I\,H$, is selected ON, an alarm condition is suspended upon power up until the process value passes through the alarm set point once. Alarm inhibit can be restored as if a power up took place by pressing both the NEXT MENU and ENTER keys for 5 seconds.

WARNING: IF INHIBIT IS ON AND A POWER FAILURE OCCURS DURING A HIGH ALARM, RESTORATION OF POWER WILL NOT CAUSE THE ALARM TO OCCUR IF THE PROCESS CALUE DOES NOT FIRST DROP BELOW THE HIGH ALARM SETTING. DO NOT USE THE ALARM INHIBIT FEATURE IF A HAZARD IS CREATED BY THIS ACTION. BE SURE TO TEST ALL COMBINATIONS OF HIGH AND LOW ALARM INHIBIT ACTIONS BEFORE PLACING CONTROL INTO OPERATION.

The following menu items apply only to the alarms:

$AL\,1$	Alarm 1 Function: Select OFF, Lo, HI, or $HI\,Lo$, Factory default is HI.	
	OFF	Alarm 1 is disabled. No Alarm 1 menu items appear in the Secondary or Secure menus.
	Lo	Low Alarm Only. $A\,1Lo$ appears in the Secondary Menu.
	HI	High Alarm Only. $A\,1HI$ appears in the Secondary Menu.
	$HI\,Lo$	Hi and Low Alarms. Both A1Lo and A1Hi appear in the Secondary Menu, and share the same Alarm 1 Relay output.
If $AL\,1$ is set to OFF, go to $AL2$ on the next page.		
ALt	Alarm 1 Type: Select $Ab5$ or dE. Factory default is $Ab5$.	
	$Ab5$	Absolute alarm that may be set anywhere within the values of $SCAL$ and $SCAH$ and is independent of $SP\,1H$.
	dE	Deviation Alarm that may be set as an offset from SP1H. As SP1H is changed, the Alarm Point will track with SP1H.

$A1rE$	Alarm 1 Reset: Select OFF or $HoLd$. Factory default is $OnOF$.	
	$OnOF$	Automatic Reset.
	$HoLd$	Manual Reset. Reset (acknowledge) by simultaneously pressing the NEXT MENU & DOWN ARROW keys for 5 seconds.

$A1P1$	Alarm 1 Power Interrupt: Select On or OFF. Factory default is OFF.	
	On	Alarm Power Interrupt is On.
	OFF	Alarm Power Interrupt is OFF.

$A11H$	Alarm 1 Inhibit: Select On or OFF. Factory default is OFF.	
	On	Alarm Inhibit is On. Alarm action is suspended until the process value first enters a non-alarm condition.
	OFF	Alarm Inhibit is OFF.

$A1St$	Alarm 1 Output State: Select $CLOS$ or $OPEn$. Factory default is $CLOS$.	
	$CLOS$	Closes Contacts at Alarm Set Point.
	$OPEn$	Opens Contacts at Alarm Set Point.

$A1LP$	Alarm 1 Lamp: Select O on or $OoFF$. Factory default is O on.	
	O on	Alarm Lamp is ON when alarm contact is closed.
	$OoFF$	Alarm Lamp is OFF when alarm contact is closed.

$AL2$	Alarm 2 Function: Select OFF, Lo, HI, or $HILo$. Factory default is Lo.	
	OFF	Alarm 2 is disabled. No Alarm 2 menu items appear in the Secondary or Secure menus.
	Lo	Low Alarm Only. $A2Lo$ appears in the Secondary Menu.
	HI	High Alarm Only. $A2HI$ appears in the Secondary Menu.
	$HILo$	High and Low Alarms. Both $A2Lo$ and $A2HI$ appear in the Secondary Menu, and share the same Alarm 2 Relay output.

If AL2 is set to OFF, the remaining A2, alarm 2, menu items do not appear.

A2t	Alarm 2 Type; Select Ab5 or dE. Factory default is Ab5.	
	Ab5	Absolute Alarm that may be set anywhere within the values of 5CAL and 5CAH and is independent of 5P 1H.
	dE	Deviation Alarm that may be set as an offset from 5P 1H. As 5P 1H is changed, the Alarm Point will track with 5P 1H.

A2rE	Alarm 2 Reset: Select OnOF or HoLd. Factory default is OnOF.	
	OnOF	Automatic reset.
	HoLd	Manual Reset. Reset (acknowledge) by simultaneously pressing the NEXT MENU & DOWN ARROW keys for 5 seconds.

A2PI	Alarm 2 Power Interrupt: Select On or OFF. Factory default is OFF.	
	On	Alarm Power Interrupt is ON.
	OFF	Alarm Power Interrupt is OFF.

A2I H	Alarm 2 Inhibit: Select On or OFF. Factory default is OFF.	
	On	Alarm Inhibit is On. Alarm action is suspended until the process value first enters a non-alarm condition.
	OFF	Alarm Inhibit is OFF.

A25t	Alarm 2 Output State: Select CLO5 or OPEn. Factory default is CLO5.	
	CLO5	Closes Contacts at Alarm Set Point.
	OPEn	Opens Contacts at Alarm Set Point.

A2LP	Alarm 2 Lamp: Select O on or OoFF. Factory default is O on.	
	O on	Alarm Lamp is ON when alarm contact is closed.
	OoFF	Alarm Lamp is OFF when alarm contact is closed.

FILt	Digital Filter: Select *OFF* or *1* to *99*. In some cases, the time constant of the sensor or noise could cause the display to jump enough to be unreadable. If this value is set too high, controllabilityl will suffer. Factory default is *3*.	
The remaining menu items appear if the corresponding option was purchased with the control.		
POL	(Analog Retransmission Output, see pages 15-16) Process Output Low: Select -1999 counts to any value less than *POH*. Factory default is *-5.7*.	
POH	(Analog Retransmission Output, see pages 15-16) Process Output High: Select from any value greater than *POL* to 9999 counts. Factory default is *23.1*.	
LOrE	(Option 232 and 485, Serial Communications) Local / Remote Status: Select *LOC* or *rE*. Factory default is *rE*.	
	LOC	The host computer is advised not to send remote commands. Any write commands sent to the controls will be rejected.
	rE	The host computer is allowed to send write commands. If the control is not addressed within the time set in the *nAt* (No Activity Timer, see Secure Menu) the *CHEC* or *LorE* error message will be displayed.
Addr	(Option 232 or 485, Serial Communications) Control Address: Set from *1* to *FF*. This number (hexadecimal, base 16) must match the address number used by the host computer. Factory default is *32*.	
bAUd	(Option 232 or 485, Serial Communications) Communication Baud Rate: Select *300*, *1200*, *2400*, *4800*, *9600*, or *19200*. This number must match the baud rate used by the host computer. Factory default is *9600*.	
nAt	(Option 232 or 485, Serial communications) No Activity Timer: Set from *OFF* or *1* to *99* minutes. Factory default is *OFF*.	
	1-99	Maximum time between host computer accesses. If timer counts to 0, *CHEC* / *LorE* will be displayed.
	OFF	No Activity Timer function is disabled.

8. DIAGNOSTIC ERROR MESSAGES

DISPLAY	MEANING	SP OUTPUTS	ACTION REQUIRED
No display lighted	Display is blank. Instrument is not getting power, or the supply voltage is too low.	Set point outputs inactive Alarms inactive	Check that the power supply is on, or that the external fuses are good.
FAIL tESt	Fail test appears upon power up if the internal diagnostics detect a failure. This message may occur during operation if a failure is detected. Displays flash.	Set point outputs inactive Alarms inactive	The display alternates between *FAIL tESt* and one of the following messages: *FACt dFLt*: Memory may be corrupted. Press the ENTER key and the DOWN ARROW key to start the factory default procedure. Recheck controller programming. *rEt FACt*: Unrecoverable error, return to factory for service.
CHEC LorE	This message appears if the Serial Communications has timed out.	Set point outputs active Alarms inactive	Restore the communications line and switch the *LorE* to *LOC*.
UFL or *OFL*	Underflow or Overlow: Process value has exceeded input range ends.	Set point outputs active Alarms active	Input signals may normally go above or below range ends. If not, check input and correct.

DISPLAY	MEANING	SP OUTPUTS	ACTION REQUIRED
CHEC CAL	Check calibration appears as an alternating message if the instrument calibration nears tolerance edges.	Set point outputs active Alarms active	Remove the instrument for service and/or recalibration. To reset, use the NEXT MENU & ENTER keys.
	Check calibration appears as a flashing message if the instrument calibration exceeds spedification.	Set point outputs inactive Alarms active	Remove the instrument for service an/or recalibration. To reset, use the NEXT MENU & ENTER keys.
ArEA (Alternatives with PV)	This message appears if the ambient temperature of the control approaches the ends of tolerance.	Set point outputs active Alarm active	Correct the ambient temperature conditions. Ventilate the area of the cabinet or check for clogged filters. If RJC broken, return to factory for service.
ArEA	This message appears if the ambient temperature of the control is out of range or RJC sensor is broken.	Set point outputs active Alarms active	Correct the ambient temperature conditions. Ventilate the area of the cabinet or check for clogged filters. If RJC broken, return to factory for service.

9. PROGRAMMING

9.1. Programming Charts

Use the charts on this page and the next to record the values in your application. You may want to photocopy the pages if you plan to make programming changes.

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Primary	PU SP 1 H			Home Position, Process Variable & SP1H's Value displayed

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secondary	SP1 H	23.1		Set Point 1 value (default is in feet)
	SP1 L	-5.7		Set Point 1 off value (default is in feet)
	SP2H	23.1		Set Point 2 value (default is in feet)
	SP2L	-5.7		Set Point 2 off value (default is in feet)
	A 1Hi	23.1		Alarm 1 (high) value (default is in feet)
	A2Lo	2.0		Alarm 2 (low) value (default is in feet)

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secure	SECr	4		Security Selection
	InP	Curr		Input (selectable current or voltage)
	InPC	0.0		Input Correction
	LdL9	On		Lead/Lag (selectable on or off)
	OSUP	OFF		Zero suppression (selectable on or off)
	dPt	0.0		Decimal Point Position
	PEA	X X		Peak, highest input value seen since last reset
	UAL	X X		Valley, lowest input value seen
	SCAL	-5.7		Scale Low value (default is in feet)
	SCAH	23.1		Scale High value (default is in feet)
	SPL	-5.7		Set Point Low value (default is in feet) since last reset
	SPH	23.1		Set Point High value (default is in feet)
	S1 St	POut		Set Point 1 State (selectable *POut* (Pumping Out) or *P1 n* (Pumping In))
	S1 LP			Set Point 1 Lampt Condition when contact is closed (selectable on or off)
	S2St	POut		Set Point 2 State (selectable *POut* (Pumping Out), *P1 n* (Pumping In), or off)

Continued on next page

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secure	S2LP			Set Point 2 Lamp Condition when contact is closed (selectable on or off)
	AL1	HI		Alarm 1 Function (selectable off, lo, hi, or hilo)
	ALt	AbS		Alarm Type 1 (selectable abs (absolute) or de (deviation))
	A1rE	OnOF		Alarm 1 Rest (selectable OnOF (auto) or hold (manual))
	A1PI	OFF		Alarm 1 Power Interrupt (selectable on or off)
	A11H	OFF		Alarm 1 Inhibit (selectable on or off)
	A1ST	CLOS		Alarm 1 Output State (selectable close or open)
	A1LP	O on		Alarm 1 Lamp condition when contact is closed (selectable on or off)
	AL2	LO		Alarm 2 function (selectable off, lo, hi, or hilo)
	A2t	AbS		Alarm 2 Type (selectable abs (absolute) or de (deviation))
	A2rE	OnOF		Alarm 2 Reset (selectable onof (auto) or hold (manual))
	A2PI	OFF		Alarm 2 Power Interrupt (selectable on or off)
	A2IH	OFF		Alarm 2 Inhibit (selectable on or off)
	A2St	CLOS		Alarm 2 Output State (selectable close or open)
	A2LP	Oon		Alarm 2 Lamp condition when contact is closed (selectable on or off)
	FILt	3		Digital Filter
	POL	-5.7		Process Output Low (default is in feet)
	POH	23.1		Process Output High (default is in feet)
	LOrE	rE		Local/Remote for computer communications
	Addr	32		Control Address for computer communications
	bAUd	9600		Baud Rate for computer communications
	nAt	OFF		No activity Timer for computer communications
	Stor	YES		Store Menu for Hi speed writes (selectable yes or no)

9.2. Programming Example
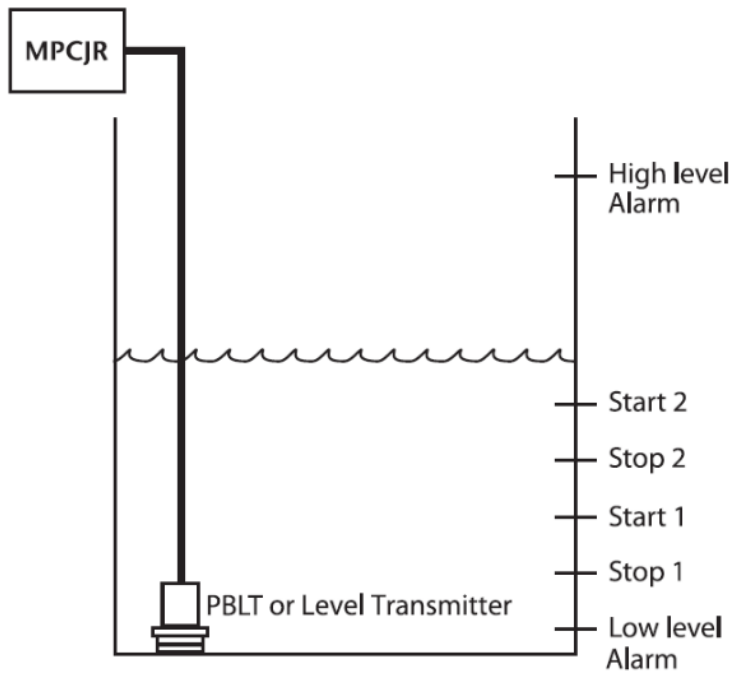
Example:
• Keep Empty, two pump (duplex)
• Depth 25 feet
• Pump 1: Start at 6 feet
            Stop at 3 feet
   Pump 2: Start at 12 feet
            Stop at 9 feet
• Low level alarm: 1 foot, fixed, auto reset
• High level alarm: 20 feet, fixed, auto reset
• Want Lead/Lag function on
• No communication options
• Want 4-20 mA retransmission
• Using with a 4-20 mA input.

9.3. Programming Chart Examples

1. Secondary Programming Chart

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secondary	SP1 H	23.1	6.0	Set Point 1 value (default is in feet)
	SP1 L	-5.7	3.0	Set Point 1 off value (default is in feet)
	SP2H	23.1	12.0	Set Point 2 value (default is in feet)
	SP2L	-5.7	9.0	Set Point 2 off value (default is in feet)
	A1HI	23.1	20.0	Alarm 1 (high) value (default is in feet)
	A2Lo	2.0	1.0	Alarm 2 (low) value (default is in feet)

2. Secure Programming Chart

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secure	SECr	4	4	Security Selection
	InP	Curr	Curr	Input (selectable current or voltage)
	InPC	0.0	0.0	Input Correction
	LdL9	On	On	Lead/Lag (selectable on or off)
	0SUP	OFF	On	Zero suppression (selectable on or off)
	dPt	0.0	0.0	Decimal Point Position
	PEA	XX		Peak, highest input value seen since last reset
	UAL	XX		Valley, lowest input value seen
	SCAL	-5.7	0.0	Scale Low value (default is in feet)
	SCAH	23.1	25.0	Scale High value (default is in feet)
	SPL	-5.7		Set Point Low value (default is in feet) since last reset
	SPH	23.1		Set Point High value (default is in feet)
	S1St	POut		Set Point 1 State (selectable POut (Pumping Out) or PIn (Pumping In))
	S1LP			Set Point 1 Lampt Condition when contact is closed (selectable on or off)
	S2St	POut	POut	Set Point 2 State (selectable POut (Pumping Out), PIn (Pumping In), or off)
	S2LP			Set Point 2 Lamp Condition when contact is closed (selectable on or off)

Secure Programming Chart Example (continued)

MENU	ITEM	DEFAULT	SET AT	DESCRIPTION
Secure	AL 1	HI	HI	Alarm 1 Function (selectable off, lo, hi, or hilo)
	ALt	AbS	AbS	Alarm Type 1 (selectable abs (absolute) or de (deviation))
	A 1rE	OnOF	OnOF	Alarm 1 Rest (selectable OnOF (auto) or hold (manual))
	A 1PI	OFF	OFF	Alarm 1 Power Interrupt (selectable on or off)
	A1 1H	OFF	OFF	Alarm 1 Inhibit (selectable on or off)
	A 1ST	CLOS	CLOS	Alarm 1 Output State (selectable close or open)
	A1 LP	O on	O on	Alarm 1 Lamp condition when contact is closed (selectable on or off)
	AL2	LO	LO	Alarm 2 function (selectable off, lo, hi, or hilo)
	A2t	AbS	AbS	Alarm 2 Type (selectable abs (absolute) or de (deviation))
	A2rE	OnOF	OnOF	Alarm 2 Reset (selectable onof (auto) or hold (manual))
	A2PI	OFF	OFF	Alarm 2 Power Interrupt (selectable on or off)
	A2I H	OFF	OFF	Alarm 2 Inhibit (selectable on or off)
	A2St	CLOS	CLOS	Alarm 2 Output State (selectable close or open)
	A2LP	Oon	Oon	Alarm 2 Lamp condition when contact is closed (selectable on or off)
	F 1Lt	3	3	Digital Filter
	POL	-5.7	0.0	Process Output Low (default is in feet)
	POH	23.1	25.0	Process Output High (default is in feet)

10. WARRANTY

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4. Examination discloses, in the judgment of Blue Ribbon Corp, a defect in materials or workmanship which developed under normal installation, use and service; and
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