

B.1 Appendix B Summary

Safety:

Steam piping is a burn hazard from contact and from steam flashing.

Steam @ 250psi is nominally 400F, 205C.

Sensors are installed in, and pumps inject into pressurized piping. Loose or improperly assembled fittings may leak water or chemicals and/or flash steam.

Do not leave the controller turned ON unless you have configured it for the site's water treatment program & verified that the pumps and blowdown valve or solenoid are operating.

FYI: inserts 'For Your Information' explanations.

Here's what we're going to do:

Startup walks you through controller set-up step by step. We'll start by verifying the blowdown, followed by each sensor and then we'll adjust blowdown and feed setpoints and limit alarms. Finally we'll ensure that the pumps are pumping.

You'll need to know and be able to do the following:

You'll need to be able to measure the non-flashed, un-neutralized boiler water conductivity. You'll need to know the target conductivity for the boiler and the feed rates for the boiler treatment, sulfite & amine.

It helps to know the expected percentage of condensate return since you may feed less Treatment chemical if the volume of softened make-up is low.

Volume Meters

If you've installed one or more water meters, you'll need to know the Gallons/contact for each meter. If they are turbine meters you'll need to know the 'K' factor.

Steam Demand

If you have a steam demand meter installed, you'll need to know the span of its current output signal (Example: 4-20mA = 0 to 50,000 lbs/hour of steam). If you are sharing the steam demand current loop with other controls, you'll need a current loop splitter.

First time users:

Have the controller user manual available to step you through the calibrate, configure and setpoint sequences.

If you have the '**LB**' LAN-browser option installed, you can use a notebook PC & Ethernet crossover cable to startup. Refer to Appendix 'C' of the user manual if you haven't set-up your notebook to browse the controller

FYI: Your controller may have been pre-configured for this site. Skip steps that involve setpoint adjust, feed mode & feed timing.

B.2 Minimum Startup Sequence

Unplug Pumps. Valve OFF Blowdown & Sensor: 1

If not hardwired, unplug the chemical pumps.
Valve OFF the upstream & downstream isolation valves
on the conductivity sensor-blowdown valve piping.
Set the throttling needle valve to 25-30% open.

FYI: Needle valve setting typical for most captured-sample controlled blowdowns.

Check for leaks: 2

Inspect the chemical injection points for leaks & correct.
If you've just installed water meters make sure they are not bypassed
& that the installation fittings are not leaking or flashing steam.

Verify the Interlock: 3

Plug-in or power up the controller. Scroll **UP** or **DOWN** to the '**S**'
Operating _S display and ensure that it shows ON indicating that the EMS or DCS
is providing a closed contact set
Don't proceed until Operating_S shows ON.

FYI: If you are not using the interlock, install a wire or jumper from S to the adjacent ground terminal.

Open Isolation Valves, Verify Blowdown Closed: 4

Open the isolation valves on the sensor – blowdown valve piping & check for leaks.
Disconnect the interlock wire from the '**S**' terminal and ensure that the valve or solenoid is closed.
This check is very necessary for motorized valves, since it's common to wire
so that a valve is open when it should be closed.

FYI: Motorized valves usually have a valve stem position indicator. Solenoid coils can be checked for magnetized:ON or you can IR temperature measure the drop across the valve.

Verify Blowdown Piping: 5

Reconnect the 'S' interlock wire.
Scroll **UP** or **DOWN** to the valve '2' Blowdown_2 display,
key **ENTER** & then select **Test-Prime** for 5 minutes.
Go back to the blowdown valve & make sure that it's open and that the boiler is blowing down.
End **Test-Prime**: Key **ENTER** at Blowdown_2 & scroll to **Alarms-Limits**,
ENTER & **ENTER** at **Reset Alarm** .

FYI: After 30 seconds, an IR temperature measure should show the same temperature all the way up to the throttling needle valve. You can be accidentally valved OFF upstream OR downstream of the blowdown valve.

Adjust Blowdown Timing: 6

Scroll **UP** or **DOWN** to the valve '2' Blowdown_2 display, key **ENTER**
Scroll to **Configure** & **ENTER** & then to **Special Control** & **ENTER** twice.
Modify the **Captured Sample** timing for your site.

FYI: Refer to user manual Section 7.2 for sample timing guidance.
Many sites, only need to adjust the **Re-sample-Wait** time from the default 60 minutes.

B.2 Minimum Startup Sequence continued

Calibrate Conductivity: 7

Scroll **UP** or **DOWN** to the sensor 'A' Boiler1_A conductivity display
Measure an un-flashed & un-neutralized boiler water sample
and calibrate the Boiler1_A conductivity sensor.

FYI: Ensure that blowdown control has captured a representative boiler water sample
at the sensor, upstream of the blowdown valve, before calibrating conductivity.

Check for Flashing @ Sensor: 8

Scroll **UP** or **DOWN** to the valve '2' Blowdown_2 display, key **ENTER**
& scroll to **Diagnostic** then select **Sensor Watch**
Watch the conductivity in real time during the
Sample-Measure sequence & verify not flashing.

FYI: Refer to user manual Section 7.4 for a detailed explanation.

Critical: Flashing at the sensor prevents accurate and repeatable blowdown control.

Correct for Time Zone: 9

Key **EXIT** to the Day – Time display.

If necessary, key **ENTER** & scroll to **Time&Date** & adjust the time for your time zone.

FYI: Sets the time & date stamp correctly for alarms & data logging.

Configure Water Meters: 10

FYI: Skip 7 if you don't have a feedwater or softened make-up meter

Scroll **UP** or **DOWN** to the meter 'O' Feedwater_O display

It's currently a contact head meter @ 100 Gallons/contact.

Key **ENTER** to **Configure** if you need to modify the meter type or gallons per contact.

Scroll **UP** or **DOWN** to the meter 'R' Softened_R display

It's currently a contact head meter @ 100 Gallons/contact.

Key **ENTER** to **Configure** if you need to modify the meter type or gallons per contact.

Note both water meters current volume display.

Set Blowdown Setpoints: 11

Scroll **UP** or **DOWN** to the valve '2' Blowdown_2 display, key **ENTER**.

Key **ENTER** to **Setpoints** and adjust the **Turn ON** & **TurnOFF** setpoints for your treatment program
and feedwater chemistry. Typically the two setpoints are 10uS apart.

B.2 Minimum Startup Sequence continued

Verify Meters: 12

In step 10 we noted the current volume on each meter.
Scroll **UP** or **DOWN** to the meter 'O' Feedwater_O display & verify a volume increase.
Scroll **UP** or **DOWN** to the meter 'R' Softened_R display & repeat.
FYI: Sites seldom have a single boiler fed from the common de-aerator sump or feedwater tank.
Level controls in the feedwater tank and variation in %condensate return obscure any ratio between feedwater and softened make-up volumes.

Select Treatment Feed Mode: 13

Scroll **UP** or **DOWN** to the '1' Treatment_1 display.
It's currently set to feed based on the to Feedwater_O meter volume.
If you don't have a feedwater meter key **ENTER** to **Configure** & **Special Control** & then select **PercentTime**.

Set Feed Setpoints: 14

Scroll **UP** or **DOWN** to the '1' Treatment_1 display & key **ENTER** to **Setpoints**.
If you are using a meter based feed, you'll enter meter volume & pump ON time setpoints.
If you are using **PercentTime**, you'll setpoint the % of every 5 minutes that interlock Operating_S is ON.
FYI: **PercentTime** may work if you are pumping into a sump but may not if you are feeding into a lightly loaded feedwater line. Consider using a feedwater pump starter contact set to feed proportional to load.

Verify Treatment Feed: 15

Scroll **UP** or **DOWN** to the '1' Treatment_1 display.
Plug in the treatment pump to the plug labeled 1.
Key **ENTER** to **Prime-Test** & feed for 5 minutes.
Verify that the pump primes & feeds.

Set Treatment Feed Limits: 16

Scroll **UP** or **DOWN** to the '1' Treatment_1 display.
Key **ENTER** to **Alarms-Limits**.
Key **ENTER** & scroll to **Minutes/Day**. Adjust this feed limit to prevent overfeeding.
FYI: The Inhibitor feed limit is reset @ midnight so that the same amount of inhibitor is available for each day's treatment.
The Mins/Actuation limit is seldom used for inhibitor feeds.

Select Amine Feed Mode: 17

Scroll **UP** or **DOWN** to the '5' AminePump_5 display.
It's currently set to feed based on the to Feedwater1_O meter volume.
If you don't have a feedwater meter key **ENTER** to **Configure** & **Special Control** & then select **PercentTime**.
FYI: If you have a 4-20mA signal that represents steam demand, connect the signal to controller input 'G'.
Convert the steaming rate to volume & use it to control the amine pump.

B.2 Minimum Startup Sequence continued

Set Amine Feed Setpoints: 18

Scroll **UP** or **DOWN** to the '5' AminePump_5 display & key **ENTER** to **Setpoints**.
If you are using a meter based feed, you'll enter meter volume & pump ON time setpoints.

If you are using **PercentTime**, you'll setpoint the % of every 5 minutes that interlock Operating_S is ON.

FYI: **PercentTime** may work if you are pumping into a steam header & load is constant.
Consider using a feedwater pump starter contact set to feed proportional to load.

Verify Amine Feed: 19

Scroll **UP** or **DOWN** to the '5' AminePump_5 display.

Plug in the amine pump to the plug labeled **5**.

Key **ENTER** to **Prime-Test** & feed for 5 minutes.

Verify that the pump primes & feeds.

Set Sulfite Feed Setpoint: 20

Sulfite is currently set to feed based on **PercentTime**.

Scroll **UP** or **DOWN** to the '4' SulfitePump_4 display & key **ENTER** to **Setpoints**.

Setpoint the % of every 5 minutes that interlock Operating_S is ON.

FYI: If you have a feed water meter or pump signal, you may wish to re-configure to feed sulfite proportional to load.

Verify Sulfite Feed: 21

Scroll **UP** or **DOWN** to the '4' SulfitePump_4 display.

Plug in the amine pump to the plug labeled **4**.

Key **ENTER** to **Prime-Test** & feed for 5 minutes.

Verify that the pump primes & feeds

Optional:End Prime-Tests: 22

Scroll **UP** or **DOWN** to each priming pump's display.

Key **ENTER** & **UP** or **DOWN** to **Alarms-Limits** & **ENTER**.

Scroll to **Clear Alarms** & **ENTER** to ending any active **Prime-Test**.

FYI: If you noted the feedwater and/or softened water meter volumes in Step 10, check that the current volume on each meter reflects the incremental volume that has occurred during Start-up.

B.3 Startup Sequence Options

Not all sites will require or wish to do the following optional steps.
Refer to the user manual for guidance on selecting and setting.

Set Conductivity Alarm: A

Scroll **UP** or **DOWN** to the sensor 'A' Boiler1_A conductivity display.
Key **ENTER** to **Alarms** and adjust both **High Alarm** and **Low Alarm**.

FYI: High conductivity alarms on captured sample blowdowns are of limited use,
since a valve fault will prevent a conductivity update.
If the boiler is always on-line, a low conductivity alarm is useful since
it will flag a failure to get a hot sample.

Set Feedwater & Softened Meter Volume/Day Alarms: B

Scroll **UP** or **DOWN** to the meter 'O' Feedwater_O display.
Key **ENTER** to **Alarms** and adjust **High Alarm**.

Repeat for 'R' Softened_R.

FYI: If you have a 24/7 boiler, set the Low Alarm to flag a meter failure.
High softened make-up may indicate a lower %condensate return.