microFlex

Blowdown Controller
for Boilers

Measures Conductivity, Temperature,
Make-up Water Meter and Interlock

Controls the Blowdown Valve
and the Inhibitor Pump

Part No. BB-IN

CONTENTS

Safety

Electrical Shock Hazard

Opening the enclosure door with the controller plugged in, exposes the user to AC line voltages.

Unplug the controller before opening the enclosure door.

USER WARNING : CAUTION

This Boiler Blowdown Controller operates a 120VAC blowdown valve or steam rated solenoid & chemical feed pump and may pump hazardous, corrosive and toxic chemicals.

Opening the controller enclosure exposes user to the risk of electrical shock at power line voltages.

Understand fully the implications of the control setpoints, feed limit and alarms that you select. Harm to personnel and damage to equipment may result from mis-application.

Unplug or turn OFF the AC power to the controller if you have any concerns regarding safety or incorrect controller operation and notify supervisory staff.

YOUR CONTROLLER

Controllers are supplied with default blowdown valve and inhibitor feed setpoints that will not be applicable to your boiler.

Select control modes, adjust setpoints and set pump timing for your site and its water treatment program.

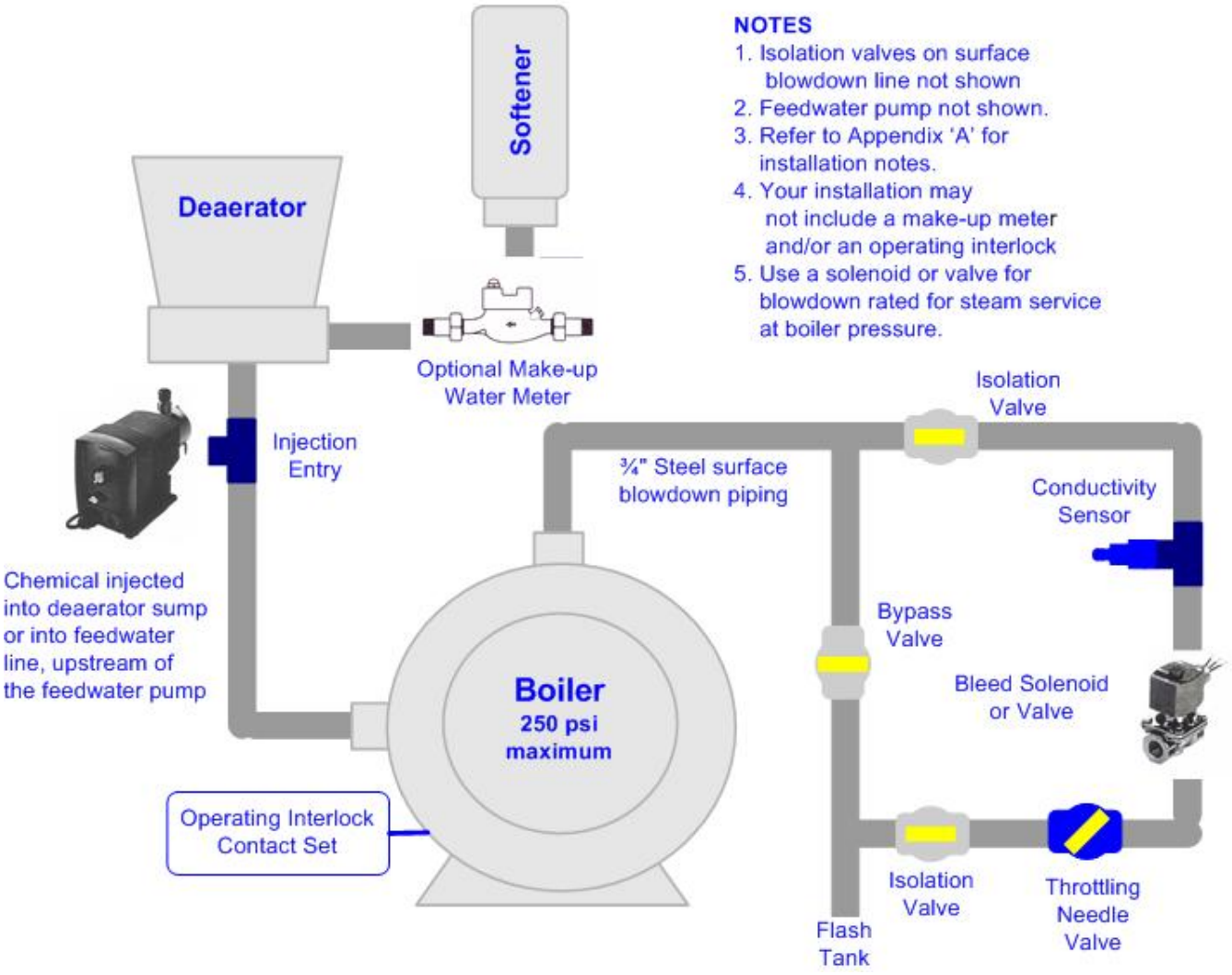
1. INSTALLATION

1.1 Sample Piping

The Controller includes a 250psi steam rated conductivity sensor and ¾" sensor entry 'T' and can be operated in either Sampling or Continuous Blowdown mode.

Sample piping is plumbed in ¾" schedule 80 black iron or steel.
If you have not previously installed this type controller, read **Appendix A: INSTALL** for plumbing and wiring guidelines.

Sampling Blowdown Control

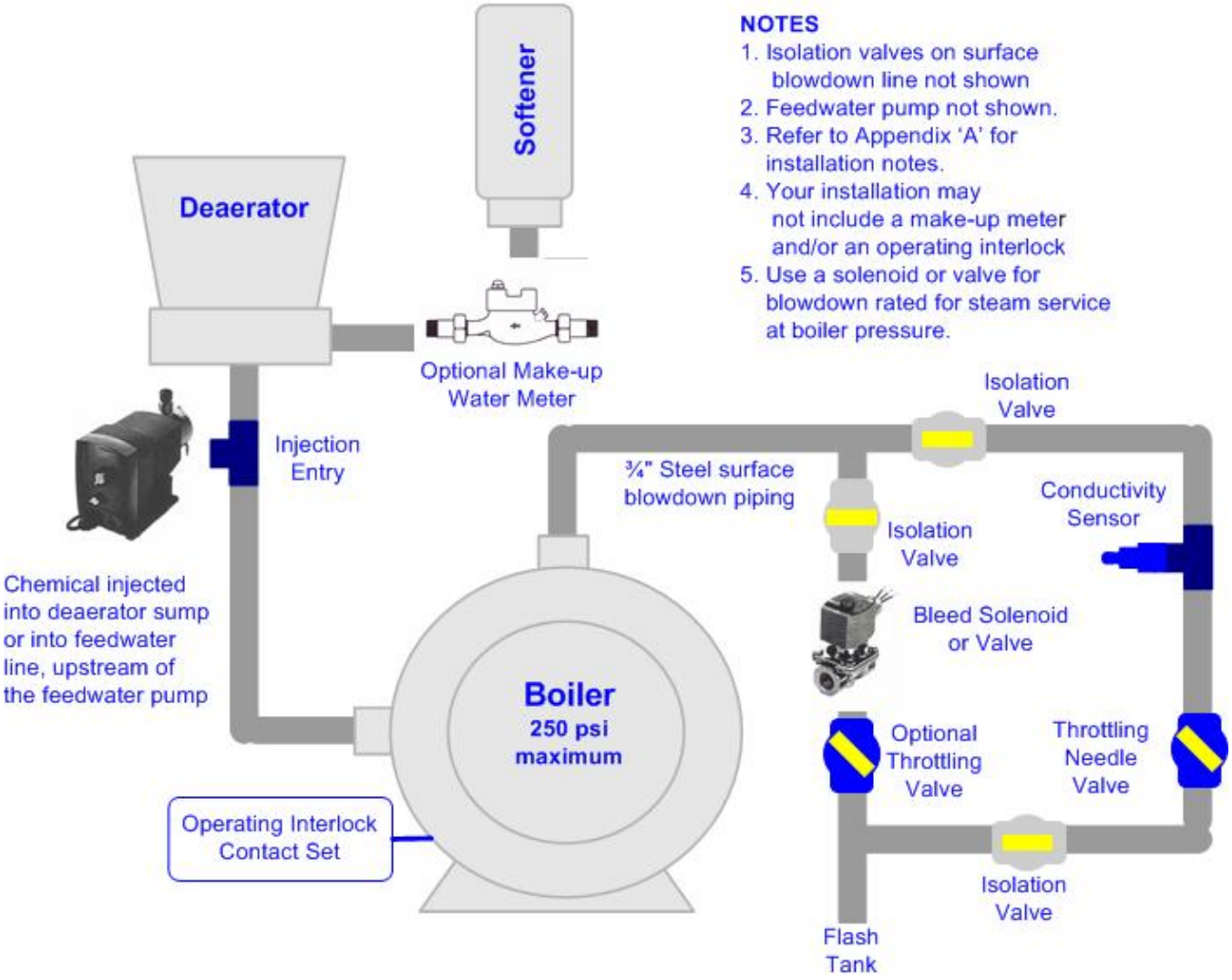


Sampling Blowdown Control is the most commonly used blowdown method. It provides the most accurate control at the lowest energy and chemical cost for most boilers and it's relatively insensitive to the setting of the throttling needle valve.

Continuous blowdown control is an older method requiring a continuous sample steam past the conductivity sensor.
It lacks the accuracy of **Sampling** blowdown control and is more difficult to set-up.

Percentage Time blowdown control mode uses the same piping configuration as **Continuous Blowdown Control**

Continuous Blowdown Control

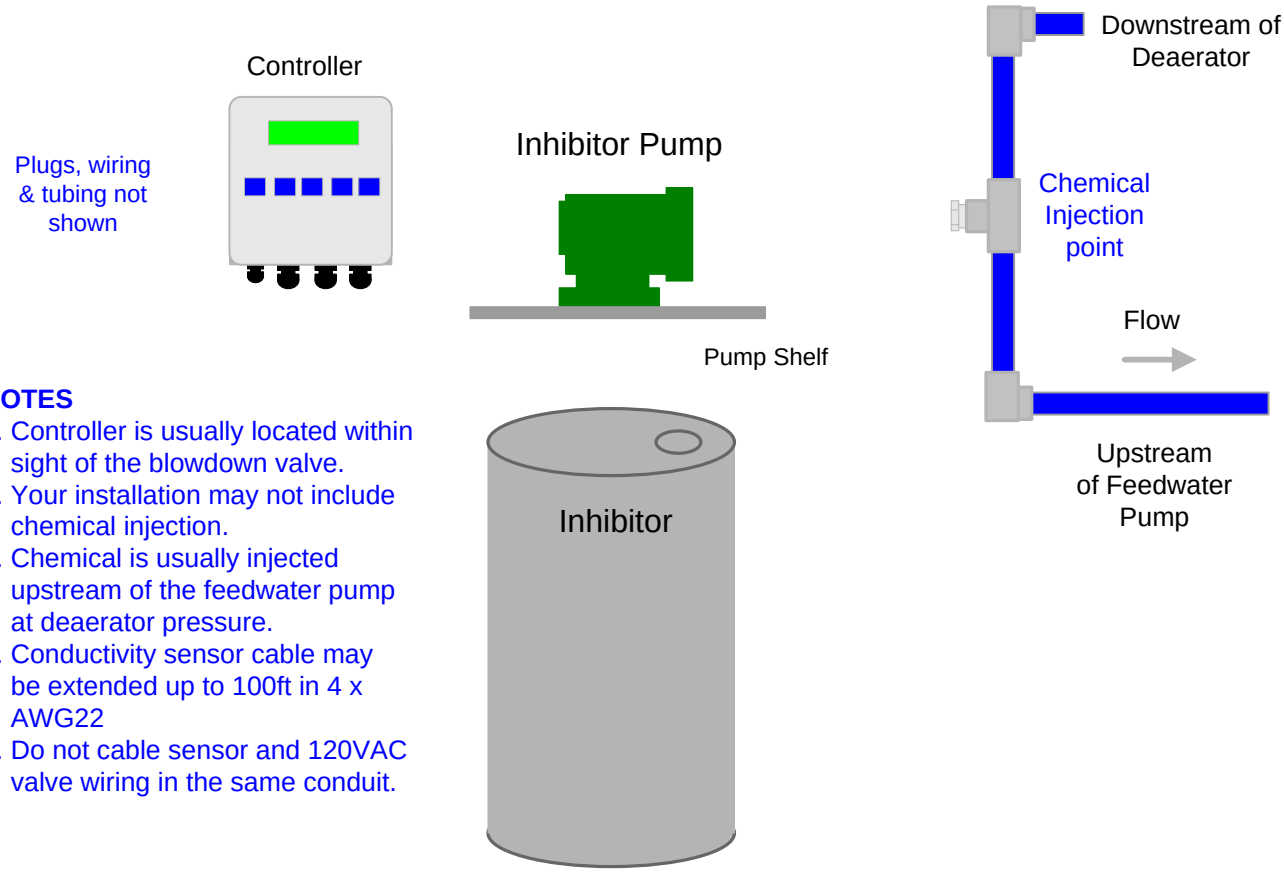


1.2 Controller Enclosure

Install the controller enclosure corner mounting hardware, available in the parts bag stapled to the controller manual.

Locate the controller at eye level, 60”/150cm. above the floor

Typical Equipment Layout



NOTES

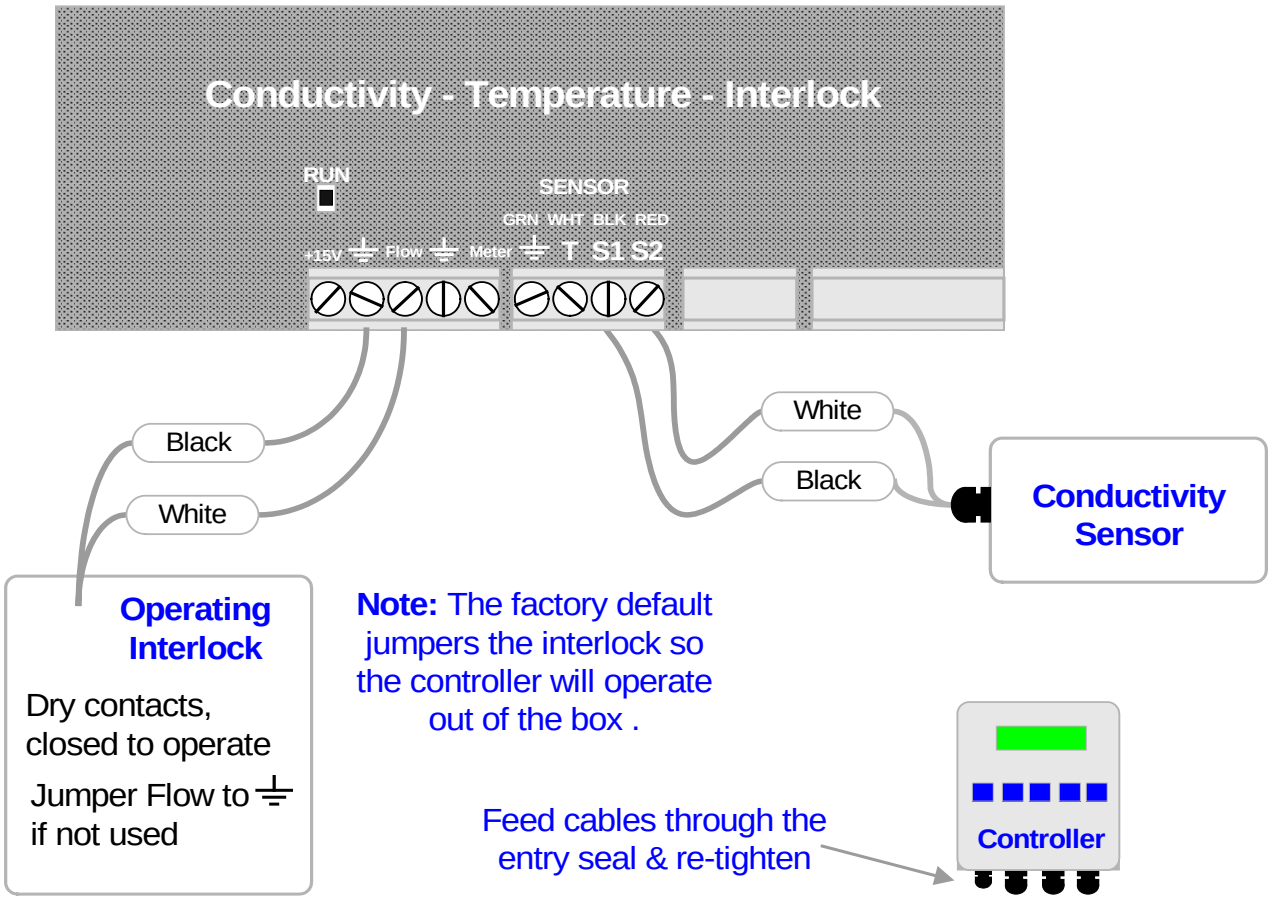
1. Controller is usually located within sight of the blowdown valve.
2. Your installation may not include chemical injection.
3. Chemical is usually injected upstream of the feedwater pump at deaerator pressure.
4. Conductivity sensor cable may be extended up to 100ft in 4 x AWG22
5. Do not cable sensor and 120VAC valve wiring in the same conduit.

Although sensor cables and pump tubing may be extended, ease of servicing occurs when water treatment components are located in the same area.

Ensure that the controller enclosure door is closed & latched when not terminating sensor and water meter wiring.

1.3 Sensors – Conductivity & Interlock

After isolating the surface blowdown line and installing the conductivity sensor, open the sample piping downstream valve, then the upstream valve. Verify that the sensor entry seals, leak and drip free



Thermally Compensated Conductivity Sensors

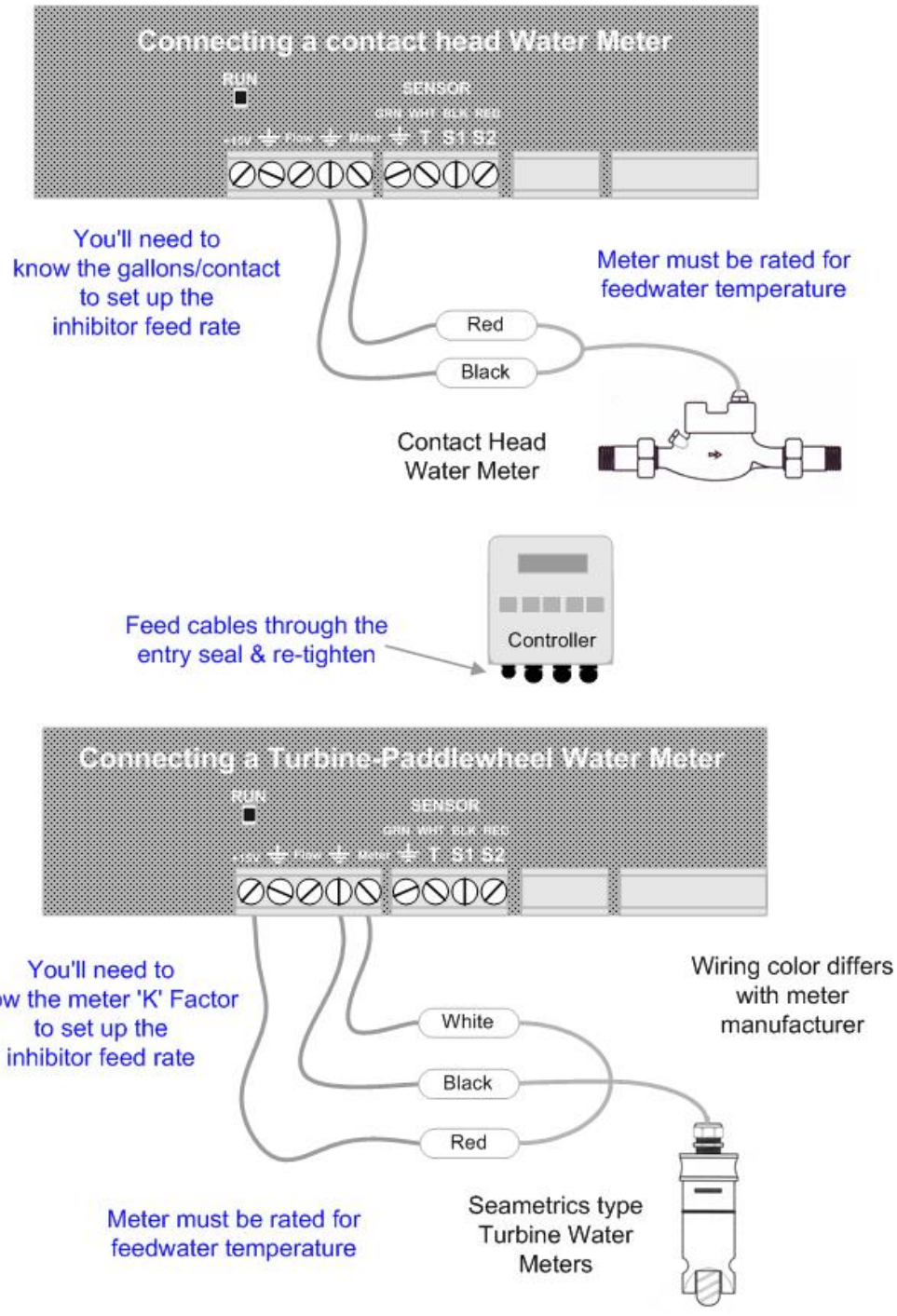
Compensated sensors are used for condensate monitoring – bypass controls and for continuous blowdown controls with the compensated sensor located downstream of a sample cooler.

Thermally compensated sensors are identified by a four wire sensor cable. Connect the GREEN, WHITE, BLACK, RED cable to the **SENSOR** GRN, WHT, BLK & RED terminals. The controller will automatically measure the temperature and thermally correct the measured conductivity.

1.4 Sensors – Water Meter

OPTIONAL SENSOR: Refer to manufacturer's recommendations on meter orientation and upstream and downstream piping. Extend meter cables with AWG22, 2 or 3 conductor.

WARNING: Do not install water meters downstream of the feedwater pump.
Ensure that the temperature rating of the meter exceeds the feedwater temperature

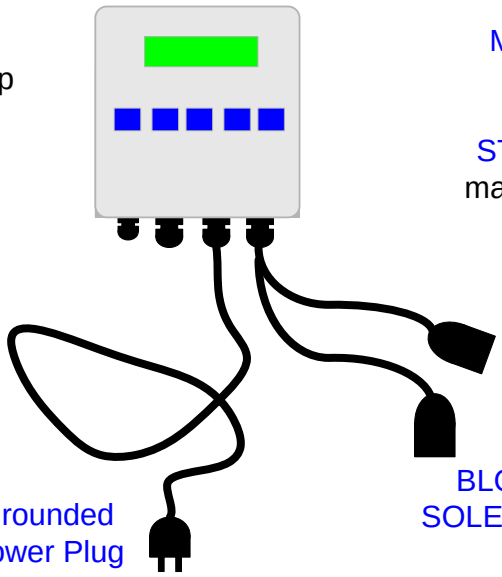


Do not install meter cabling in the same conduit as AC power wiring.

1.5 Inhibitor Pump & Blowdown Valve

The controller supplies the AC power for the pump and blowdown valve or solenoid. Controller relays switch power to the pump and blowdown solenoid, fused at a maximum of 5 Amps.

WARNING:
Do not plug-in controller, pump or blowdown valve until you are ready to setup & operate



START-UP

BEFORE you plug-in the controller, set the throttling valve to 20% open, open the surface blowdown line and sensor piping isolation valves.

WARNING: Plugging in the controller may immediately turn ON the blowdown valve.
Plug-in the controller.

Set control modes and setpoints.
Set the feed limit on the **Inhibitor Pump**.

Verify that the sensors are reading correctly and set the alarms.

If you are using a water meter, verify that meter is measuring the expected volume.

Verify that the operating **Interlock** is working.

An overview of system operation is available in the **Yearly** section of 4.1 Maintenance.

2. START-UP
2.1 Power-up Display & Keypad

UP & **DOWN** to view options or to EDIT numbers

Move **RIGHT** to select next field when EDITing

ENTER to select an option & to execute EDITing

EXIT to escape option, info display or EDITing

Enclosure keypad Response

UP or DOWN to the display you wish to view or EDIT & press ENTER

Unique Controller Serial Number

Press ENTER for Controller Diagnostic, And US-Metric select

```
Boiler Blowdown↵
S/N: D206NT248
```

Press ENTER to clear Alarms

```
Alarms          ↵
none
```

Current Conductivity sensor value

Press ENTER for Conductivity Calibrate & Alarms

```
Conductivity    ↵
    1425 uS
```

Valve ON or OFF and ON time this blowdown cycle

Press ENTER for Blowdown Setpoints, Mode, Test and Current State

```
Blowdown Valve  ↵
ON      125.6min
```

Water meter measured volume in most recent 0-24 hours.

Press ENTER to Install, Select type, View on-line total & days on-line

```
16.4hr Make-up  ↵
    8050  G
```

Inhibitor Pump ON or OFF and ON time this feed cycle

Press ENTER for Inhibitor Setpoints, Feed Mode, Limit Timer, Prime Pump and Current State

```
Inhibitor Pump  ↵
ON      96.4min
```

2.1 Power-up Display & Keypad
continued

Interlock ON or OFF and ON time in most recent 24 hours
Reset to zero on POWER OFF/ON

```
Interlock
ON     780.6min
```

Diagnostics since power ON
Reset to zero on POWER OFF/ON
Last blowdown, average blowdown, max-min temperature….

```
Diagnostics on
last  18.6hrs
```

If there is no option card installed
you'll view the serial number power-up display

```
Boiler Blowdown↵
S/N: D041B0248
```

LAN –Browser, 'LB' Option
Displays current IP – see Appendix F, 'LAN' for User Manual

```
LAN IP          ↵
010.010.006.101
```

OR

4-20mA Output, 'CL' Option
Displays loop current – see Appendix D, '4-20mA OUTPUT' for User Manual

```
4-20mA Output   ↵
15.4mA
```

OR

Alarm Relay, 'AR' Option
Displays relay state – see Appendix E, 'ALARM RELAY' for User Manual

```
Alarm Relay     ↵
Closed
```

2.2 Blowdown Mode: Conductivity Setpoints

The factory default Blowdown Mode is 'Sampling Control'
Refer to *3.2 Blowdown Controls*
to select one of three Blowdown Modes

Press UP or DOWN until you see **Blowdown Valve** & press ENTER

```
Blowdown Valve ↵
ON   2.7 hrs/day
```

Press ENTER to view or adjust **Setpoints**

```
Setpoints      ↵
Blowdown Mode  ↓
```

Displays current blowdown setpoints,
Display varies with **Blowdown Mode**

```
Turn ON   3000 ↵
TurnOFF   2990 ↓
```

Press ENTER adjust **Turn ON**,
or DOWN & ENTER for **TurnOFF**

```
Edit & Enter
Turn ON   3025 →↕
```

Press UP-DOWN to adjust and RIGHT to move the cursor.
Press EXIT to leave the **Setpoints** unchanged

then

Press ENTER, displays current **Setpoints**.

If you make **Turn ON** less than **TurnOFF**,
the setpoints will be switched.

```
Turn ON   3025 ↵
TurnOFF   2990 ↓
```

Setpoints for 'Sampling' & 'Continuous' **Blowdown Mode**

```
Turn ON   3000 ↵
TurnOFF   2990 ↓
```

Continuous Control

Setpoints for 'Percentage Time' **Blowdown Mode**

```
Percentage Time
 15% each 5min ↵
```

% Time Control

Sidebar: The difference between Turn ON & TurnOFF, the 'deadband', is usually set to 10uS. For 'Sampling' blowdown mode and 50uS for 'Continuous' blowdown mode.
Conductivity should decrease as Blowdown Valve ON time increases.

2.3 Inhibitor Feed Mode: Setpoints, Feed Limit

The factory default **Feed Mode** is 'Percentage Time'
Refer to *3.6 Inhibitor Controls*
to select one of three Feed Modes

Press UP or DOWN until you see
Inhibitor Pump & press ENTER

Press ENTER to view or adjust **Setpoints**

Displays current feed setpoints,
Inhibitor will be ON for 10% of the time that the Interlock is ON; 30 seconds in every 5 minutes

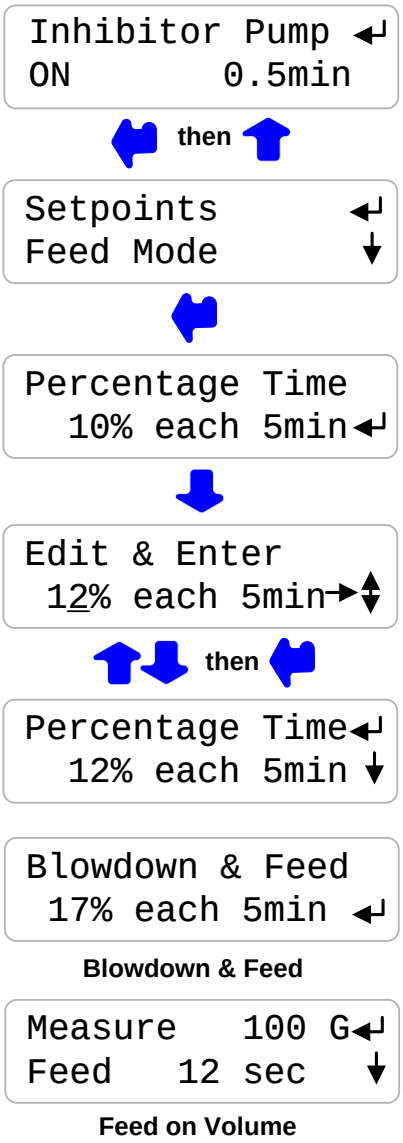
Press ENTER adjust % of ON time.

Press UP-DOWN to adjust and RIGHT to move the cursor.
Press EXIT to leave the **Setpoint** unchanged

Press ENTER, displays current setpoint,
36 seconds in every 5 minutes

If **Feed Mode** is set to **'Blowdown & Feed'**
Inhibitor Pump is ON for user set % of each blowdown.

If **Feed Mode** is set to **'Feed on Volume'**
Inhibitor Pump is ON for user set seconds for each user set make-up volume.



Sidebar: 'Percentage Time', base feeding is the most common way to feed inhibitor into small boilers which usually do not have a softened make-up or feedwater meter.
If you are using the Operating **Interlock**, chemical feed stops when the boiler is off line.

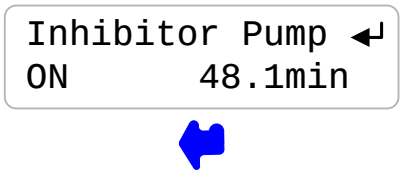
If your % condensate return is fixed and the blowdown control is reliable, consider using **'Blowdown & Feed'**.
If you have a water meter on the softened make-up use 'Feed on Volume'

Operating **Interlock** is a set of dry contacts which open when the boiler is off line.
When the **Interlock** contact set opens, blowdown and chemical feed stop.
The **Interlock** contact set may be supplied by the building automation system or the boiler burner control.

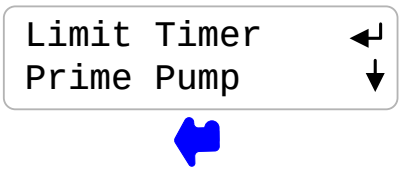
2.3 Inhibitor Feed Mode: Setpoints, Feed Limit
continued

The Inhibitor feed limit timer turns OFF the inhibitor pump to prevent overfeeding.
The factory default feed limit 20 Minutes per feed cycle.

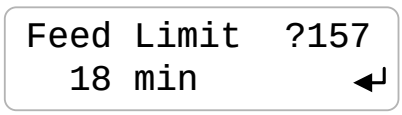
Press UP or DOWN until you see **Inhibitor Pump** & press ENTER.



Press DOWN until **Limit Timer**.
Press ENTER to view or adjust **Limit Timer**.



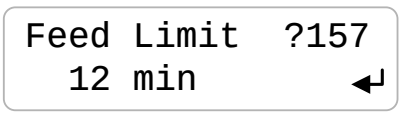
Displays feed limit in minutes,
?157 indexes more explanation @ www.prominentcontroller.com



Press ENTER adjust **Feed Limit**,

Press UP-DOWN to adjust and RIGHT to move the cursor.
Press EXIT to leave the **Feed Limit** unchanged

Press ENTER, displays current limit,
12 minutes per feed cycle



HELP: ?157 and other help numbers display wherever more explanation is available at www.prominentcontroller.com. If you are using water treatment controls for the first time, the language and application of some of the controller options and settings requires more detail than a 2 line display can deliver.

2.4 Verify Temperature

OPTION: The default sampling blowdown controller does not require or include temperature measurement.

Ensure that the conductivity sensor is immersed at operating temperature.

Press UP or DOWN until you see Serial Number. Press ENTER.

Press ENTER & then press ENTER to view temperature at the conductivity sensor.

A sampling blowdown controller will display '-' With sensor type **NT**, **N**o **T**emperature

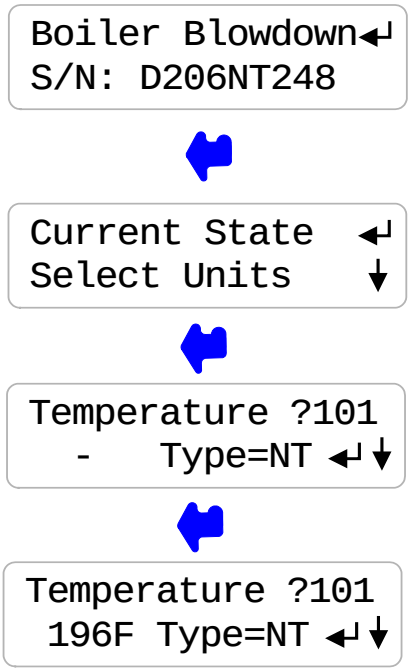
Display on Thermally Compensated Sensor Connected
If the GREEN & WHITE wires are connected to the controller terminals, you'll view the current temperature.

A low temperature may indicate a closed valve, upstream or downstream of the sensor

'Fault' automatically removes conductivity temperature compensation – see **Sidebar**.
Key EXIT twice to return to Serial Number

?101 indexes more explanation @ www.prominentcontroller.com

Verify Temperature



Sidebar: Continuous Blowdown Control
Temperature is used to compensate the measured conductivity. The temperature value does not have to be accurate to correctly compensate but it does have to change as the boiler water temperature at the sensor changes.

If you select Continuous blowdown control without a thermally compensated sensor, the controller will display a Temperature alarm.

Sidebar: Sampling Blowdown Control
The temperature is not used to compensate the measured conductivity since the MEASURE interval provides a fixed & repeatable temperature at the conductivity sensor.

2.5 Calibrate Conductivity Sensor

Open the downstream, then the upstream sample line isolation valves, immersing the conductivity sensor.

Select **Alarms** then **Clear Alarms** to force a **Sample** & **Measure** sequence. Calibrate after a **Sample-Measure** sequence has updated **Conductivity**.

Press DOWN until you see **Conductivity**. Sample the boiler water & verify that the displayed conductivity matches the measured conductivity. See **Sidebar**

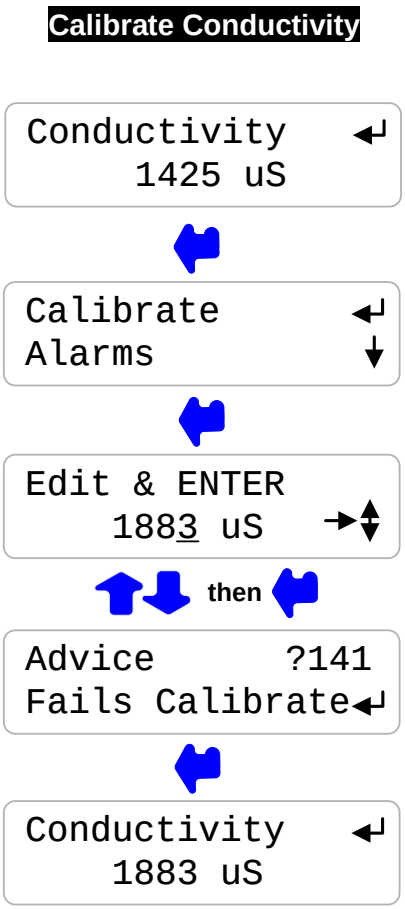
Adjust the displayed conductivity by pressing ENTER twice.

Press UP-DOWN to adjust and RIGHT to move the cursor. Press EXIT to leave **Conductivity** unchanged.

You'll see this screen if the sensor is fouled, miswired, not immersed or you keyed incorrectly.

NOTE: Press ENTER to ignore OR EXIT to return to Factory Default.

?141 indexes more explanation @ www.prominentcontroller.com
Displays the current, calibrated conductivity.



Sidebar:
Measuring boiler water conductivity requires a sample cooler to obtain a non-flashed sample. Flashed samples of boiler water do not represent the boiler water conductivity.

A low temperature at the conductivity sensor indicates that the sensor is not measuring a hot sample of boiler water. Do not calibrate a cold sensor.

Check the isolation valves upstream and downstream of the sensor, ensure the blowdown valve is opening & closing and verify that the throttling valve is not blocked.

2.6 Check Interlock & Install Water Meter

Press UP - DOWN until you see **Interlock**. Displays ON or OFF and the total minutes ON in the last 24 hours.

NOTE: An OFF, open **Interlock** contact set stops the inhibitor pump and the blowdown valve. The **Interlock** can be bypassed by jumpering the **Flow** terminal to ⏚, **Ground**.

Controllers are shipped with the Interlock jumpered.

Interlock

```
Interlock
ON      780.6min
```

OPTIONAL: The factory default water meter is a 100 Gallons/contact contact head meter

Press UP - DOWN until you see **0-24hr Make-up**. Displays make-up volume during the last 24 hours.

Make-up volume resets every 24 hours and every power OFF/ON to 0.0 hours

Press ENTER twice to view or change meter type.

Key ENTER to view or change the gallons/contact. Metric users will view volumes in 'L'iters & L/Contact

Press UP-DOWN to adjust and RIGHT to move the cursor. Press EXIT to leave Gallons/contact unchanged.

ENTER or EXIT displays the current meter type.

Contact Head Watermeter

```
24hr Make-up   ↵
    10450  G
```

↓

```
Meter Type     ↵
Year-to-Date   ↓
```

↓

```
Contact Head   ↵
Paddlewheel    ↓
```

↓

```
 G/Contact
  100          ↵
```

↓

```
Edit & ENTER
  25           →↕
```

↑ ↓ then ↓

```
Contact Head   ↵
Paddlewheel    ↓
```

Sidebar: 2 wire meters are usually Contact Head
3 wire meters are typically Turbine or Paddlewheel water meters.
Softened make-up water meters are lower cost ambient temperature rated meters.
Feedwater meters are usually high temperature paddlewheel type.

2.6 Check Interlock & Install Water Meter
continued

OPTIONAL: Turbine-Paddlewheel type water meters provide pulses per Gallon or Liter.
The number of Pulses/Unit Volume is the 'K' factor.

Turbine –Paddlewheel Watermeter

Press UP - DOWN until you see **0-24hr Make-up**.
Displays make-up volume during the last 24 hours.

```
6.4hr Make-up  ↵
   31450  G
```

Fewer hours are displayed if the controller has not been ON for 24 hours

Press ENTER twice to view or change meter type.

```
Meter Type     ↵
Year-to-Date   ↓
```

Key DOWN to select **Paddlewheel** type meter

```
Paddlewheel    ↵
Contact Head   ↓
```

Key ENTER to view or change the pulses per Gallon.
Metric users view pulses per Liter.

```
'K'Factor
   100.0       ↵
```

Press UP-DOWN to adjust and **'K' Factor** unchanged.

```
Edit & ENTER
   104.5       →↕
```

then

ENTER or EXIT displays the current meter type.

```
Paddlewheel    ↵
Contact Head   ↓
```

Sidebar: A typical operating boiler will require softened make-up.
If a make-up meter exists, take the time to verify that the meter displays an increasing volume as the boiler operates.

An accurate and working make-up or feedwater meter is required to meter inhibitor feed using **'Feed on Volume'** mode.

Dry contact closures from the boiler feedwater pump are frequently used to control chemical feed. Whenever the pump turns ON, the controller measures a user set volume of make-up.

WARNING: Verify paddlewheel meters immediately and disconnect if not verified.
Mis-wired paddlewheel meters will fail the meter Hall Effect sensor.

2.7 Plug-in Pump and Blowdown Solenoid

Sections 2.1 to 2.6 adjust setpoints and verify sensors. We're now ready for the blowdown solenoid and the inhibitor pump, verifying each one as it's plugged in. (Blowdown motorized ball valves are hardwired)

Blowdown Valve

Plug the blowdown solenoid into the top, right plug. Press UP or DOWN to view **Blowdown Valve**.

```
Blowdown Valve ↵
ON      12.4min
```

OR

If ON, verify that the green **Bleed** light on the inside of the enclosure is ON.

Verify that the blowdown valve is open and that boiler water is going to the flash tank. See **Sidebar**.

```
Blowdown Valve ↵
OFF    126.8min
```

then

If OFF, press ENTER & DOWN to Test Valve. Press ENTER and the Blowdown & **Bleed** light will turn ON for 5 minutes

```
Test Valve      ↵
Current State   ↓
```

Inhibitor Pump

Plug the inhibitor pump into the bottom, right plug. Press UP or DOWN to view **Inhibitor Pump**.

```
Inhibitor Pump ↵
OFF
```

If ON, verify that the green **Inhibit** light on the inside of the enclosure is ON.

then

Verify that the pump is stroking, primed and feeding inhibitor.

```
Prime Pump      ↵
Current State   ↓
```

If OFF, press ENTER & DOWN to Prime Pump.

Press ENTER and the Inhibitor Pump & **Inhibit** light will turn ON for 5 minutes

```
Inhibitor Pump ↵
ON      0.2min
```

Sidebar: The Blowdown Valve and Pump will not turn ON unless the Interlock is ON. The internal **Bleed** & **Inhibit** lights will not turn ON unless the Flowswitch is ON.

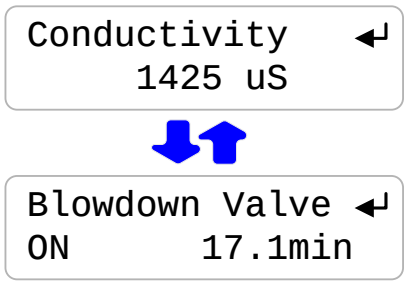
An IR, non-contact temperature meter is the easiest way to verify that valves are open and that there is a high temperature path past the sensor to the flash tank.

2.8 Check Controls

Verify that the controls work in the way that you expect for this site.

Conductivity & Blowdown

Watch the **Conductivity** increase as the boiler operates. Sampling controls update the Conductivity at the end of every **Measure** period.



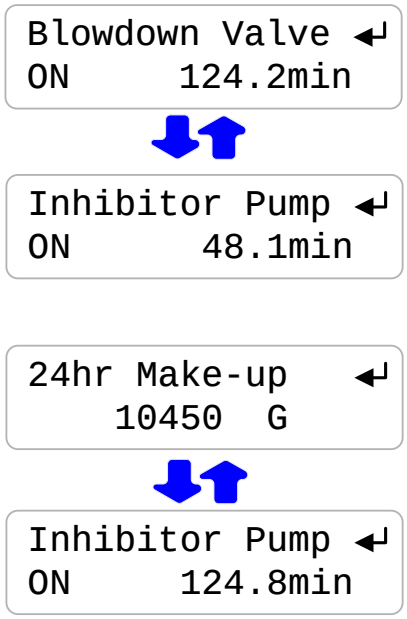
The **Blowdown Valve** will turn ON during **Sampling** and as the conductivity exceeds the Turn ON setpoint.

Sampling Controls will cycle between the **Blowdown** and **Measure** states. Refer to Section 3.2 for details.

Water Meter or Bleed & Inhibitor Pump

If the Inhibitor feed mode is set to **Percentage Time** and the % of each 5 minutes is set to less than 100% the **Inhibitor Pump** will turn ON & OFF while **Interlock** is ON.

If the Inhibitor feed mode is set to **Blowdown & Feed,** the **Inhibitor Pump** will turn ON as soon as the Bleed turns ON. The pump will turn ON & OFF to meet the % setpoint in each blowdown period.



If the inhibitor pump is set to **Feed on Volume** , the inhibitor pump will turn ON after measuring Make-up.

.

Sidebar: The Blowdown Valve and Pump will not turn ON unless the Interlock is ON.

The Inhibitor Pump turns OFF if the Feed Limit is exceeded.
Increase the Limit Timer to allow the pump to turn ON.
Feed limited inhibitor pumps reset every 24 hours of controller run time or on power OFF/ON.

3. OPERATION
3.1 Conductivity Sensor

Sensor calibration is detailed in Section *2.5*

Press UP - DOWN until you see **Conductivity**.

Press ENTER & then DOWN to **Alarms**.

Press ENTER to view current alarms or adjust

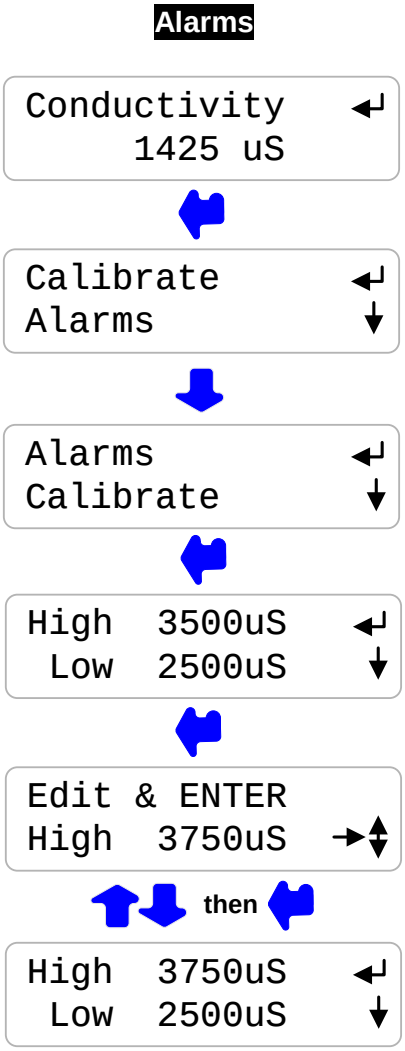
Press ENTER to adjust the **High** Alarm
or DOWN & ENTER to adjust the **Low** Alarm

Press UP-DOWN to adjust and RIGHT to move the cursor.
Press EXIT to leave Alarm unchanged.

ENTER updates the alarms & displays the current **High** & **Low** Alarms.

Conductivity Alarms display on the '**Alarms**' display and resets automatically.

'Clear Alarms' does not reset a conductivity alarm above the **High** or less than the **Low** Alarm level.



Sidebar: Conductivity alarms may occur when the boiler is offline and the sensor is cold.

The alarm clears automatically when the sensor measures a hot boiler water sample and the measured conductivity in between the High & Low alarm levels.

If **Blowdown Mode** is set to **Sampling**, the **Conductivity** display updates at the end of each **Measure** period.

Sensor Watch shows the conductivity continuously, revealing problems with valves & flashing.

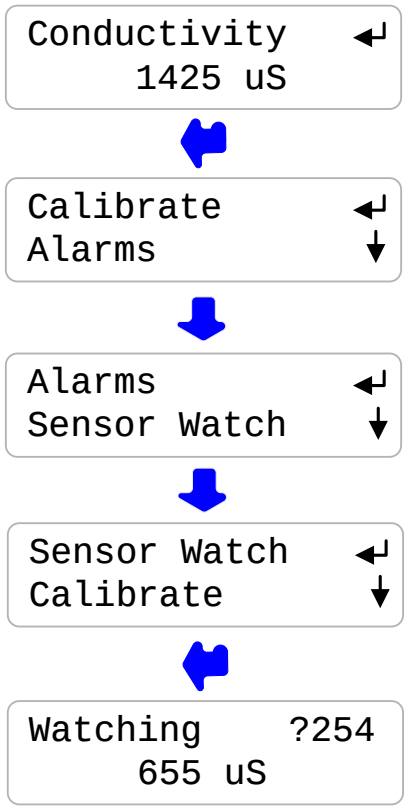
Press UP - DOWN until you see **Conductivity**.

Press ENTER & then DOWN to **Sensor Watch**. (This option only displays when **Blowdown Mode** = **Sampling**)

Press ENTER to view current sensor conductivity.

Press Exit to end watching

Sensor Watch



Sidebar: Sensor Watch

Sampling or **Blowdown:** The valve opens and Conductivity increases as the sensor heats up. If the conductivity doesn't change, the valve didn't open or an upstream or downstream isolation or throttling valve is closed. Correct this fault!
If the conductivity is unstable, showing values less than 200uS, it's likely, that flashing is occurring, indicating a partially closed valve or orifice union upstream of the sensor. Correct this fault!

Measure: The valve closes. Sensor Watch displays a stable value, falling as the sensor cools.

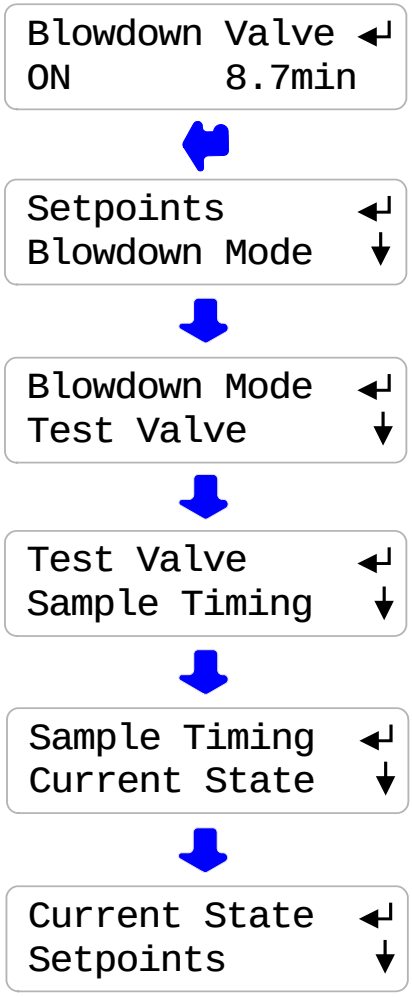
If the Sensor Watch displays a low value and the boiler has cycled up to operating, conductivity, the sensor may be partially immersed, measuring a mix of vapor and water. Correct this fault!

If Sensor Watch displays a value which does not fall or a value which moves up and down, the blowdown valve may not have closed or may have closed but not sealed (more common with blowdown solenoids). Correct this fault!

3.2 Blowdown Control

For conductivity control setpoints Section *2.2 Blowdown Mode: Conductivity Setpoints*

Blowdown Menu



Press UP - DOWN until you see **Blowdown Valve**. Displays ON or OFF and ON time in the current 24 hour period.

Press ENTER to view or adjust **Setpoints**. Setpoints vary with selected **Blowdown Mode**.

Press ENTER view current mode or to select from **Sampling**, **Continuous** or **Percentage Time**.

Press ENTER @ **Test Valve** to turn ON **Blowdown Valve.** See **Sidebar**. **Alarms-Clear Alarms** ends the test.

Sample Timing is only displayed if **Blowdown Mode** = **Sampling**
Press ENTER to view or adjust **Sampling** timing.

Press ENTER @ **Current State** to view control status. Display varies with **Blowdown Mode**

Sidebar: Test Blowdown will not turn ON the **Blowdown Valve** unless the **Interlock** is ON.

Warning: Changing **Blowdown Mode** may require plumbing changes.
See manual Section 1.1 for piping configuration is each mode.

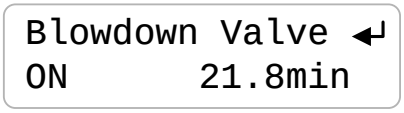
Test Valve starts a **Sample** period if **Blowdown Mode** = **Sampling**.
Alarms – Clear Alarms, also starts a new **Sample** period if **Blowdown Mode** = **Sampling**.

Test Valve turns ON the **Blowdown Valve** for 5 minutes, 300 seconds,
if **Blowdown Mode** = **Continuous** or **Percentage Time**

3.2 Blowdown Controls
Continued

Blowdown Valve Modes

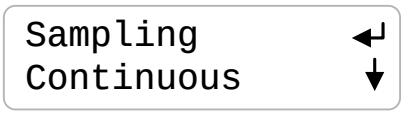
Press ENTER then DOWN @ **Blowdown Valve**



then

Press ENTER @ **Blowdown Mode** to view current mode and to select a new mode

Most boilers operate with **Sampling** blowdown control. The Blowdown Valve opens to **Sample** the conductivity.



If above the **TurnON** setpoint, **Blowdown-Measure** periods occur until below the TurnOFF setpoint.
If below the **TurnON** setpoint, waits **ReSample** time until next **Sample**.

Continuous control turns ON the **Blowdown Valve** above the **TurnON** setpoint and OFF below the **TurnOFF** setpoint.

Percentage Time turns ON the **Blowdown Valve** for a user set % of 5 minutes if **Interlock** is ON.

then

NOTE: If you change the **Blowdown Mode**, press UP to Setpoints & ENTER to adjust for the new **Blowdown Mode**.
Warning: See **Sidebar**

Sidebar:
Warning: Changing **Blowdown Mode** may require plumbing changes
See manual Section 1.1 for piping configuration is each mode.

Sampling control requires the blowdown valve downstream on the conductivity sensor.

Continuous and **Percentage Time** modes require the Blowdown Valve parallel to the sensor piping so the sensor can continuously read the boiler water conductivity.

3.2 Bleed Controls
Continued

Current State of the Blowdown Valve Control

Press ENTER then UP @ **Blowdown Valve**

```
Blowdown Valve ↵
ON      21.3min
```

then

Press ENTER @ **Current State**

```
Current State  ↵
Setpoints
```

Displays **Sampling** OR **Measure** OR **B'down** OR **Waiting**
Counts down time in the current state.
Key ENTER to end the state and go to next state

```
ON,Sampling ?250
 11 sec. Stop= ↵
```

Sampling Control

If **ON**, displays **TurnOFF** setpoint,2990
& current conductivity,3042.

If **OFF**, displays **TurnON** setpoint,3000
& current conductivity,2993

```
Off@ 2990   ?121
ON  3042uS
```

Continuous Control

If **ON**, displays Owes 41 sec ?123
& **ON ENTER=Stop**
If **OFF**, displays seconds to turn **ON**,

```
On in 221sec?123
OFF
```

% Time Control

HELP:
?250,122 & **?123** and other help numbers display wherever more explanation is available at www.prominentcontroller.com.

Stop= ↵ ends the current **Sampling** control period and starts the next period.
If you **Stop** the **Measure** period you will measure a high conductivity.
If you **Stop** the **Sample** period you may not measure a fresh, representative sample of boiler water

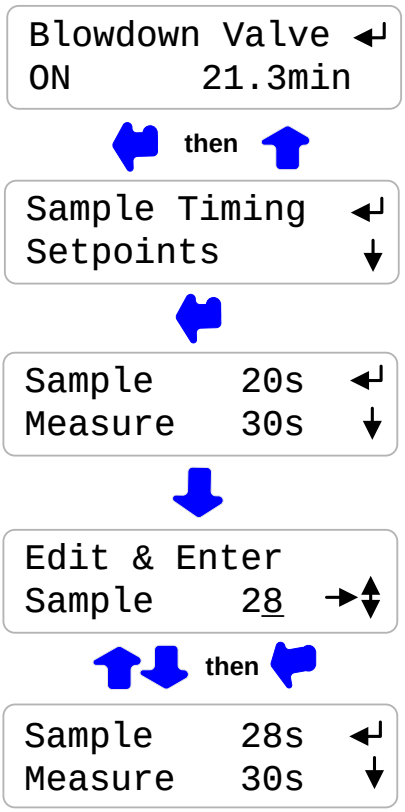
The **Blowdown Valve** is **ON**, open during the **Sample** & **B'down** periods and **OFF**, closed during the **Measure** and **Waiting** periods.

ON ENTER=Stop ends Percentage Time blowdown control mode ON period.

3.2 Bleed Controls
Continued

Sampling Control Mode Timing

Press ENTER then UP @ **Blowdown Valve**



Press ENTER @ **Sample Timing** to view or adjust timing.
This option only displays if **Blowdown Mode** = **Sampling**.

Key DOWN to view current **Sample**, **Measure**, **Blow'dwn** & **ReSample** times.
Key ENTER to adjust.

Key UP & DOWN to adjust.
EXIT ends with changing the time.

ENTER ends adjust and executes the new timing.
In this example we've increased the **Sample** time from 20 seconds to 28 seconds.

Sample: May be set a short as 5 seconds if the sensor is located at the boiler or as long as 60 seconds for a sensor 100 feet from a boiler. It's the time required to fill the piping between boiler & sensor and reflects both the length of pipe and the setting of the throttling valve.

Measure: Usually never less than 30 seconds. May be as long as 120 seconds. Allows a stable sample with a fixed and repeatable amount of cooling.

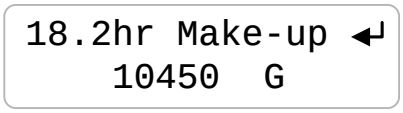
Blow'dwn: Never less than Sample time seconds & typically no more than 5 times **Sample** time. The conductivity is checked every Blow'dwn time & Blow'dwn continues if conductivity above TurnOFF setpoint. Long **Blow'dwn** times may overblow the boiler.

ReSample, Waiting: As short as 15 minutes for heavily loaded boilers that increase conductivity rapidly. Typically 30 minutes to 4 hours. May be as long as 12 hours for stand by boilers. **ReSample** is the time between conductivity checks when the conductivity is less than **TurnOFF** setpoint.

3.3 Make-up Meter

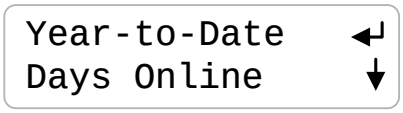
OPTIONAL: Meter type selection & installation detailed in Section *2.5 Check Interlock & Install Water Meter*

Press UP - DOWN until you see '**0-24 hr Make-up'** & press ENTER .

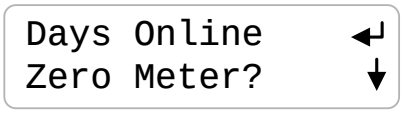


Press ENTER to view current type or to select **Contact Head** or **Paddlewheel** water meter.

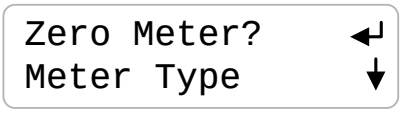
Key DOWN & ENTER for volume during the most recent 365 days. Resets to zero every 365 days.



Key DOWN & ENTER for the number of 24 hour periods of ON time in the current year

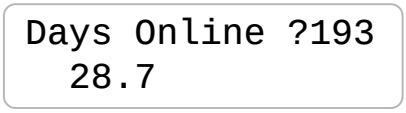


Key ENTER to reset **Year-to-date**, **Days OnLine** and **24 hr Make-up** to zero.
Warning: Cannot Undo



Year-to-Date logged every 60 minutes power ON. Displays in 'L'iters if metric selected.

Days water meter ON in current year. Resets to zero every 365 days.



Press EXIT to return to previous display

Sidebar: Year-to-date divided by Days OnLine is average usage in any 24 hour period.

HELP: ?192 & **?193** and other help numbers display wherever more explanation is available at www.prominentcontroller.com.

3.4 Inhibitor Controls

For inhibitor control setpoints & feed limit, refer to Section *2.3 Inhibitor Feed Mode: Setpoints, Feed Limits*

Inhibitor Pump Menu

Press UP - DOWN until you see **Inhibitor Pump**. Displays ON with time on in the current 24 hour period.

```
Inhibitor Pump ↵
ON       3.1min
```

Press ENTER to view or adjust **Setpoints**. Setpoints vary with selected **Feed Mode**.

```
Setpoints      ↵
Feed Mode      ↓
```

Press ENTER view current mode or to select from **Blowdown & Feed**, **Feed on Volume**, **Percentage Time**.

```
Feed Mode      ↵
Limit Timer    ↓
```

Press ENTER to set maximum Inhibitor Pump ON time in minutes in any 24 hours

```
Limit Timer    ↵
Prime Pump     ↓
```

Press ENTER @ Prime Pump to turn ON Inhibitor Pump for 5 minutes. **Alarms-Clear Alarms** ends Priming.

```
Prime Pump     ↵
Current State  ↓
```

Press ENTER @ **Current State** to view control status. Display varies with **Feed Mode**

```
Current State  ↵
Setpoints      ↓
```

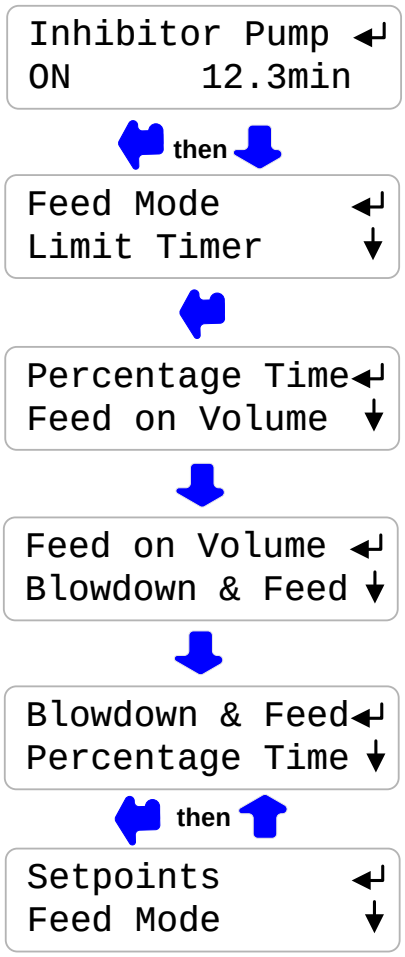
Sidebar: Prime Pump will not turn ON the pump unless **Interlock** is ON.

Inhibitor pumps with **Feed Mode** set to **Blowdown & Feed** will not feed unless the **Blowdown Valve** is ON.

3.4 Inhibitor Controls
Continued

Inhibitor Pump Feed Modes

Press ENTER then DOWN @ **Inhibitor Pump**



Press ENTER & DOWN @ **Feed Mode** to view current mode and to select a new mode

Percentage Time turns ON the **Inhibitor Pump** for a user set % of 5 minutes if **Interlock** is ON.

Feed on Volume measures a user set volume on the Make-up water meter then turns ON the pump for a user set time.
For example:
Measure 100 Gallons of make-up & feed for 8 seconds.

Inhibitor Pump turns ON when the **Blowdown Valve** is ON. Pump switches ON & OFF during bleed at user set % of 5 minutes

NOTE: If you change the **Feed Mode**, press UP to **Setpoints** & ENTER to adjust for the new **Feed Mode**.

Sidebar:
Percentage Time is used to base feed & is the most commonly used chemical feed method for smaller boilers.

Feed on Volume is an accurate & reliable way to feed chemical for boilers which have a softened make-up meter or a dry contact closure from the feedwater pump.

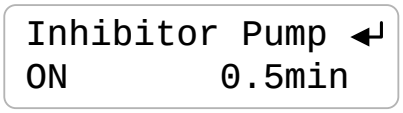
Blowdown & Feed requires reliable blowdown control and conductivity tracking.
The setpoint % time is based on either the sum of **Sample** + **Measure** time or **Blowdown** + **Measure** time. The sum of periods is used since a boiler that is blowing down may require a number of **Blowdown-Measure** cycles to fall below the **TurnOFF** setpoint.

Chemical is lost any time the blowdown valve is open, so feed is based on both **Sample** and **Blowdown** periods.

3.4 Inhibitor Controls
Continued

Current State of the Inhibitor Pump Control

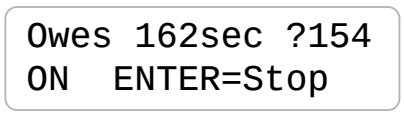
Press ENTER then UP @ **Inhibitor Pump**



then

Press ENTER @ **Current State**

If **Feed Mode** = **Blowdown & Feed**
If **Sampling** or **Blowing Down**, displays
Owes 162sec ?154
OR **On in 86sec ?150**
If **Blowdown Valve** OFF: displays **Blowdown Off ?150**

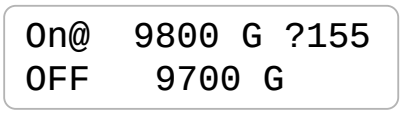


Blowdown & Feed

If **ON**, displays **Owes 41 sec ?156**
and **ENTER=Stop**
If **OFF**, displays seconds to turn ON,

Percentage Time

If **ON**, displays **Owes 38 sec ?154**
If **OFF**, displays turn-on volume, **9800**
& current volume **9700**



Feed on Volume

Sidebar:
Blowdown & Feed applies the user set %of Blowdown valve ON time to each 300 seconds of **Blowdown Valve** ON time.

ON ENTER=Stop ends the current feed cycle or %Time ON period.

HELP: ?150,?154,?155 & **?156** and other help numbers display wherever more explanation is available at www.prominentcontroller.com.

3.5 Diagnostics

Diagnostics displays operating information from the last power OFF/ON. Average Blowdown & Temperature MAX-MIN are reset on every power ON

The time that the Blowdown Valve is open depends on throttling valve %open, load and conductivity setpoints.

A loaded boiler will blowdown more frequently than a standby boiler. Boilers in commercial-institutional sites will blowdown frequently during business hours.

Increasing **Average Blowdown** time may indicate a change in make-up chemistry or a restricted bleed or a higher boiler load.

Pump ON time verifies setpoints and feed mode selection. For example: If you are feeding '**Blowdown & Feed'** at 25% of bleed time & the **Last Bdown ON** = **5** min then **Last Feed ON** = **75** sec.

If your **Inhibitor Pump** is controlled by the **Blowdown Valve**, you would see that the last **Feed Ended** when the **B'dwn Ended**.

If your **Inhibitor Pump** is controlled by the **Make-up**, you would see that the last **Feed Ended** when the **Last make-up**. occurred
If the **Last make-up** occurred several days ago, there's understandably a metering problem

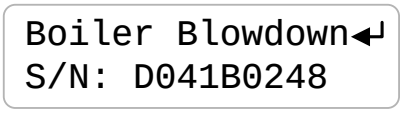
Requires optional thermal sensor:
Temperature max-min may reflect variation in sample cooler water temperature or condensate usage if used for condensate monitoring

The usefulness of **Diagnostic** information varies with each site's boiler, piping, water chemistry and treatment program.

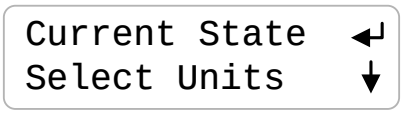
3.6 System- Alarms

System Menu Options

Press UP - DOWN until you see the Serial Number.
Press ENTER view System options.



Press ENTER to view **Current State**
Controller diagnostics



Press ENTER to view or change
US or Metric units.

Alarms

Press UP - DOWN until you see **Alarms**
The first alarm to trip will display or 'none' if no alarms

Press ENTER to **Clear Alarms**.
Clearing alarms sets pump & blowdown owed times to zero.

Sensor Alarms,' Out-of-Calibration' and System Alarms
auto-clear when the fault is corrected

Sidebar: If **Blowdown Mode** = **Sampling**

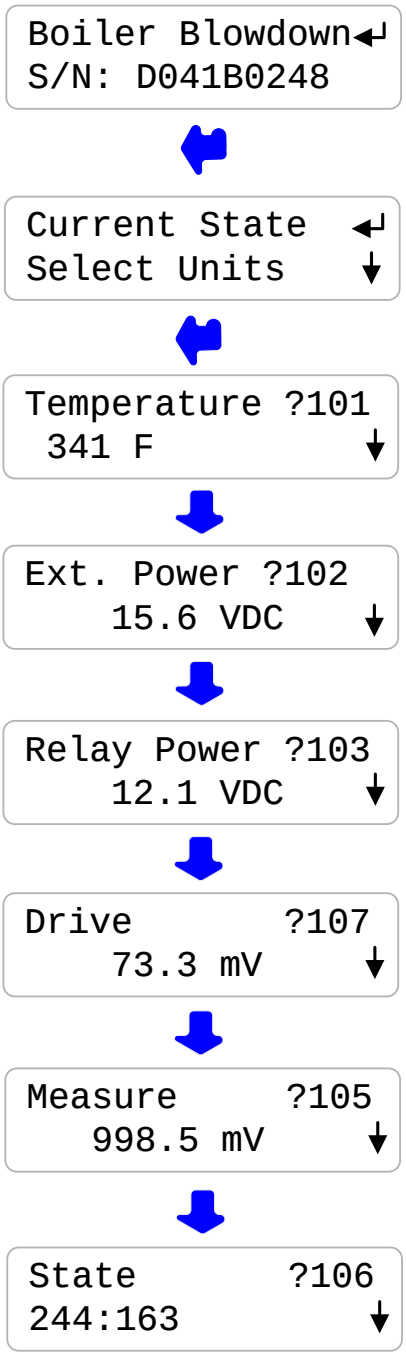
A. **Clear Alarms** starts a new **Sampling** period.

B. A **Fail-to-Sample** alarm indicates a low temperature at the sensor at the end of the **Measure** period. The **Blowdown Valve** has failed to operate, an isolation valve upstream or downstream of the sensor is closed, the throttling valve is closed or blocked…
Blowdown control will not work correctly until this fault is corrected**.**
Find & fix the cause, **Clear Alarms** to start a new **Sample** period

3.6 System- Alarms
continued

System : Current State

Press UP - DOWN until you see the Serial Number.
Press ENTER view System options.



Press ENTER to view **Current State**
Controller diagnostics

Temperature at the conductivity sensor.
Displays 'Fault' if not used to compensate conductivity,
Indicates wiring or sensor problem.

Power used for paddlewheel water meters
and to power 4-20mA current loops
Alarms on short circuits, recovers when wiring corrected.

Internal power used for blowdown valve and pump relays.
Always 11.8 to 12.2.
Alarms on fault.

Conductivity sensor drive, 72-76mV or 995 – 1010mV
as sensor drive auto-ranges.
Alarms and cannot measure conductivity if out of range.

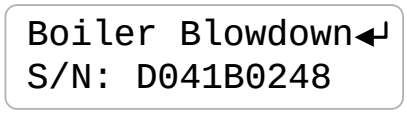
Internal diagnostics.
Checks that user setpoints being saved
& that the controller timing is operating,

Sidebar: System: Diagnostics verifies the controller operation & alerts you to wiring problems with conductivity temperature, paddlewheel water meters and controller powered 4-20mA current loops.

3.6 System- Alarms
continued

System : Select Units

Press UP - DOWN until you see the Serial Number.
Press ENTER & DOWN to **Select Units**



then

Press ENTER to view or adjust current **Select Units**.

Press EXIT to leave changed
or DOWN to change.

Key ENTER to:
Set to U.S. units, degrees Fahrenheit & Gallons
Or
Set to Metric, degrees Centigrade & Liters

Sidebar:
Select Units changes make-up meter units, total volume units and volume per contact units.

Temperature compensation of conductivity, switches automatically between Centigrade & Fahrenheit as does the System / Current State display of temperature.

3.7 Password

Password is turned OFF in new controllers

Press UP - DOWN until you see **Boiler Blowdown**.

Press ENTER & DOWN to select **Password ON**

If you press ENTER you'll be prompted for a password then next time you press ENTER.

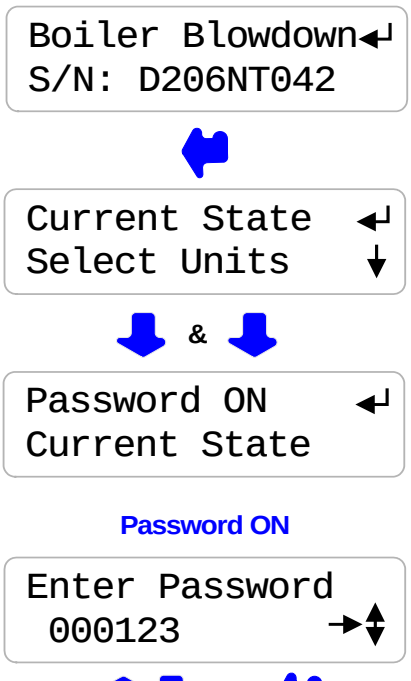
Press UP or DOWN to view the current state of the controller. Any ENTER key will prompt for the password, displaying the default password **123**.

Use the UP, DOWN & RIGHT keys to enter a password then key ENTER.

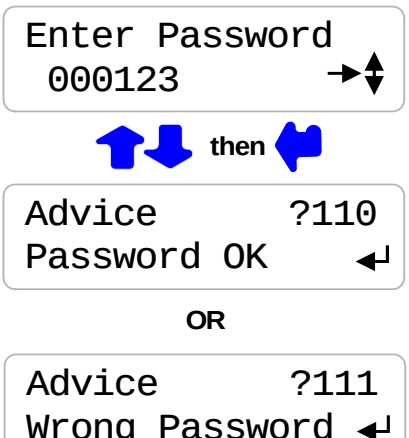
A correct password displays, **Password OK**. Press any key to start operating the controller.

Press ENTER to re-key an incorrect password

Turning ON Password



Password ON



OR

Sidebar: When you first select **Password ON**, the default password is **123**.

Whenever you **Enter Password** the controller displays the default password **123**.
If you have not changed the default password, press **ENTER** to log in.

3.7 Password
continued

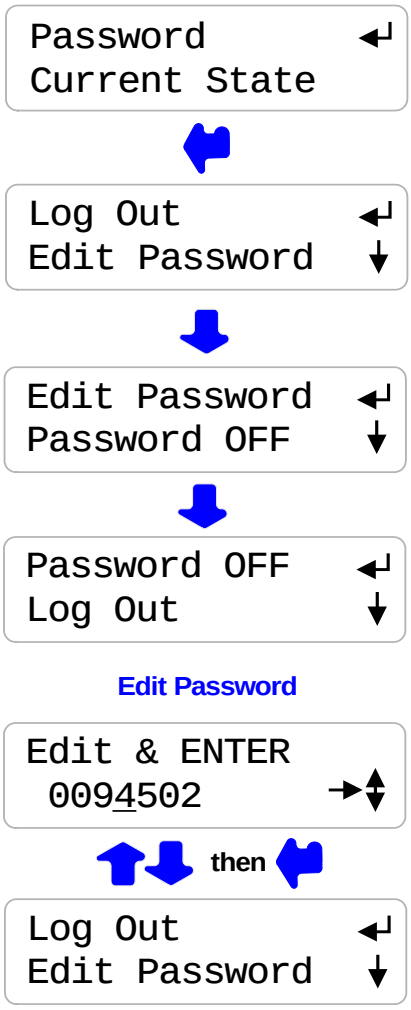
Press UP - DOWN until you see **Boiler Blowdown**.
Then press ENTER & UP to view **Password** tools.

Password tools are available when **Password** is **ON** and you are logged in. Press ENTER to view the tools:

Press ENTER to **Log Out**.
If you forget to **Log Out**, the controller logs you out 30 minutes after the last key press and on controller power OFF/ON.

Press DOWN & then ENTER to view & change the current password

Press DOWN to **Password OFF**.
Pressing ENTER turns OFF **Password**.



Edit Password

Press RIGHT & UP – DOWN to change the current password.

ENTER changes the password.
Press EXIT to leave the password unchanged

Sidebar: If your controller is password protected. Select **Edit Password** and change the password from the '**123**' factory default.

Passwords may be from 1 to 6 numbers. Leading zeros are ignored.

If you forget your password, you'll require the controller serial number to get a **Reset Password** from the controller manufacturer.
The controller password is '**123**' after you key in the **Reset Password**.

4. MAINTENANCE

4.1 Guidelines

Modify the maintenance guidelines to reflect both the site priorities and the site water treatment program.
Guidelines are for controller function only. Water treatment program maintenance requirements are provided by the site water treatment provider.

Frequency	Activity	Method
Daily	Check for Alarms.	Identify and correct the cause of alarms on sensors and inhibitor pump. Make-up water or Pump rate & stroke may have changed. The percentage of condensate return may have changed, extending inhibitor ON times, changing blowdown run times. Debris may have partially blocked the blowdown line throttling valve.
	Scan Sensors, Make-up Meter & Flowswitch	Sampling Blowdown: A low conductivity may indicate a failure to sample resulting in a cold sample at the sensor. The blowdown valve may not be operating or may be valved OFF, upstream or downstream of the valve. Continuous Blowdown: A high conductivity may indicate a blocked or failed blowdown valve. If there's a softened make-up meter, you'd expect daily volume to vary with load if the % condensate return doesn't vary. High make-up may indicate a low % condensate return or a faulted blowdown control. If the boiler is on line, verify that the **Interlock** shows ON. At the same boiler load and percentage condensate return, you would expect consistent and repeatable Blowdown Valve and Inhibitor pump ON times in every 24 hour period.

Frequency	Activity	Method
Weekly	Verify Conductivity	Sample the boiler water conductivity. Verify controller matches sample +/-50uS. Conductivity sensors should not drift or require cleaning. Scaling a conductivity sensor usually indicates flashing at the sensor due to a restriction upstream of the sensor. Sampling Blowdown Control: Temperature not used or measured during Sampling blowdown control.
	Check both current Temperature and Minimum-Maximum temperature	Continuous Blowdown Control: You would expect to see a relatively constant sensor temperature with only a small difference between Minimum & Maximum temperatures if the boiler operates continuously. You'd expect to see only a small change in sensor temperature when the blowdown valve opens
	Note Make-up Volume If make-up meter installed.	Weekly softened make-up water usage indicates both average boiler load and percentage condensate return. High water usage may result from a reduction in controller setpoints or faulted or failing softener.
	Verify Interlock	If you are using the Interlock, verify that Interlock shows OFF when the boiler is off line.
	System Check	Visually inspect sensor and sensor piping for leaking fittings. Inspect chemical injection tubing and entry for leaking.

Sidebar: Maintenance Guidelines for water treatment testing are set by the chemical treatment program vendor.

Frequency	Activity	Method
Yearly	Calibrate Conductivity Tester	Verify the boiler water conductivity tester annually with a calibration solution using a solution that's as close as possible to the controller conductivity setpoints. Replace outdated calibration solutions.
	Observe a Blowdown Control Cycle	Sampling Blowdown Control: How many Blowdown-Measure cycles does it take to lower the conductivity below the TurnOFF setpoint. If the conductivity is well below the TurnOFF setpoint, it's likely that the Blowdown time is set too long. If the conductivity increases markedly above the TurnON setpoint, consider opening the throttling valve to allow a higher blowdown rate. Check that the flash tank can handle higher blowdown volumes. Continuous Blowdown Control: Watch the conductivity as the blowdown valve turns ON. Does it fall immediately? You may not have enough throttling on the blowdown line. You'll see the blowdown valve rapidly opening & closing, shortening valve life. Does the conductivity take a long time to increase, even when the boiler is loaded. You may have to throttle the sensor flow to limit heat & chemical loss.
	Verify Water Meter	If a make-up water meter is installed, verify that the controller measures an increase in make-up volume when the boiler feedwater pump turns ON. If you are using the meter to control inhibitor feed, you'll be aware of the problem prior to an annual check. Chemical levels will be either higher or lower than target.

4.1 Spare Parts

4.1.1 Line Fuse

Protects	Rating / Type	Manufacturer – Vendor
Controller, Pump and Blowdown Valve	5 Amps @ 115VAC 5mm x 20mm, Fast Acting	Littlelfuse, Type 217, 250VAC Digikey Part# F953-ND www.digikey.com 1-800-344-4539

4.1.2 Controller Parts

Part#	Description
SFuse	120VAC Fuse Kit, 10 x 5A Controller Fuses,
A261000	Boiler Conductivity-Temperature sensor, ¾" NPT, maximum 250psi steam
BB-IN-NS	Spare Controller without sensors & entry fittings
R171230	Enclosure Power cable entry fitting, PG11
R717231	Enclosure Sensor cable entry fitting, PG9

On-Line Help

Browse to **www.prominentcontroller.com/help** with the 3 digit HELP#' from the controller LCD display.
LCD display HELP numbers are preceded by '?'

Users Manual

Download **AQB2_User** from www.prominentcontroller.com

Manual Version	Detail
03/06	BB-IN Production

Appendix A: INSTALL

A.1 PLUMBING

Safety: Follow the site's valve off and tag out procedures prior to making any plumbing changes to the surface blowdown line. Multiple boiler sites may require both more than one upstream and downstream isolation valve.

Ensure the isolation and needle valves are rated for steam service at a pressure exceeding the maximum expected steam pressure.
Plumb sensor piping in the same metallurgy and schedule as the surface blowdown line.

Warning: Throttling needle valves will block with flashed solids if not correctly installed. Follow the manufacturer's recommendation for upstream-downstream orientation.
Remove needle valves and orifice unions upstream of the conductivity sensor.

A.2 SENSORS

Conductivity sensors may be installed in a ¾" 'T' in any orientation.
Do not install sensors in 'T's larger than ¾". The required reducers may result in a non-immersed or intermittently immersed sensing surface.
Water meter and sensor wiring cannot be installed in the same conduit as 120VAC power, pump or blowdown valve wiring. Even a short section of shared conduit may cause operational problems.
Sensor wires may be extended up to 200 hundred feet using multiple pair AWG22 cable.
Always splice sensor wires in an electrical fitting to allow both inspection and sensor replacement.
Extend the conductivity sensor using the same colors as the sensor to avoid wiring errors at the controller terminals.
Contact head water meters and interlock contact sets are not polarized, simplifying cable extension.

CAUTION: Three wire turbine-paddlewheel meters are polarity sensitive and can be permanently damaged by miswiring. Wait until you are ready to start-up the controller before connecting this type of meter to the controller. Meter wiring errors are easily detected and corrected at start-up.

A.3 CHEMICAL FEED

Since the controller feeds a single chemical, it's likely to be fed into the feedwater line or directly into the dearator sump.
Inject water treatment chemical upstream of the boiler feedwater pump where pressure and temperature are limited to the deaerator sump levels.

The controller is not fused to power a fractional horsepower, piston drive chemical pump.
A motor start relay is required with the 120VAC coil powered by the controller.

A.4 BLOWDOWN VALVE & LOCATION

Steam rated solenoids are seldom used in boilers rated over 100psi steam. Steam rated solenoids are commonly used and reliable on low pressure boilers. Solenoids have the added advantage of being closed when solenoid power is OFF.

Motorized ball valves are typically the PowerON – PowerOFF type. AC power is required to both open and close the valve.
If the controller is powered OFF when the valve is open, the valve will stay open. Although this is seldom an operational problem, sites may elect to use a spring loaded return type ball valve which does not require power to close.

PowerON-PowerOFF motorized blowdown valves require 3 wires & ground, Power Open, Power Closed and Neutral.
Steam rated solenoids & Spring Return motorized valves require only 2 wires & ground, Power Open and Neutral.

The optimum blowdown location is after the surface blowdown safety isolation valves, typically in a vertical run, beside the boiler where the operation of the blowdown valve can be observed and the distance between sensor and boiler minimized.
Orient the valve so that the valve state is easily viewed. Typically, motorized valves have a shaft position indicator so it's easy to see the valve operate and if it's currently open or closed.

It's more difficult to see the state of a steam rated solenoid. A non-contact, IR temperature meter is a low cost, easy way to verify solenoid state by reading the temperature on either side of the solenoid.

A.5 MAKE-UP METER

Ensure that the meter is rated for the temperature. Meters installed in feedwater lines, upstream of the feedwater pump are typically stainless steel paddlewheel type.
Add meter isolation and/or bypass valves so the meter can be serviced.

Ensure that the meter manufacturer's recommendations for orientation and upstream and downstream piping are observed.
Horizontal installation may be limited for contact head meters, while straight upstream and downstream piping is required to prevent errors in turbine-paddlewheel meters.

Contact head meters have a Gallon/Contact or Liter/Contact rating. In some meters this value can be altered by moving magnets or gears. Typical meters are rated 10, 50 & 100 Gallons/contact.
Turbine-Paddlewheel meters have a 'K' Factor which is the number of pulses / Gallon or pulses/Liter. Some manufacturers have both nominal values listed by meter size and calibration values on the meter body.

Take the time to get the meter volume/contact or 'K' factor correct, since most meters are used to control inhibitor feed and inhibitor ppm errors result when meters are incorrectly configured.

A.6 CONTROLLER ENCLOSURE

The optimum location for blowdown valve, sensor and controller allows the keypad user to see the blowdown valve operate. Typically the chemical feed pump is more remote from the controller, at the deaerator.

Wall mount the controller enclosure at eye height for a 5’ to 5’6” person so that an operator does not have to reach over drums or pumps to use the controller key pad.

Do not punch conduit access holes in the top of the enclosure to avoid condensation damage to the controller electronics.

Plug the controller into an ‘Always ON’ utility outlet. Maximum controller current @ 120VAC is 5 Amps.

Appendix B: SPECIFICATIONS

Each controller includes an option card slot.
Auto re-configuration occurs on installation of one of LAN, 4-20mA Output OR Alarm Relay option card.

Analog – Digital I/O	Rating - Detail	Notes
Conductivity	1 Temperature Compensated conductivity sensor. Displays 1uS resolution. Rated 250psi steam maximum,	Autoranging from 100uS to 10000uS.
Water Meter Interlock	Interlock, Dry Contacts, 250mS response. Water Meter, 400 Hz max 0.5mA @ 5VDC measurement current	Contact head meter, software debounced. Turbine-Paddle wheel rating = Seametrics max pulse rate.
Relay Outputs	1 SPDT, Blowdown Solenoid or Motorized Valve 1 SPST, Inhibitor Pump	Relays rated 10A, 120VAC Controller fused @ 5 Amps
4-20 ma Output on conductivity (CL: optional card)	1, DC isolated, loop powered. Nominal 0.1% of span resolution. Auto polarity correction field wiring.	Alarm on open loop. Auto-configure on Driver installation and removal Software calibration of span & zero
Alarm Relay (AR: optional card)	Dry contact set. Rated 500mA @ 24VDC	Closed in the non-alarmed state. Contact set opens on alarm or loss of controller power.

Communications User Interface	Rating – Detail	Notes
Keypad - LCD	5 Key Tactile feedback: UP / DOWN / ENTER / EXIT / RIGHT 2 Line x 16 Character, Backlit	Scan rate 100mS nominal User adjustable LCD contrast
Browser (**LB**: optional card)	10BaseT Ethernet RJ45 Jack Full command & control via browser. XML real time controller data	User set fixed IP for non-LAN connected controllers. Fixed MAC

BB-IN: Boiler Blowdown Controller

Controls	Rating – Detail	Notes
Blowdown Valve	Controls: Sampling, Continuous and Percentage Time.	
Inhibitor Pump	Controls: Percentage Time, Blowdown & Feed, Feed on Volume. Feed cycle limit timer.	Blowdown & Feed : User sets % of Blowdown ON time used for Inhibitor feed.
Interlock	Blowdown Valve & Inhibitor Pump OFF when Interlock contact set opens.	Requires dry contact set from boiler controls or site DCS.

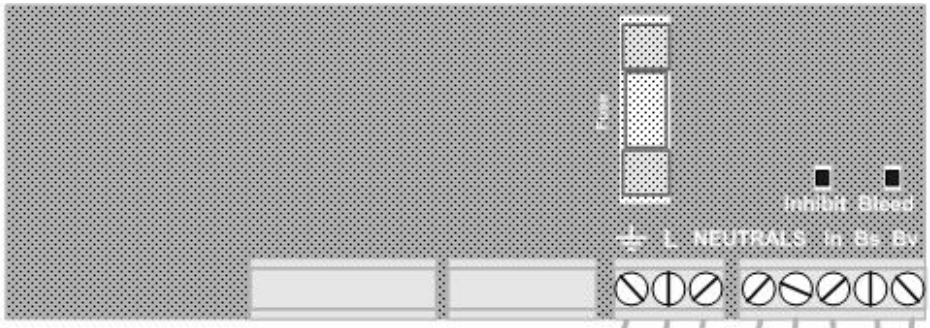
System	Rating - Detail	Notes
Controller Configuration	User settings and configuration written on silicon.	Makes current configuration factory default.

Electrical	Rating - Detail	Notes
AC Input	115 VAC, 50/60Hz,	
Fusing	5 Amps @ 115VAC	5x20mm, 120VAC fusing.
Surge-Spike Suppression	Bleed solenoid relay contacts snubbed 0.1uF, 150R Varistor on AC power input	Controller electronics transformer isolated from AC line
AC Terminals	AC Input & Output : maximum. Stranded AWG 14, 150mm^2	
Sensor, Digital Input Terminals	AWG 22, 0.25 – 0.50mm^2	
Paddlewheel Meter Power 4-20mA output loop power	14 – 20 VDC, unregulated Thermally fused @ 50mA	4-20mA output option can be powered by load or by controller

Mechanical	Rating	Notes
Enclosure	Non-metallic, NEMA4X, ”5.9W x ”5.9H x 3.5”D 150mmW x150mm H x 90mm D	Nominal dimensions, excluding entry fittings and flexible conduit. Enclosure door hinged left. Allow 8”, right for door opening Allow 18”, below for cable access.

Appendix C: HARDWIRING

Controllers are shipped with pre-wired AC power cord, Blowdown Solenoid & Inhibitor plugs. Remove the Blowdown Solenoid plug from terminals **White1** & **Bs-Black** to hardwire a motorized ball valve.



Ground
Line
Neutral
120VAC Service Power from a dedicated 15A GFI circuit breaker (AWG14 stranded)

Green
Black
White
White 1
White2

Bv = Red 1
Bs = Black 1
In = Black 2

Valve connections vary with manufacturer and valve type

Power Open Black 1
Power Closed Red 1
Neutral White 1
Ground Green 1

Motorized Valve

Ground
Green
Green 1
Green 2

Connect grounds in a common wire nut

OR

Power Open Black 1
Neutral White 1
Ground Green 1

Blowdown Solenoid or Spring Return Motorized Valve

Line Black 2
Neutral White 2
Ground Green 2

Inhibitor Pump

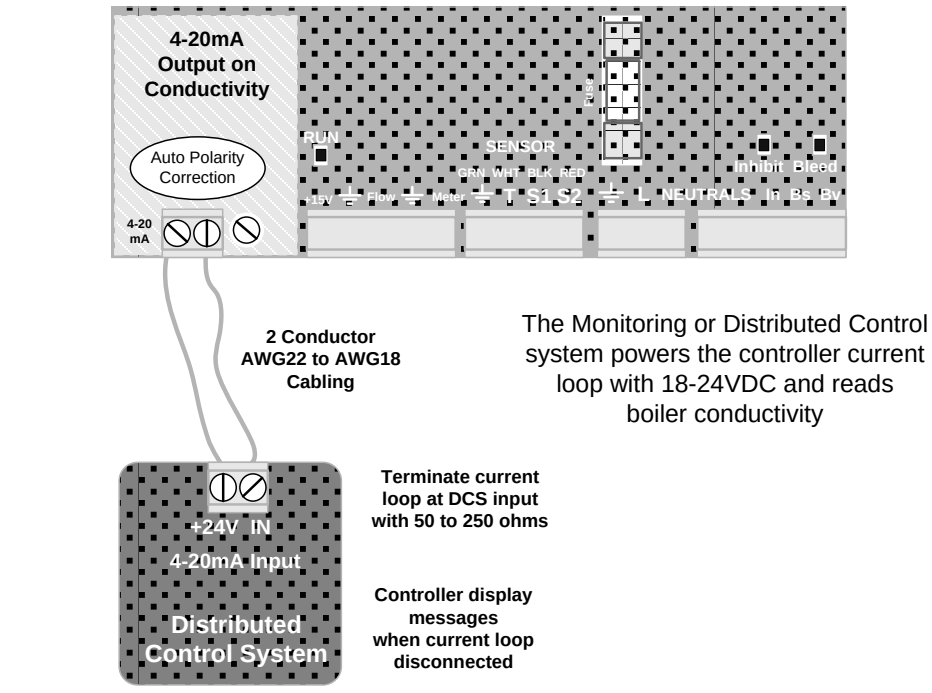
WARNING:
1. Use multiple strand, copper AC power wiring. Do not use solid conductors.
2. Pump and Solenoid Outputs are fused at 5 Amps total. AC wiring must be minimum AWG18, rated 300V
3. Do not exceed AWG14.

Appendix D: 4-20mA Output Option

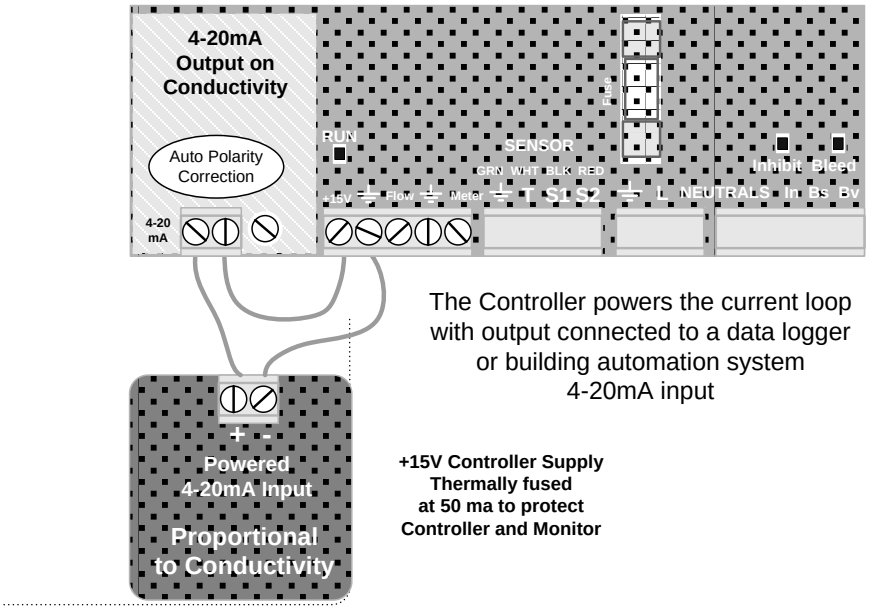
The optional 4-20mA output on conductivity is DC isolated from the controller & may be either powered by the load or by the controller DC supply. The 4-20mA output is auto-polarity correcting.

D1. WIRING

LOAD POWERED 4-20mA Output



CONTROLLER POWERED 4-20mA Output



Appendix D: 4-20mA Output Option
D.2 VIEW & ADJUST SPAN

The displayed value of the 4-20mAloop current depends on both the Boiler conductivity and the Span

```
4-20mA Output  ↵
15.4mA
```

OR

If the current loop output is disconnected you'll see this display in place of the mA level.

```
4-20mA Output  ↵
Disconnected!
```

Press ENTER @ Select Span to view or adjust the Span
Span sets the conductivity at 4mA & at 20mA

```
Select Span    ↵
Trim Zero      ↓
```

Press ENTER @ Trim Zero to calibrate the 4mA level

```
Trim Zero      ↵
Trim Span      ↓
```

Press ENTER @ Trim Span to calibrate the 20mA level

```
Trim Span      ↵
Select Span    ↓
```

View & Adjust Span

Press ENTER @ 4-20mA Output
& then DOWN to Select Span
Press ENTER.

```
Select Span    ↵
Trim Zero      ↓
```

Displays current Span.
Press ENTER to adjust 4mA level
or DOWN & ENTER to adjust 20mA level.

```
 4mA=   100uS  ↵
20mA=  5000uS  ↓
```

Press RIGHT to place the underline
under the digit you wish to adjust.
Press UP – DOWN to adjust.

```
Edit & ENTER
 4mA=  2500uS  →↕
```

then

ENTER updates the Span.
EXIT leaves Span unchanged

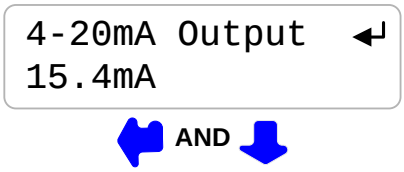
```
 4mA=  2500uS  ↵
20mA=  5000uS  ↓
```

Appendix D: 4-20mA Output Option

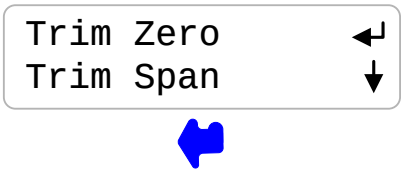
D.3 CALIBRATE

Calibration is seldom necessary & is used to correct to offset errors.
The range of Zero & Span adjustment is limited.
If you are not able to calibrate:
A: Verify your milli-ammeter B: If Load Powered, verify you have at least 15VDC available.

Press ENTER & then DOWN at 4-20mA Output

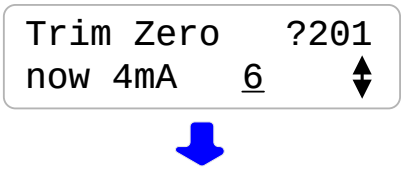


Press ENTER at Trim Zero to adjust the 4mA level.



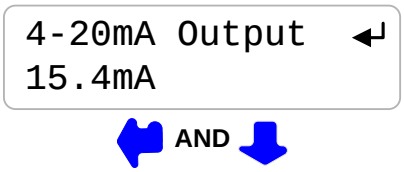
Connect a DC milli-ammeter in series with either of the current loop wires.

Press UP or DOWN until you read 4mA on the milli-ammeter.

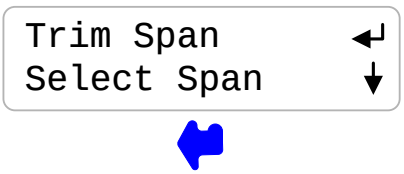


Press ENTER to view the output current and verify that the milli-ammeter reads the same current.

Press ENTER & then DOWN at 4-20mA Output

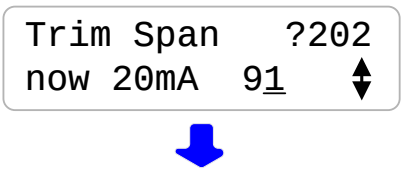


Press ENTER at Trim Span to adjust the 20mA level.



Connect a DC milli-ammeter in series with either of the current loop wires.

Press UP or DOWN until you read 20mA on the milli-ammeter.

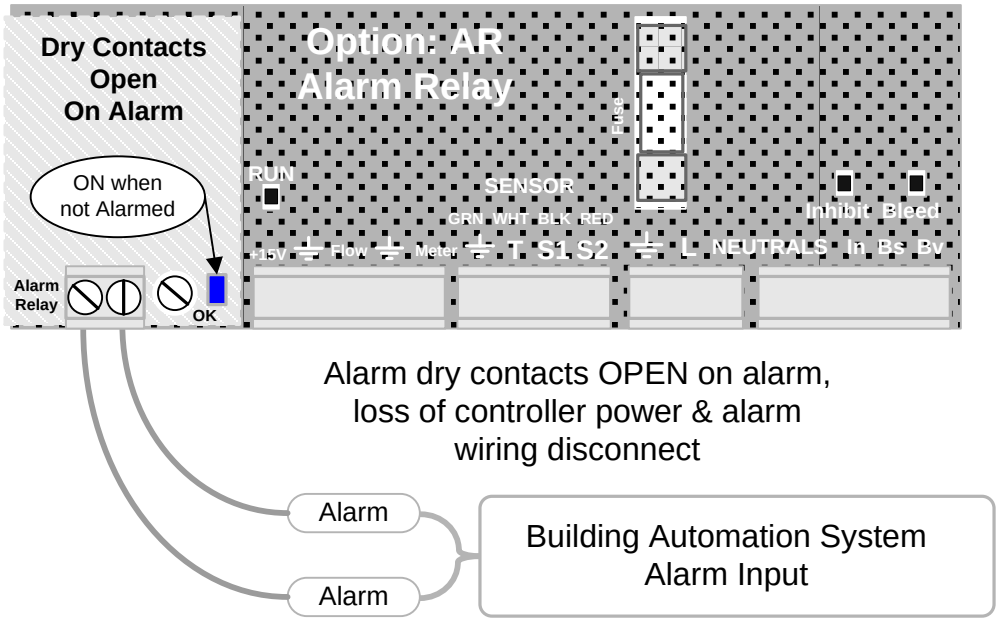


Press ENTER to view the output current and verify that the milli-ammeter reads the same current.

Appendix E: Alarm Relay Option

E.1 WIRING ALARM CONTACTS

Alarm contacts rated 500mA at 24VDC.
Requires optional Alarm Relay Card



Alarm dry contacts OPEN on alarm, loss of controller power & alarm wiring disconnect

Wire alarm contacts AWG22 to AWG18, 2 conductor

E.2 ALARM DISPLAYS

Press UP - DOWN until you see Alarms

If the Alarm Relay Card is installed you'll see one of the following displays.

```
Alarms          ↵
none
```

If Alarms & 'none' then the alarm contacts will be closed

```
Alarm Contacts
CLOSED,No Alarm
```

OR

Alarm contacts open on alarm.

```
Alarm Contacts
OPEN,Alarm
```

This display verifies the contact set state measured at the Building Automation System input terminals.

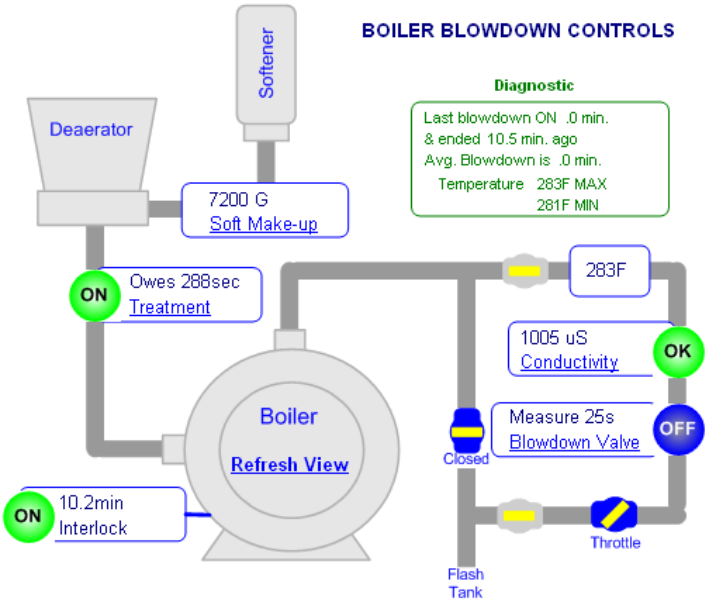
Appendix F: LAN - Browser Option

Download Sflex_LB manual from www.prominentcontroller.com.

Do not connect the controller to the site LAN without permission from the site IT staff.

This controller micro-server uses a 'static' IP assigned by the site IT staff and set using the controller keypad.

You can use a crossover cable to connect to your notebook PC to view the controller state. Information on browsing controllers is available in the Sflex_LB manual.



Boiler Blowdown Controls

Up Time	00:09:22
Alarms	Temperature
Alarms,Events and Timers	☐ Reset All
Part No.	BB-IN
Serial Number	U904B9999

Click a link in the View to operate the controller

Setup	Configure
Submit	Refresh