B.1 Appendix B Summary

Safety:

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

Do not leave the controller turned ON unless you have configured it for the site's water treatment program & verified that the pumps and 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 each sensor and then
we'll adjust blowdown and feed setpoints and limit alarms.
We'll check that the bleed solenoid is operating and 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 cooling water conductivity and free chlorine or bromine.
You'll need to know the target conductivity for the cooling tower and the feed rate for the inhibitor.

You'll need to know the target free chlorine or bromine. We're going to set the ORP controlled oxidant-bleach pump to hold the target level, typically 0.5ppm to 1ppm for continuous ORP control, higher for ORP control only during timed events.

You'll need to know the biocide feed program; when the biocide is fed and for how long.
FYI: Estimating the total volume of water in the tower & it's piping & knowing your target biocide concentration and biofeed pump GPH rating, make feed time easy to calculate.

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.

Knowing the expected tower make-up volume per day and the nominal hours of tower operation, if not 24/7, will help you set the inhibitor feed rate and biocide timing.

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 & biocide timing.

B.2 Minimum Startup Sequence

Unplug Pumps. Valve OFF Bleed. Valve ON flow.: 1

If not hardwired, unplug the chemical pumps and solenoid(s).
If solenoid(s) hardwired, close the upstream isolation valve.
Open the downstream isolation valve on the sensor – chemical injection piping and then the upstream isolation valve.
FYI: Always OPEN in this order & CLOSE upstream first.
You may be using a solenoid to feed oxidant from a brominator or pot feeder.

Check for leaks: 2

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

Verify Flowswitch: 3

Plug-in or power up the controller. Scroll **UP** or **DOWN** to the '**S**' Flowswitch_S display and ensure that within 30 seconds of power ON the flowswitch shows ON.
Don't proceed until the flowswitch shows ON.
FYI: Thermal flowswitches take time to respond. The CTF type responds within 30 seconds at 1GPM.

Check Temperature: 4

Scroll **UP** or **DOWN** to the sensor '**B**' Temperature_B display & check that it's displaying the approximate temperature, +/-10F.
FYI: Temperature doesn't need to be accurate. We're only using it to compensate conductivity, so it has to track, changing when the cooling water changes temperature.

Calibrate Conductivity: 5

Scroll **UP** or **DOWN** to the sensor '**A**' Conductivity_A display
Measure the tower water conductivity at the sensor sample valve and calibrate the conductivity sensor.

Don't Calibrate ORP: 6

Scroll **UP** or **DOWN** to the sensor '**C**' ORPSensor_C display
If you don't have an oxidant residual, you'll see an ORP from 50mV to 150mV
FYI: We're going to add oxidant until we achieve the target free chlorine or bromine & then we're going to use the ORP at the target ppm to set the feed control. So it's not necessary to calibrate ORP.

Correct for Time Zone: 7

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 timed biocide feeds, alarms & data logging.

B.2 Minimum Startup Sequence continued

Configure Water Meters: 8

FYI: Skip 7 if you don't have a make-up or bleed meter
Scroll **UP** or **DOWN** to the meter '**O**' Makeup_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 '**P**' Bleedmeter_P 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 Bleed Setpoints: 9

Scroll **UP** or **DOWN** to the '**2**' Bleed_2 display.
Key **ENTER** to **Setpoints** and adjust the **Turn ON** & **TurnOFF** setpoints for your treatment program and make-up chemistry. Typically the two setpoints are 10uS apart.

Verify Bleed & Meters: 10

Plug-in the bleed solenoid in the plug labeled **2** and/or
open the upstream solenoid isolation valve.
If '**2**' Bleed_2 is not ON, key **ENTER** and **Test-Prime** for 15 minutes.
If you can view the tower drain, verify there's flow when the bleed solenoid is ON.
If you have a '**P**' Bleedmeter_P installed, it should measure volume within the **Test-Prime** time.

Monitor sensor '**A**' Conductivity_A. Its value should fall as the
tower float drops and turns ON the tower make-up.
If you have an '**O**' Makeup_O meter installed,
you'll see it measure increased volume as the tower makes up.

Select Inhibitor Feed Mode: 11

Scroll **UP** or **DOWN** to the '**1**' Inhibitor_1 display.
It's currently set to feed based on the tower make-up meter volume.
If you don't have a make-up meter key **ENTER** to **Configure**
& **Special Control** & then select **Bleed thenFeed.**

Set Feed Setpoints: 12

2.1 Chemical Feed 101, outlines estimating setpoints for
typical feed modes to get a target ppm of inhibitor.
Approximate & correct based on your wet ppm testing after a week of run time.

If this tower has no inhibitor in it now, estimate its volume
& use **Prime-Test** to get to initial ppm levels.

Scroll **UP** or **DOWN** to the '**1**' Inhibitor_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 **Bleed thenFeed**, you'll setpoint the % of every 5 minutes of bleed time.

B.2 Minimum Startup Sequence continued

Verify Inhibitor Feed: 13

Scroll **UP** or **DOWN** to the '**1**' Inhibitor_1 display.
Plug in the Inhibitor pump to the plug labeled **1**.
Key **ENTER** to **Prime-Test** & feed for 5 minutes.
Verify that the inhibitor pump primes & feeds.

Set Inhibitor Feed Limits: 14

Scroll **UP** or **DOWN** to the '**1**' Inhibitor_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.

Set BiocideB Cycle Days: 15

Scroll **UP** or **DOWN** to the '**5**' BiocideB_5 display.
Key **ENTER** & scroll to **Configure.** Key **ENTER** & scroll to **Event Cycle.**
A 28 Day cycle is the default. Adjust if your feed program requires a weekly program.
FYI: Organic biocides are typically fed on a 28 day, 4 week cycle. Oxidizing biocides like bleach or bromine are either fed continuously and ORP controlled OR fed 1 to 3 days a week using the '7 Days' Event Cycle.

Set BiocideB Feed Events: 16

Scroll **UP** or **DOWN** to the '**5**' BiocideB_5 display.
Key **ENTER** & scroll to **Biofeed Event.** Key **ENTER** & **Add Event.**
FYI: The 'Add Event' display shows you how many feed events are set for this pump. Once you set an event, the controller will prompt you for how often you wish to run the event.

Verify BiocideB Feed: 17

Scroll **UP** or **DOWN** to the '**5**' BiocideB_5 display.
Plug in the BiocideB pump to the plug labeled **5**.
Key **ENTER** to **Prime-Test** & feed for 5 minutes.
Verify that the biocide pump primes & feeds.

Feed Oxidant to the target ppm : 18

Scroll **UP** or **DOWN** to the '**4**' Oxidant_4 display.
Plug in the oxidant pump to the plug labeled **4**
OR if a hardwired solenoid, open the isolation valve on the brominator or pot feeder.
Key **ENTER** to **Setpoints** and adjust the **Turn ON** & **TurnOFF** above the current ORP and feed until you get to the target ppm in the tower water.
FYI: Until you meet the chlorine or bromine demand, the ORP will not increase and you will not measure a residual oxidant level.

B.2 Minimum Startup Sequence continued

Set Oxidant Feed Setpoints: 19

When you've achieved the target oxidant residual
Scroll **UP** or **DOWN** to the sensor '**C**' ORPSensor_C display and note the ORP mV.
Scroll **UP** or **DOWN** to the '**4**' Oxidant_4 display.
Key **ENTER** to **Setpoints** and adjust the **Turn ON** & **TurnOFF** setpoints.
Typically the two feed setpoints are 5-10 mV apart.
FYI: ORP control setpoints vary widely as water chemistry and target residual ppm vary. Most are in the 250mV to 500mV range.

Set Oxidant Feed Limits: 20

Note the oxidant feed cycle time; the time to move the ORP from the **TurnON** to **TurnOFF** setpoints.
Scroll **UP** or **DOWN** to the '**4**' Oxidant_4 display.
Key **ENTER** to **Alarms-Limits**.
Key **ENTER** & scroll to **Mins/Actuation**, typically to 25-35% longer than the hottest day ON time
FYI: Feed Limit alarms stop oxidant feed when the pump is ON for more than the Limit time. These limits protect you against a sensor fault or an error in calibration or adjusting setpoints.

Set ORP Alarms: 21

Scroll **UP** or **DOWN** to the sensor '**C**' ORPSensor_C display
Key **ENTER** to **Alarms** and adjust both **High Alarm** and **Low Alarm**.
FYI: The low ORP alarm flags a failure to feed oxidant & the high ORP alarm may be due to faulted feed solenoid.

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 make-up and/or bleed water meter volumes in Step 8, check that the current volumes on each meter reflect the make-up or bleed 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.

Slug Oxidant under ORP Control: A

It's common to only feed oxidant 3 times a week and during those feed event control at a high ORP, delivering short periods of high oxidant level.
Scroll **UP** or **DOWN** to the '**4**' Oxidant_4 display.
Key **ENTER** to **Configure**, scroll to **Control Type**, key **ENTER** and select **Event Falling**.
Key **EXIT** and scroll to **Biofeed Event**.
ENTER and **Add an Event** for each of the 3 days that you wish to feed every week.
FYI: Now you only feed oxidant during the timed event and during the event you'll ORP control the feed.
Typically you'd increase setpoints to control at a higher oxidant ppm.

Preventing Oxidant Feed during Inhibitor Feed: B

Refer to Section 2.9 of the user manual for '**Blocking**' method and rationale.
FYI: Typically you'd the 'block' the oxidant feed, during a short duration inhibitor feed.
In this case you'd set blocking on Oxidant_4 to Inhibitor_1.
Exercise care when setting 'blocks' so that you don't prevent critical feeds when the blocking pump or solenoid is ON for an extended period.

Set Bleed Limit Alarms: C

Scroll **UP** or **DOWN** to the '**2**' Bleed_2 display.
Key **ENTER** to **Alarms-Limits** and adjust both **Min/Actuation** and **Minutes/Day** alarms to flag variation from the expected bleed operation.
FYI: The Bleed limit is set NOT to turn OFF on limit so you get the warning but bleed continues.
Use Min/Actuation to flag a partially blocked bleed and Minute/Day to flag an increase in make-up conductivity or bleed setpoints set too low.
Set limit times so that nuisance alarms do not occur.

Set Conductivity Alarms: D

Scroll **UP** or **DOWN** to the sensor '**A**' Conductivity_A display
Key **ENTER** to **Alarms** and adjust both **High Alarm** and **Low Alarm**.
FYI: The Low conductivity alarm can flag a sump or circulation piping water loss.
The High conductivity alarm can flag a failed or blocked bleed.
Use the Delay on Alarm setting to block nuisance alarms.

Set Biocide Prebleed-Lockout: E

Scroll **UP** or **DOWN** to the '**5**' BiocideB_5 display.
Key **ENTER** & scroll to **Configure.** Key **ENTER** & scroll to **Special Control.**
Key **ENTER** & scroll to **Prebleed-Lock**.
FYI: If you able to schedule biocide feeds during the tower's low load period, you may not need Prebleed-Lock.
You don't need to set both PreBleed & Lock-out. Use either or both.

B.3 Startup Sequence Options

Set Biocide Feed Limits: F

Scroll **UP** or **DOWN** to the '**5**' BiocideB_5 display.
Key **ENTER** to **Alarms-Limits** and adjust the **Min/Actuation** alarm.
FYI: The Biocide feed limit is set to turn OFF on limit since overfeeding biocide usually means an error in setting feed time or an extended Prime-Test period.

Set Make-up Meter Volume/Day Alarm: F

Scroll **UP** or **DOWN** to the meter '**O**' Makeup_O display
Key **ENTER** to **Alarms** and adjust **High Alarm.**
Repeat for '**P**' Bleedmeter_P.
FYI: If you have a 24/7 site, set the Low Alarm & flag meter failure.

24/7 Sites, Set Flowswitch Alarm: G

Scroll **UP** or **DOWN** to the '**S**' Flowswitch_S display.
Key **ENTER** to **Alarms** and adjust **No Flow Alarm.**
FYI:A No Flow alarm indicates no flow past the measuring sensors & therefore no control.