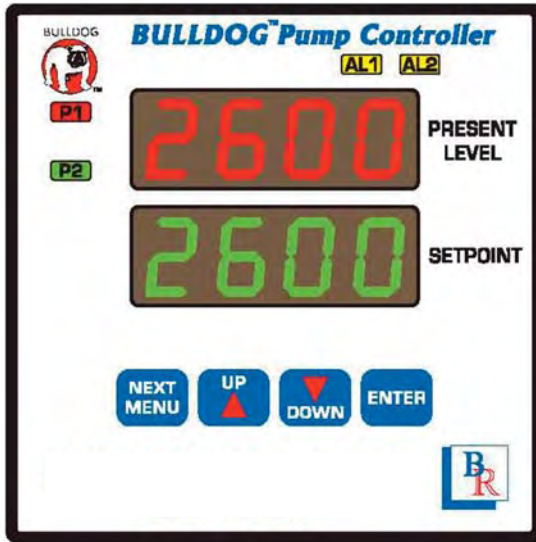


INSTRUCTIONS FOR THE BULLDOG MICROPROCESSOR BASED PUMP LEVEL SET POINT CONTROLLER



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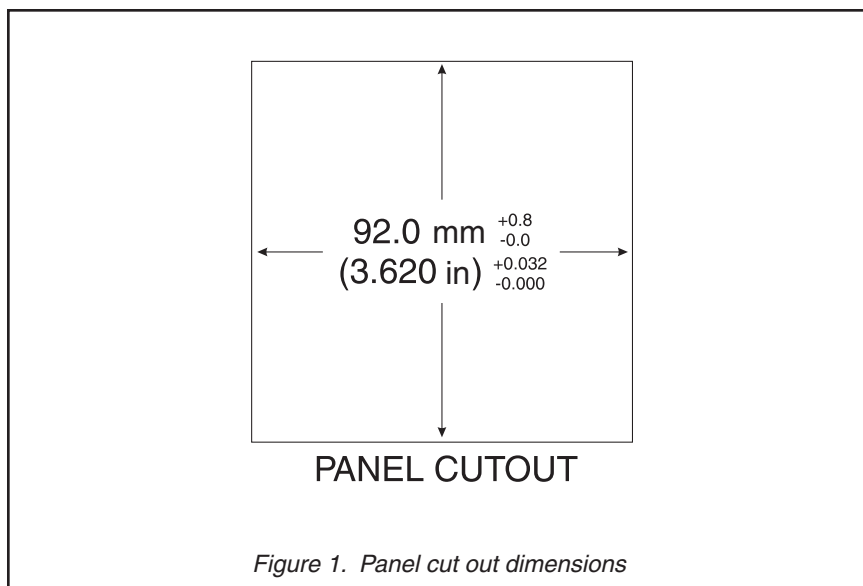
INSTALLATION

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. Hold the housing with one hand and using the other hand, push the collar evenly against the panel until the springs are compressed. The ratchets will hold the mounting collar and housing in place.



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 and protection against Electrostatic Discharge (ESD). Failure to exercise good ESD practices may cause damage to the instrument.

WIRING

Do not run Birdcage wiring or other class 2 wiring in the same conduit as power leads. Use only the Birdcage 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 Birdcage probe or transmitter is rated CLASS 2.

Control wiring is as shown in Figure 2.

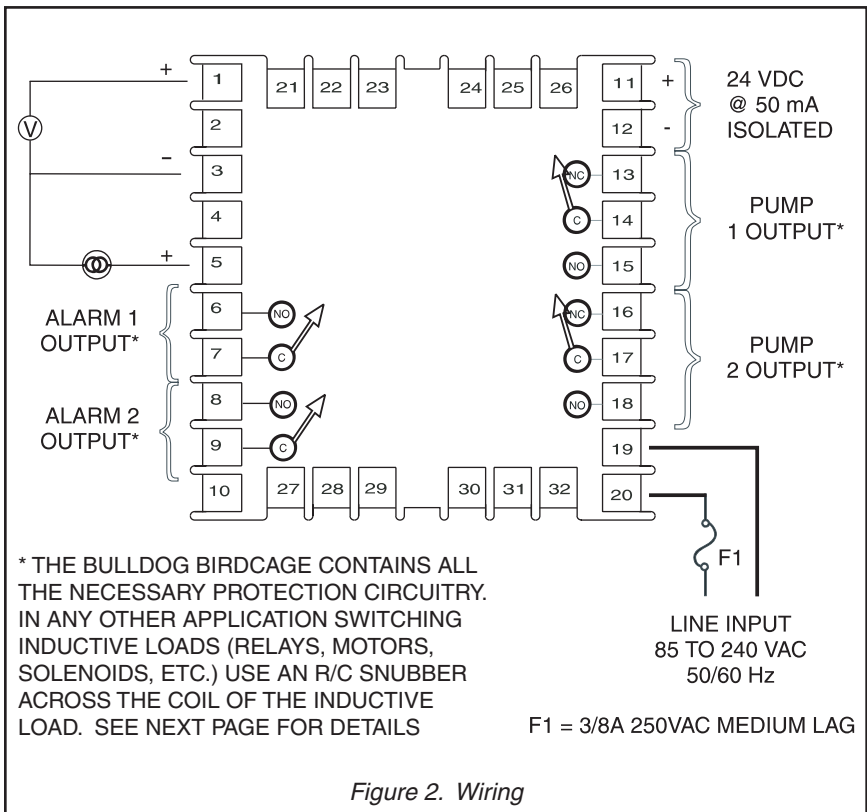
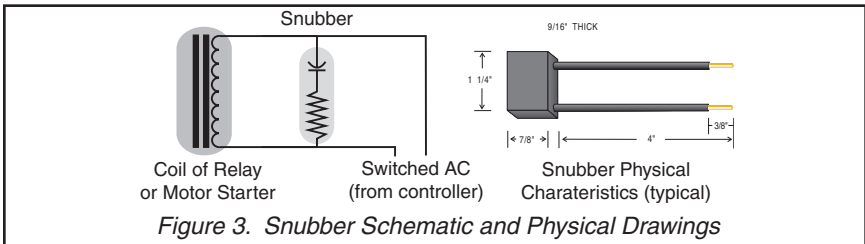


Figure 2. Wiring

Use of Snubbers with Inductive Loads



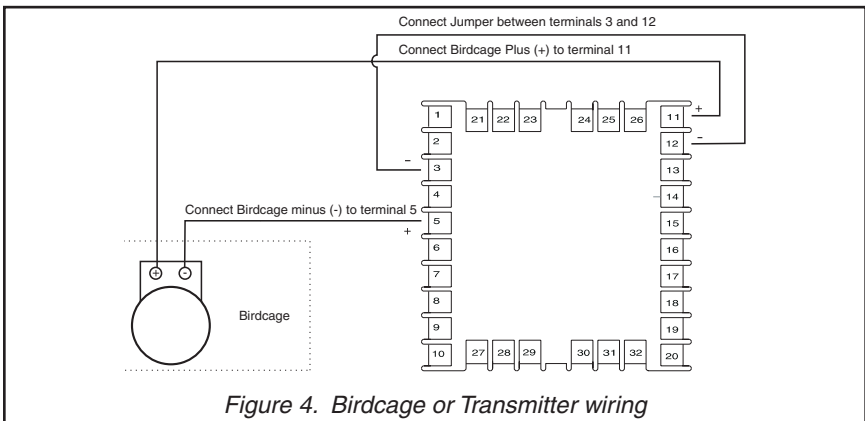
A snubber is a resistance/capacitance device that is used to reduce or eliminate high voltage spikes generated from inductive loads. For best effect, the snubber should be mounted as close to the coil as physically possible. Electrical and typical physical characteristics are shown above.



FAILURE TO USE A SNUBBER ON AN INDUCTIVE LOAD MAY CAUSE ERRATIC OPERATION AND / OR PREMATURE RELAY CONTACT WEAR.

Wiring for Birdcage and Transmitter inputs

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



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.

Wiring for Optional Inputs and Outputs

Wire power and outputs as shown on page 5. Wiring for options is shown below. All wiring shown below is Class 2. Shielded twisted pair is recommended for Option 9485.



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.

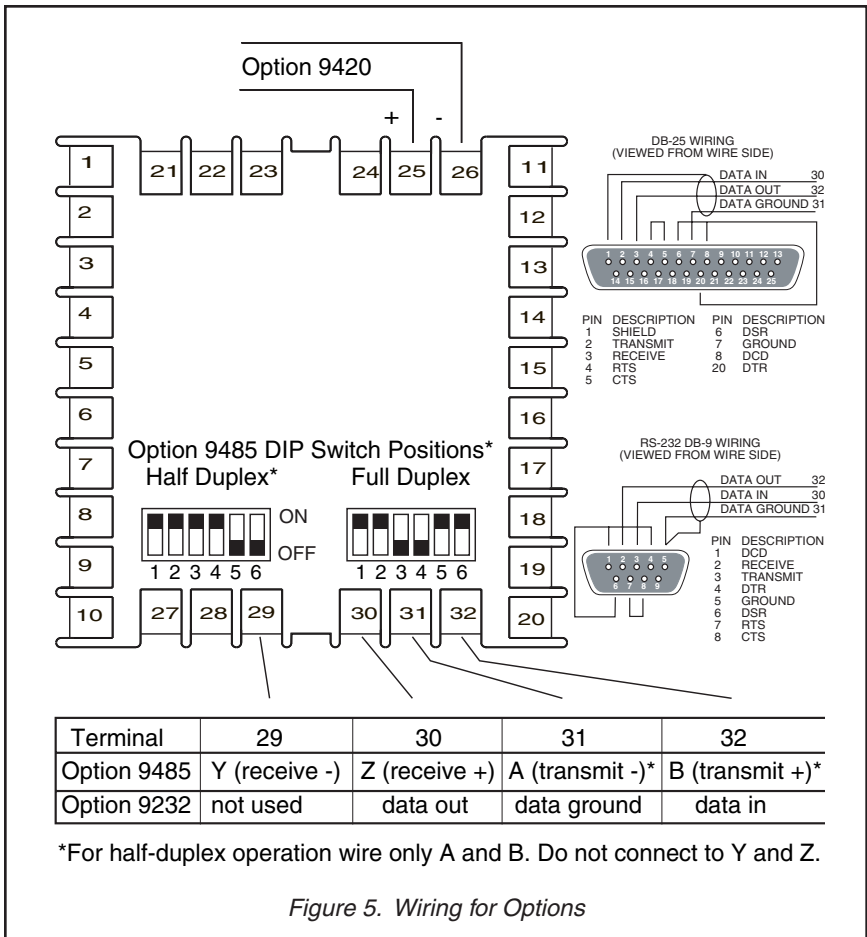
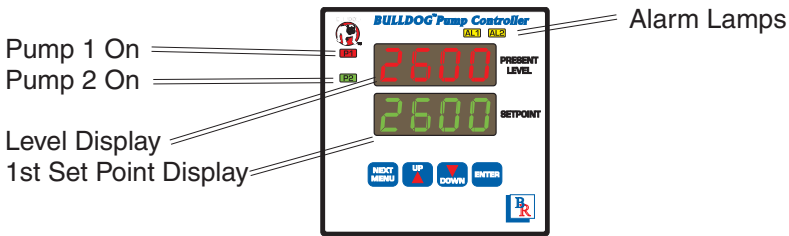


Figure 5. Wiring for Options

FRONT PANEL FUNCTIONS



Key functions are as follows:

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 ARROW: Increments a value, changes a menu item, or selects the item to ON. The maximum value obtainable is 9999 regardless of decimal point placement.

DOWN ARROW: Decrements a value, changes a menu item, or selects the item to OFF. The minimum value obtainable is -1999 regardless of decimal point placement.

ENTER: Pressing **ENTER** stores the value or the item changed. If not pressed, the previously stored value or item will be retained. The display will flash once when **ENTER** is pressed.

UP ARROW & ENTER: Pressing these keys simultaneously brings up the home menu starting at the *SP #* menu item. Pressing these keys for 5 seconds will bring up the secure menu.

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: Pressing these keys simultaneously and holding them for 5 seconds allows recovery from the various error messages. The following menu items will be reset:

Alarm inhibit




CHK 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.

While in the **Home 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.

SECURITY LEVEL SELECTION

Three levels of security are provided. The display shows the current security level. To change security levels change the password value using the  **UP ARROW** or  **DOWN ARROW** keys and pressing the  **ENTER** key. Refer to the password table (following) for the correct value to enter for the security level desired. The **SECr** menu item security level may be viewed or changed at any time regardless of the present security level.

To set the access level to, for example, 2, at the **SECr** menu item press the  **UP ARROW** key until the upper display show the password, 1101. Press the  **ENTER** key. The display will blink, and return with the level value, 2, in the upper display.

PASSWORD TABLE

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 book.

Security Level Menu	Status	Displayed Value When Viewed	Password Value To Enter
Home Secure	Locked Locked	2	1101
Home Secure	Unlocked Locked	3	1011
Home Secure	Unlocked Unlocked	4	1111

NOTATION CONVENTIONS FOR THE MENU

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.

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 *SP #* Pump 1 On Set Point on the bottom.

Error messages may over-ride the HOME display. See ERROR MESSAGES on page 22.

OPERATION

The Blue Ribbon 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 Bulldog pump controller has a pair of set points each for pump one and pump two. If the lead/lag feature is turned off, $SP\ H$ and $SP\ L$ control pump one and $SP2H$ and $SP2L$ control pump two. If the lead/lag feature is turned on, pumps one and two will be controlled in the alternating fashion described below. In all cases the P1 lamp will indicate activity of pump one and the P2 lamp will indicate activity of pump two.

After installation, set the $SP\ H$ to the high level (pump on point) for standard operation. Set $SP\ L$ 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 $SP\ H$ below $SP\ L$, $SP\ L$ above $SP\ H$, $SP2H$ 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 $SP\ H$ point is reached, one of the pumps will turn on. When lead/lag is turned on, pumps one and two 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 $SP\ L$ is reached, remaining running pump will turn off. The last pump off will not be the next pump on.

If lead/lag is turned off, $SP\ H$ and $SP\ L$ control pump one and $SP2H$ and $SP2L$ control pump two. There is no alternating function.

OPERATION AND PROGRAMMING OF OPTIONS

Option 9420, Analog Retransmission.

The analog retransmission option allows the Process Variable to be sent as an analog signal to an external device. The signal is 0 (or 4) to 20 mADC.

Wire the input as shown on page 7.

To set up the analog retransmission, first determine the scale range that the analog signal will represent. The maximum scale is 9999 counts. In the Secure Menu set PQL for the scale value that will be represented by the low end of the analog signal (0 mA). Set PQH for the scale value that will be represented by the high end of the analog signal (20 mA).

If you require a suppressed scale or output, you may use the following equations to determine the proper settings for PQL and PQH .

$K = (\text{Highest desired scale reading} - \text{Lowest desired scale reading}) / (\text{Maximum desired analog signal} - \text{Minimum desired analog signal}).$

$PQH = ((\text{Maximum possible analog output} - \text{Maximum desired analog signal}) * K) + \text{Highest desired analog reading}.$

$PQL = \text{Lowest desired scale reading} - (\text{Minimum desired analog output} * K).$

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

Option 9485, 9232, Serial Communication.

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 a RS-485 (Option 9485) port, or a RS-232 (Option 9232) port.

Wire the communication lines as shown on Page 7. 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 *LQrE* menu item in the Secondary Menu to *LQC*. To allow the host to write commands to the control set *LQrE* to *rE*. (The host does have the ability to change the *LQrE* 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 *LQrE* is set to *rE* and the *nAt* is set to any value other than *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 *CHCC LQrE*. To clear the message set *LQrE* to *LQC*.

MENU SELECTIONS

HOME MENU

Hold  **UP ARROW** &  **ENTER**. 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.

SP 1H Pump 1 On Set Point. Factory Default 23.1 (feet).

SP 1L Pump 1 Off Set Point. Factory Default - 5.7 (feet).

SP 2H Pump 2 On Set Point. Factory Default 23.1 (feet).

SP 2L Pump 2 Off Set Point. Factory Default - 5.7 (feet).







A 1L Alarm 1 Low: Factory Default 2.0 (feet). (Does not appear with Factory default programming.)

A 1H Alarm 1 High: Factory Default 23.1 (feet).

A 2L Alarm 2 Low: Factory Default 2.0 (feet).

A 2H Alarm 2 High: Factory Default 23.1 (feet). (Does not appear with Factory default programming.)

SECURE MENU

Hold  **UP ARROW** &  **ENTER** for 5 Seconds. 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 SECURE MENU.**

SECr Security Code: See the Security Level Selection and the Password Table in this manual, in order to enter the correct password. Factory Default is 4.

InP Input Type: Select one of the following. Refer to the Input wiring section for the proper wiring. Factory Default is *Cur*.

- Cur* DC Current Input 0.0 to 20.0 or 4.0 to 20.0 mA.
- Volt* 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*.



- On* The Lead/Lag function is enabled. The outputs of SP1 and SP2 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*, *0.000*, or *.0000*. All Menu Items related to the Input will be affected. Factory default is one decimal place (*0.0*).

- 0* No decimal Point is selected.
- 0.0* One decimal place.
- 0.00* Two decimal places.
- 0.000* Three decimal places.
- .0000* Four decimal places.

- PEAK* The Peak feature stores the highest input the control has measured since the last reset or Power On. At Power On *PEAK* is reset to the present input. To manually reset the value *PEAK* must be in the lower display. Press the  **ENTER** key to reset. *PEAK* will be reset and display the present input value.
- VAL* The Valley feature stores the lowest input the Instrument has measured since the last reset or Power On. At Power On *VAL* is reset to the present input. To manually reset the value *VAL* must be in the lower display. Press the  **ENTER** key. *VAL* will be reset and display the present input value.
- SCALE* Scale Low: Select *100* to *9999* counts below *SCALEH*. The total span between *SCALE* and *SCALEH* must be within 11998 counts. Maximum setting range is *-1999* to *+9999* counts. Factory Default is *- 5.7*.
- SCALEH* Scale High: Select *100* to *9999* counts above *SCALE*. The total span between *SCALE* and *SCALEH* must be within 11998 counts. Maximum setting range is *-1999* to *+9999* counts. Factory Default is *23.1*.
- SP1* Set Point Low: Select from the lowest input range value to *SPH* value. This will set the minimum *SP1L* or *SP2L* value(s) that can be entered. The value for *SP1L* or *SP2L* will stop moving when this value is reached. Factory Default is *- 5.7*.
- SPH* Set Point High: Select from the highest input range value to *SP1* value. This will set the maximum *SP1H* or *SP2H* value that can be entered. The value for *SP1H* or *SP2H* will stop moving when this value is reached. Factory Default is *23.1*.
- STATE* Set Point 1 State: Select *P in* or *POut*. Factory default is *POut*.
- P in* 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.
- SLP* P1 Lamp: Select *ON* or *OFF*. Factory default is *ON*.
- ON* Lamp ON when Output is ON.
- OFF* Lamp OFF when Output is ON.

- S2St** Set Point 2 State: Select *P in* or *POut*. Factory default is *POut*.
- P in* 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 *On* or *Off*. Factory default is *On*.
- On* Lamp ON when Output is ON.
- Off* Lamp OFF when Output is ON.

ALARM TYPE AND ACTION



Caution: In any critical application where failure could cause expensive product loss or endanger personal safety, a redundant limit controller is required.

When setting an alarm value for an absolute alarm ($Rlt = Rb5$ or $R2t = Rb5$), simply set the value at which the alarm is to occur.

When setting the alarm value for a deviation alarm ($Rlt = dE$ or $R2t = dE$), set the difference in value from the Set Point (SPH) desired.

Since the input for the Bulldog pump controller is driven from a transmitter or birdcage, 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.

Remember that the Factory Default for the decimal point (dPt) is 0.0 .

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 SPH , then set **A#Lo** to **-5**. If a high alarm is required 20 counts above the SPH , then set **A#Hi** to **+20**. If SPH is changed, the alarm will continue to hold the same relationship as originally set.

The following diagram (below) shows the action and reset functions for both absolute and deviation alarms.

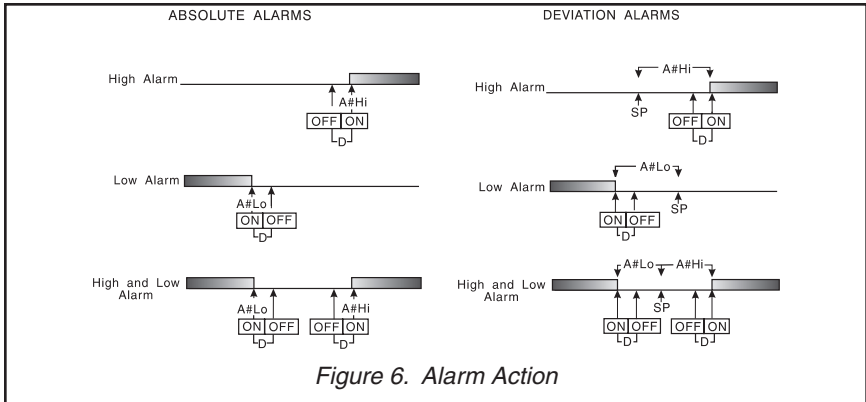


Figure 6. Alarm Action

When Alarm Power Interrupt, **A#Pi**, is programmed **ON** and Alarm Reset, **A#rE**, is programmed for **Hold**, the alarm will automatically reset upon a power failure and subsequent restoration if no alarm condition is present.

If Alarm Inhibit, **A#iH**, 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 VALUE 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 alarm.

- AL 1** Alarm 1 function: Select *OFF*, *Lo*, *Hi*, or *HiLo*. 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. *HiLo* appears in the Home Menu.
- Hi* High Alarm Only. *HiLo* appears in the Home Menu.
- HiLo* High and Low Alarms. Both *HiLo* and *HiLo* appear in the Home Menu, and share the same Alarm 1 Relay output.

If **AL 1** is set to *OFF*, go to **AL 2** below.

- Al* Alarm 1 Type: Select *AbS* or *dE*. Factory default is *AbS*.
AbS Absolute Alarm that may be set anywhere within the values of *SCR*_L and *SCR*_H and is independent of *SP* *IH*.
dE Deviation Alarm that may be set as an offset from *SP* *IH*. As *SP* *IH* is changed the Alarm Point will track with *SP* *IH*.
- AlrE* Alarm 1 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.
- AlP* Alarm 1 Power Interrupt: Select *On* or *OFF*. Factory default is *OFF*.
On Alarm Power Interrupt is *On*.
OFF Alarm Power Interrupt is *OFF*.
- AlIH* 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*.
- AlSt* 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.
- AlLP* Alarm 1 Lamp: Select *On* or *OFF*. Factory default is *On*.
On Alarm Lamp is ON when alarm contact is closed.
OFF Alarm Lamp is OFF when alarm contact is closed.
- Al2* Alarm 2 function: Select *OFF*, *Lo*, *H*, or *HLo*. 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. *AlLo* appears in the Home Menu.
H High Alarm Only. *AlH* appears in the Home Menu.
HLo High and Low Alarms. Both *AlLo* and *AlH* appear in the Home Menu, and share the same Alarm 2 Relay output.

If *AL2* is set to *OFF* skip to *FILT* below.

- AL2* Alarm 2 Type: Select *ABS* or *dE*. Factory default is *ABS*.
ABS Absolute Alarm that may be set anywhere within the values of *SCRAL* and *SCRH* and is independent of *SP IH*.
dE Deviation Alarm that may be set as an offset from *SP IH*. As *SP IH* is changed the Alarm Point will track with *SP IH*.
- AL2-E* 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.
- AL2-P* Alarm 2 Power Interrupt: Select *On* or *OFF*. Factory default is *OFF*.
On Alarm Power Interrupt is **On**.
OFF Alarm Power Interrupt is **OFF**.
- AL2-IH* 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**.
- AL2-OS* Alarm 2 Output State: Select *CLOS* or *OPEN*. Factory default is *CLOS*.
CLOS Closes Contacts at Alarm Set Point.
OPEN Opens Contacts at Alarm Set Point.
- AL2-LP* Alarm 2 Lamp: Select *On* or *OffF*. Factory default is *On*.
On Alarm Lamp is ON when alarm contact is closed.
OffF Alarm Lamp is OFF when alarm contact is closed.
- FILT* Digital Filter: Select *OFF*, 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, controllability will suffer. Factory default is 3.

If the controller is not equipped with options, the Secure Menu ends.

If the controller has option 9420, 9485, or 9232, continue with menu items below.

- POL** (Option 9420, Analog Retransmission Output) Process Output Low: Select -1999 counts to any value less than PCH. Factory default is - 5.7.
- PCH** (Option 9420, Analog Retransmission Output) Process Output High: Select from any value greater than POL to 9999 counts. Factory default is 23.1.
- LoRE** (Option 9485, 9232, Serial Communications) Local / Remote Status: Select LUC or rE. Factory default is rE.
- LUC** 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 CHEL LoRE error message will be displayed.
- Addr** (Option 9485, 9232, Serial Communications) Control Address: Set from 1 to 3FF. This number (hexadecimal, base 16) must match the address number used by the host computer. Factory default is 32.
- BRUD** (Option 9485, 9232, 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 9485, 9232, Serial Communications) No Activity Timer: Set from 0FF or 1 to 99 minutes. Factory default is 0FF.
- 1 - 99** Maximum time between host computer accesses. If timer counts to 0, CHEL LoRE will be displayed.
- 0FF** No Activity Timer function is disabled.

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.
<i>FAIL tEST</i>	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 alternate between FAIL tEST and one of the following messages: <i>FRtE dFLt</i> : Memory may be corrupted. Press the ENTER key and the DOWN ARROW key to start the factory default procedure. Recheck controller programming. <i>rEt FRtE</i> : Unrecoverable error, return to factory for service.
<i>CHtC LOrE</i>	This message appears if the Serial Communications has timed out.	Set point outputs active Alarms inactive	Restore the communications line and switch the <i>LOrE</i> to <i>L0C</i> .

DIAGNOSTIC ERROR MESSAGES

DISPLAY	MEANING	SP OUTPUTS	ACTION REQUIRED
<i>UFL</i> or <i>OFL</i>	Underflow or Overflow: 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.
<i>CHEC CAL</i>	Check calibration appears as an alternating message if the instrument calibration nears tolerance edges. Check calibration appears as a flashing message if the instrument calibration exceeds specification.	Set point outputs active Alarms active Set point outputs inactive Alarms active	Remove the instrument for service and / or recalibration. To reset use the NEXT/MENU & ENTER keys. Remove the instrument for service and / or recalibration. To reset use the NEXT/MENU & ENTER keys.
<i>RRER</i> (Alternates 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.
<i>RRER</i>	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.

Input Ranges Process Input Types

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

SPECIFICATIONS

Selectable Inputs: DC Voltage or DC Current selectable.

Input Impedance:

Current = 10 ohms.

Voltage = 5000 ohms.

Set Point Range: Selectable (See Input Ranges Page 23).

Display: Two 4 digit, 7 segment 0.56" high LEDs.

Alarm On - Off Differential: 1 count.

Accuracy: $\pm 0.25\%$ of span, ± 1 least significant digit.

Resolution: 1 count.

Line Voltage Stability: $\pm 0.05\%$ over the supply 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 all inputs and outputs.

Process Output: 500 VAC to all other inputs and outputs.

Supply Voltage: 100 to 240 VAC, nominal., +10 -15%, 50 to 400 Hz. single phase; 132 to 240 VDC, nominal., +10 -20%.

Power Consumption: 5VA maximum.

Operating Temperature: -10 to +55 °C (+14 to 131 °F).

Storage Temperature: -40 to +80 °C (-40 to 176 °F).

Humidity Conditions: 0 to 90% up to 40 °C non-condensing 10 to 50% at 55 °C non-condensing.

Memory Backup: Nonvolatile memory. No batteries required.

Control Output Ratings:

Relay: SPDT, 10 A @ 240 VAC resistive; 1/4 hp @ 120 VAC, 1/3 hp @ 240 VAC.

Alarm Relay: SPST, 3 A @ 240 VAC resistive; 1.5 A @ 240 VAC inductive; Pilot Duty Rating: 240 VA, 2 A @ 120 VAC or 1 A @ 240 VAC.

Loop Power Supply (isolated): 24VDC @ 50mA, regulated.

Panel Cutout: 92 mm x 92 mm (3.625" x 3.625").

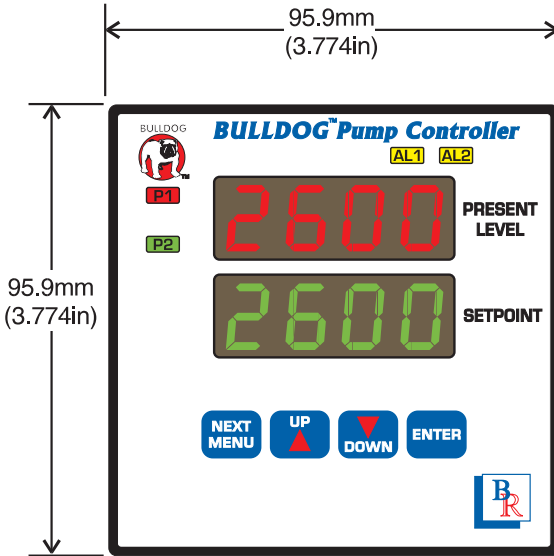
Depth Behind Mounting Surface: 103 mm (4.0 in).

Weight: 454 g (16 oz).

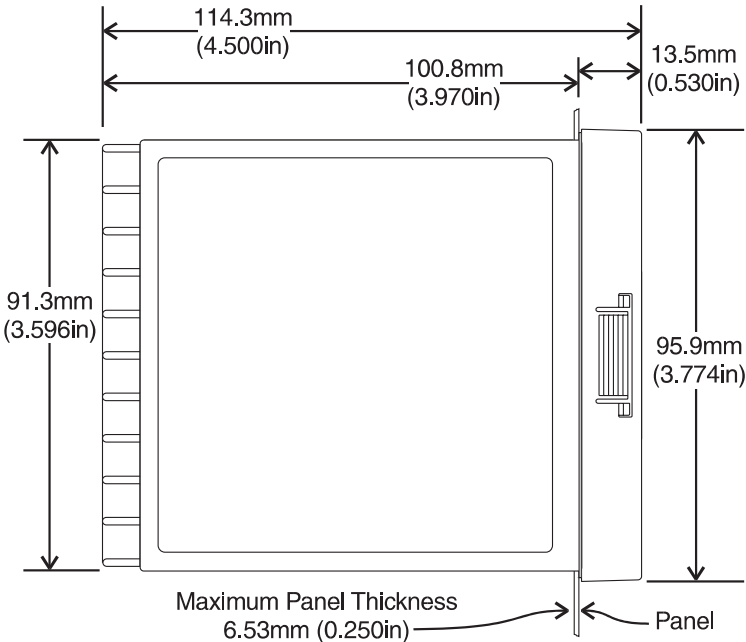
Agency Approvals: UL, C-UL E175611; CE.

Front Panel Rating: IP66, (UL Type 4X).

DIMENSIONS



Meets IP66 (UL Type 4X)



All dimensions are in millimeters with inches in parenthesis.

Panel cutout for all models is 92mm x 92mm (3.625in x 3.625in).

Allow for 13mm (0.5in) clearance at the rear of the instrument.

Programming Chart

Use the charts on this and the next page to record the values used in your application.

Home Menu

Menu Item	Format	Description	Factory Default	Current Setting
SP H	####	PUMP 1 ON SET Pt (FEET)	23.1	
SP L	####	PUMP 1 OFF SET Pt (FEET)	-5.7	
SP2H	####	PUMP 2 ON SET Pt (FEET)	23.1	
SP2L	####	PUMP 2 OFF SET Pt (FEET)	-5.7	
R H	####	Alarm 1 high	23.1	
R2Lo	####	Alarm 2 low	2.0	

Notes

Secure Menu

Menu Item	Format	Description	Factory Default	Current Setting
SECr	####	Security code 2,3,&4	4	
inP	Volts/Curr	0 to 10 Volt, 0 to 20 mA	Curr	
inPC	-500 to 500	Input Correction	0.0	
LdLg	On /OFF	Lead/La On/Off	On	
OSUP	On / OFF	Zero Suppression Start	OFF	
dPt	0, 0.0, 0.00, 0.000, 0.0000	Decimal Point	0.0	
PER	####	Peak PV, ENTER to reset to present PV		
VAL	####	Valley PV, ENTER to reset to present PV		
SCAL	####	Scale low	-5.7	
SCRH	####	Scale hi h	23.1	
SPL	####	Set Pt. low limit	-5.7	
SPH	####	Set Pt. hi h limit	23.1	
S1St	POut / P in	Pump OUT/IN (DIR/REV)	POut	
S1LP	0 on/OFF	Lamp on contact closed	0 on	
S2St	POut / P in	Pump OUT/IN (DIR/REV)	POut	
S2LP	0 on/OFF	Lamp on contact closed	0 on	
AL1	OFF, Lo, Hi, HiLo	Alarm Type	Hi	
AL1E	Rb5/dE	Absolute or Deviation to SP1	Rb5	
AL1rE	OnOFF/HoLd	Alarm On/Off or Hold	OnOFF	
AL1P	On /OFF	Power interrupt	OFF	
AL1h	On /OFF	Power inhibit	OFF	
AL1St	CLOS /OPEn	Contact Closed or Open @ Alarm	CLOS	
AL1LP	0 on/OFF	Lamp On or Off contact closed	0 on	
AL2	OFF, Lo, Hi, HiLo	Alarm Type	Lo	
AL2E	Rb5/dE	Absolute or Deviation to SP1	Rb5	
AL2rE	OnOFF/HoLd	Alarm On/Off or Hold	OnOFF	
AL2P	On /OFF	Power interrupt	OFF	
AL2h	On /OFF	Power inhibit	OFF	
AL2St	CLOS /OPEn	Contact Closed or Open @ Alarm	CLOS	
AL2LP	0 on/OFF	Lamp On or Off contact closed	0 on	
FLt	OFF, 1 to 99	Filter value 0=off	3	
POL	####	Process Output Low	-5.7	
POH	####	Process Output Hi h	23.1	
LOCrE	LOC/rE	Comm. Commands Local/Remote	rE	
Addr	0 to 3FF	Comm. Address	3E	
BAUD	####	Baud Rate Select	9600	
nAt	OFF, 1 to 99	No Activity Timer	OFF	



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