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Safety

Electrical Shock Hazard

Opening the controller enclosure with the controller plugged in,
exposes the user to AC line voltages on the lower of the two controller circuit boards.

USER WARNING : CAUTION

Water Treatment Controllers operate steam and water valves 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, interlocks 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 in many different configurations.

The **HELP** section in the back of this manual contains the information for terminating the sensors supplied with your specific controller.

The **HELP** section in the back of this manual depicts the installation plumbing header showing the sensor set supplied with your specific controller.

1.1 What's Happening Now

.

Power UP, first display, current date
Key ENTER for System menu

.

Key DOWN & enter to clear all alarms
And to view detail on Sensor 'D', Relay '2' and 'Sys'tem Alarms

.

.

Sensors and the relays they control are grouped

.

Key ENTER on sensor for sensor 'O' menu
& ENTER on the relay '1' relay menu

.

.

.

Sensor 'E' menu: Diagnostics | Alarms | Calibrate | Configure

.

Relay '2' menu: Diagnostics | Configure | Alarms | Timed Events | Setup

.

.

The display line with the ENTER arrow
Displays Relay '9' menu on ENTER

.

Sampling timing is adjusted by keying ENTER, DOWN to Configure & ENTER

.

.

.

Sensor display current value
Relays sown ON/OFF state and run time if ON

.

Water meters show volume from midnight

.

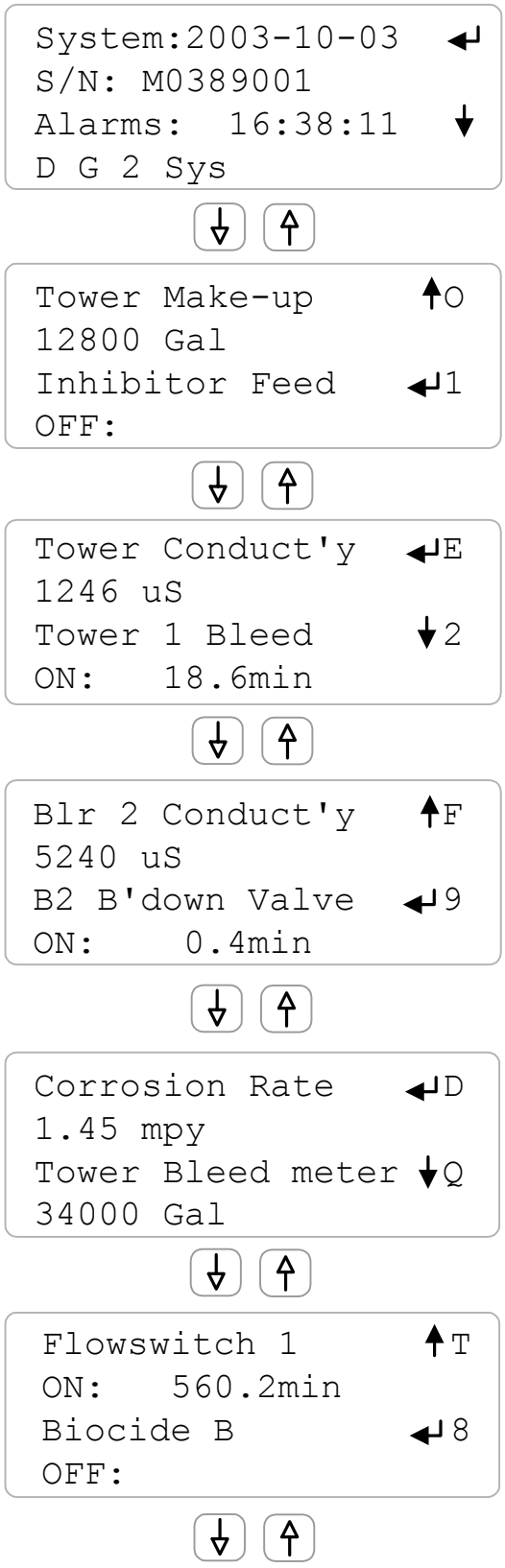
.

.

Flowswitch 'T' is ON and has been on for 560.2 minutes from midnight

.

Biocide B pump is controlled by Relay #8
and is now OFF:



1.2 Checking & Clearing Alarms 1 of 3

CHECK ALARMS
Power UP, first display

.
.

Key DOWN to Alarms & ENTER
to view detail on Sensors ‘C’ ,‘K’ & Relay ‘3’
& to clear alarms

.
.

Key DOWN to view active alarms
& ENTER

.
.
.
.
.
.

Display on no active alarms

.
.

OR
Scroll down to view all active alarms

.
.

Name of alarming Sensor
Alarm type: pH Sensor value above High alarm for a user set time.

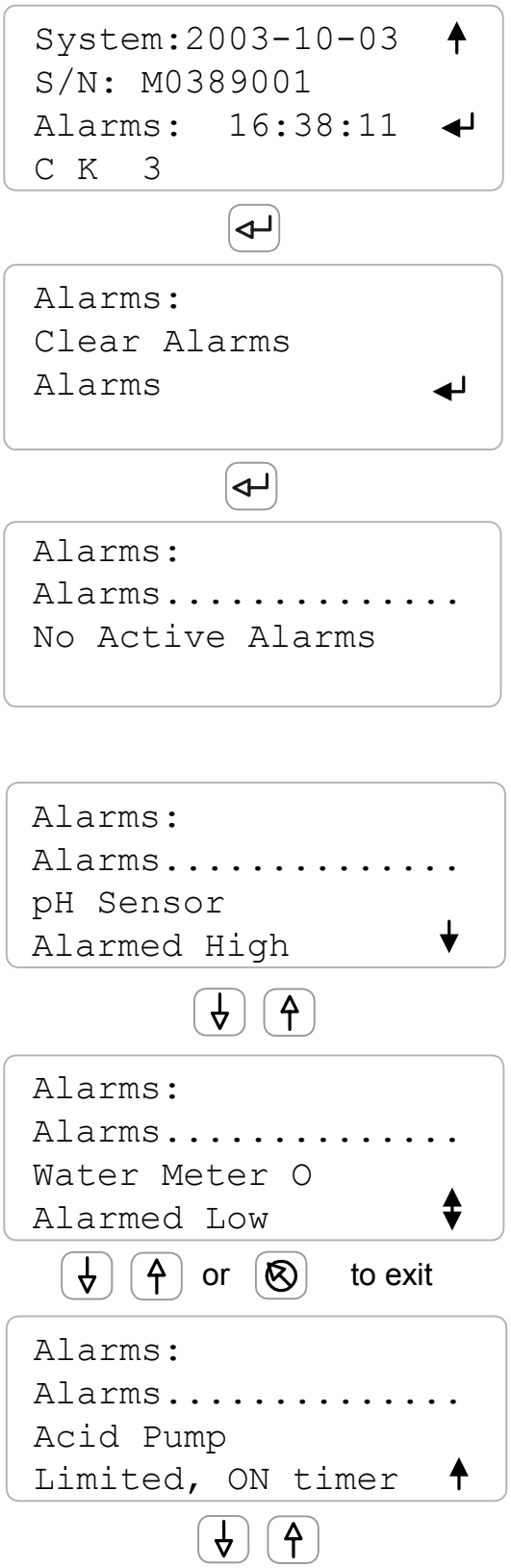
.
.
.
.
.

Name of alarming Water Meter
Alarm type: Low alarm checked at midnight
High meter alarm trip immediately

.
.
.
.

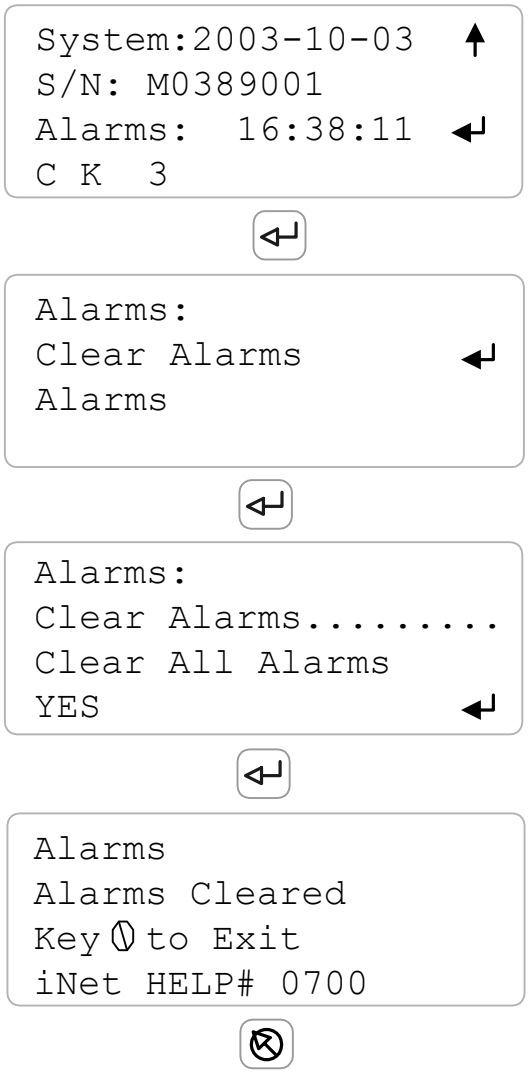
Name of Output control alarming
Alarm type: Feed limit timer turns OFF Pump
Day Timer may be set to limit on time/day

.



1.2 Checking & Clearing Alarms 2 of 3

CLEAR ALARMS
Power UP, first display
.
.
Key ENTER
to view detail on Sensors ‘C’ ,‘K’ & Relay ‘3’
& to clear alarms
.
.
Key ENTER to Clear Alarms
.
.
.
.
Clear Alarms:
Resets only all active alarms
.
If you wish to end biocide events.
Prebleeds or lockouts.
OR restart special controls:
Clear the target relay alarm.
See page 3 of 3.
.
Information only display
EXIT key escapes
.
Internet HELP reference for more detail
Refer to Technical Support.
.



RESET RELAY USING CLEAR ALARMS

.

Key UP or DOWN to the output relay
& key ENTER

.

Any relay can be reset

.

This example is a Biocide pump with 16.6 minutes
of ON time remaining

.

Key DOWN to Alarms & ENTER

.

.

Key DOWN to 'Reset Alarm & Time & ENTER
Relay 4 will turn OFF

.

Biocide feeds and prebleeds will end
If this relay is timing a biocide lockout, it will end

.

Special controls like Bleed & Feed, % Time
or Boiler Captured Sample controls will restart.

.

.

.

After you key ENTER you see the value of the relay
feed limit timer.

.

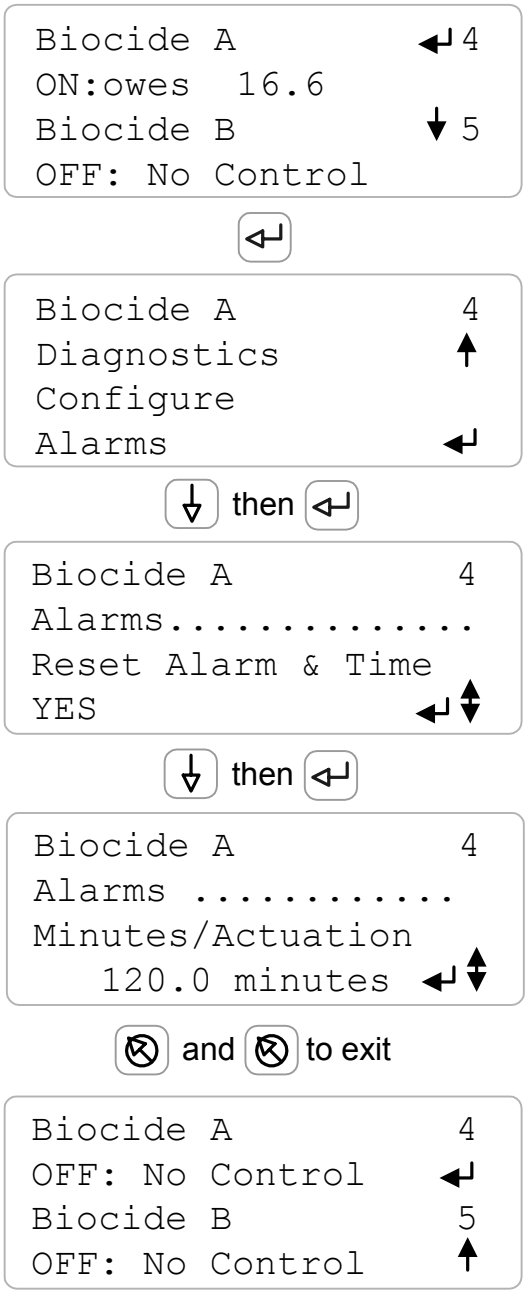
.

Key EXIT twice
& you'll see that Relay 4 is now OFF

.

.

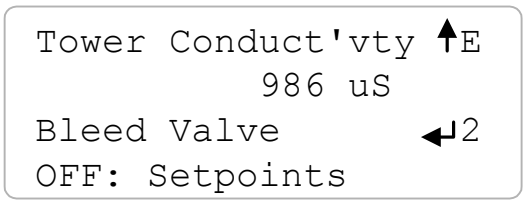
Relays don't need to be ON to be reset
You may wish to restart special control
Or end the lockout of a bleed relay



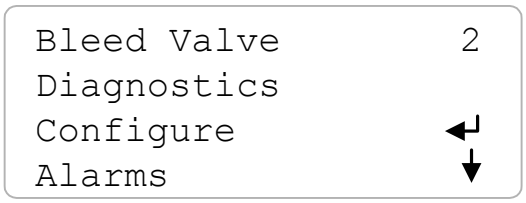
1.3 Checking & Changing Setpoints

Key UP or DOWN to the output relay & key ENTER

Relays follow the controlling sensor

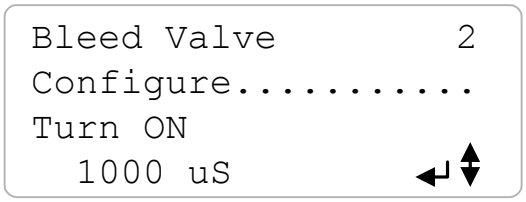


Key DOWN to Configure & ENTER



then

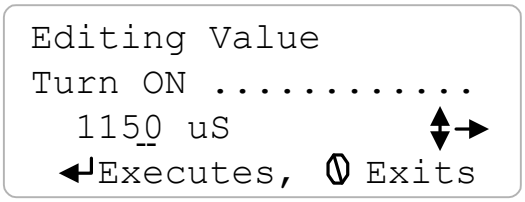
Key DOWN to 'Turn ON' & ENTER
Select 'Measure Volume' for water meter controls.
Current setpoint is 1000uS



then

Use the UP & DOWN keys to adjust the setpoint
RIGHT moves the cursor across the screen

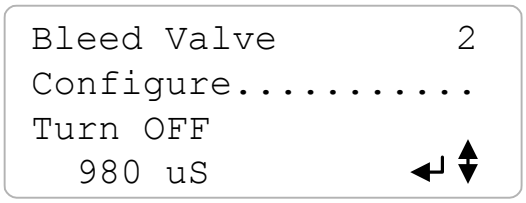
EXIT abandons adjusting the setpoint



then

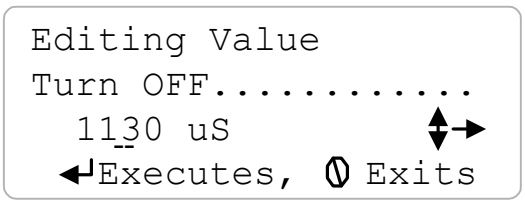
You can adjust ON or OFF setpoints or both

Key ENTER to adjust or UP – DOWN to view current settings



then

Turn OFF > Turn ON not allowed with a Rising Setpoint control

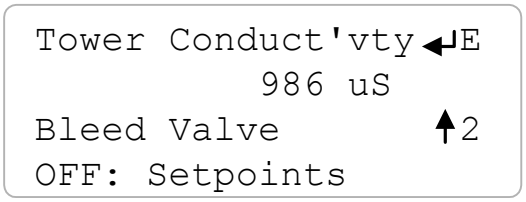


then

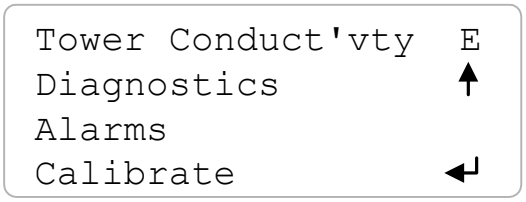
1.4 Calibrating Sensors 1 of 2

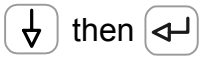
SENSORS

Key ENTER at selected sensor

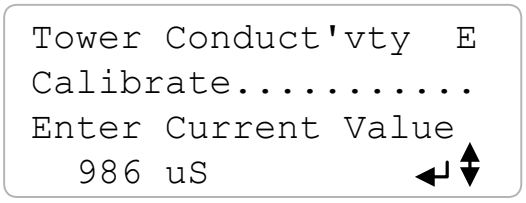


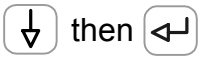
Key DOWN to Calibrate & ENTER





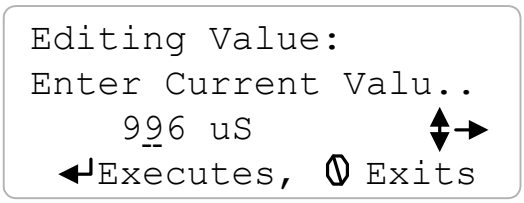
Key ENTER to change sensor value
OR
DOWN & ENTER to Reset to Factory option





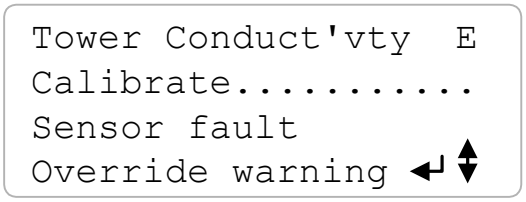
Use the UP & DOWN keys to adjust the value
RIGHT moves the cursor across the screen

EXIT abandons calibrating

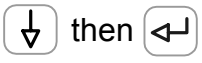


If the calibration succeeds,
you'll return to the sensor value display

If the sensor is outside of calibration limits
You'll view the override option

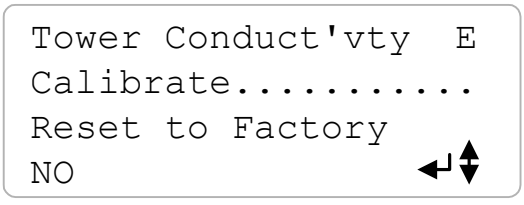


Key ENTER then UP or DOWN to override



If you key DOWN, you'll have the
Reset to Factory option

Key ENTER then UP or DOWN to Reset



1.4 Calibrating Sensors 2 of 2

CONTACT HEAD & TURBINE METERS

.

Key ENTER at selected water meter

.

.

.

.

.

.

Key DOWN to Calibrate & ENTER

.

.

.

.

.

.

Key ENTER to change value
OR
DOWN & ENTER to Reset to Factory option

.

.

.

Use the UP & DOWN keys to adjust the value
RIGHT moves the cursor across the screen

.

EXIT abandons calibrating

.

.

If the calibration succeeds,
you'll return to the sensor value display

.

Turbine and Paddlewheel meters
use pulses/unit volume as calibration value

.

.

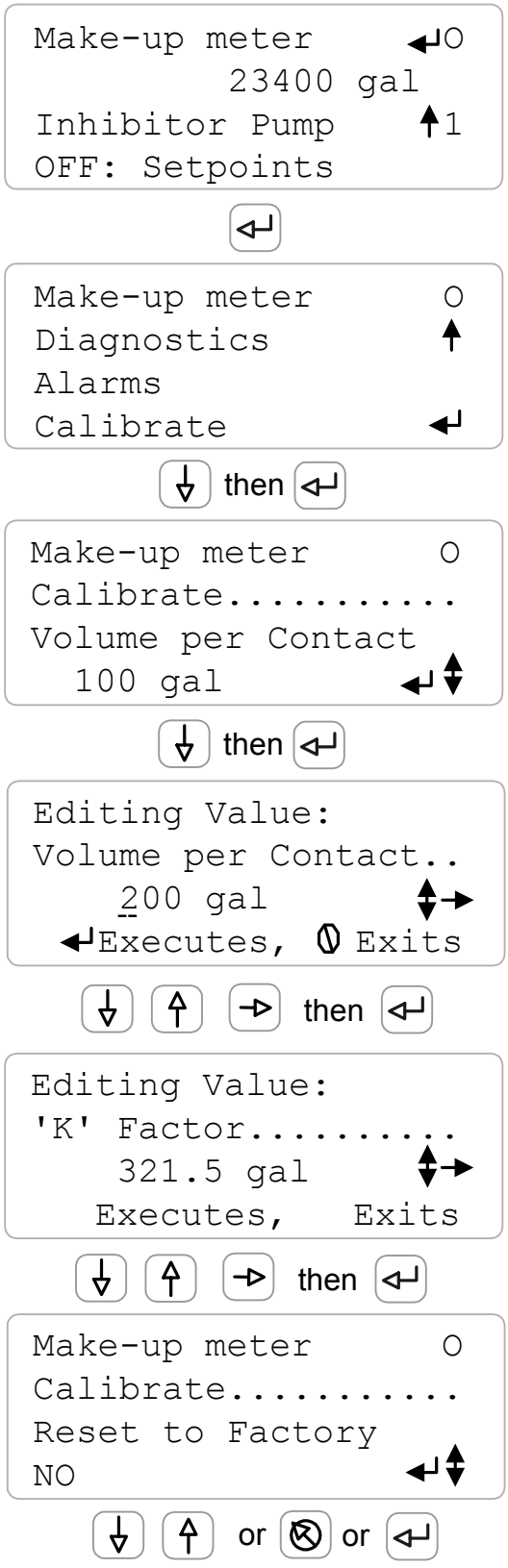
.

.

If you key DOWN, you'll have the
Reset to Factory option

.

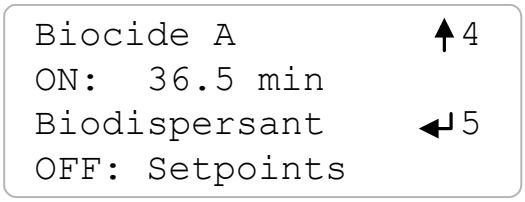
Key ENTER then UP or DOWN to Reset
Setting Volume per Contact OR 'K' Factor to 100



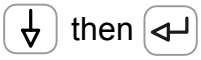
1.5 Changing Biocide Timing 1 of 2

MODIFY EXISTING EVENT, REVIEW EVENTS

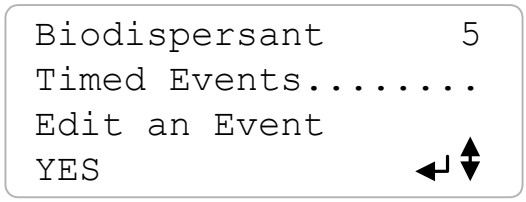
Key ENTER at selected chemical pump
This one's powered by Relay No.5



Key DOWN to Timed Events & ENTER

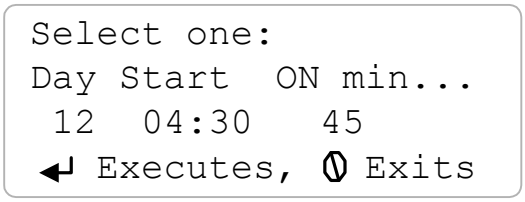


This Biodispersant has 8 existing events
See Page 2 for Add an Event



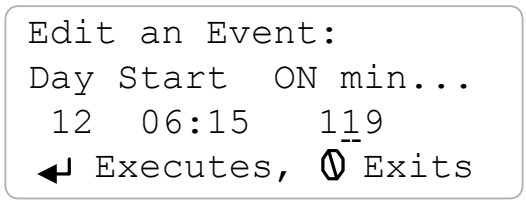
If there are '0' events then the Edit an Event option does not exist

ENTER to select the Event you wish to edit



Key UP DOWN to Select one of 28 events
OR
Review existing timed events

Day = 1 to 28 for 4 week feed cycles
Day = 1 to 7 on weekly feed cycles



Key RIGHT to select the field you wish to modify

Key UP DOWN to modify the field
ENTER to update.

ADD AN EVENT OR EVENTS

Key ENTER at selected chemical pump

Key DOWN to Timed Events & ENTER

Key RIGHT to select the field you wish to modify

Key UP DOWN to modify the field
ENTER to update.

Key UP DOWN to select ONCE | WEEKLY | ALTERNATE WEEKS

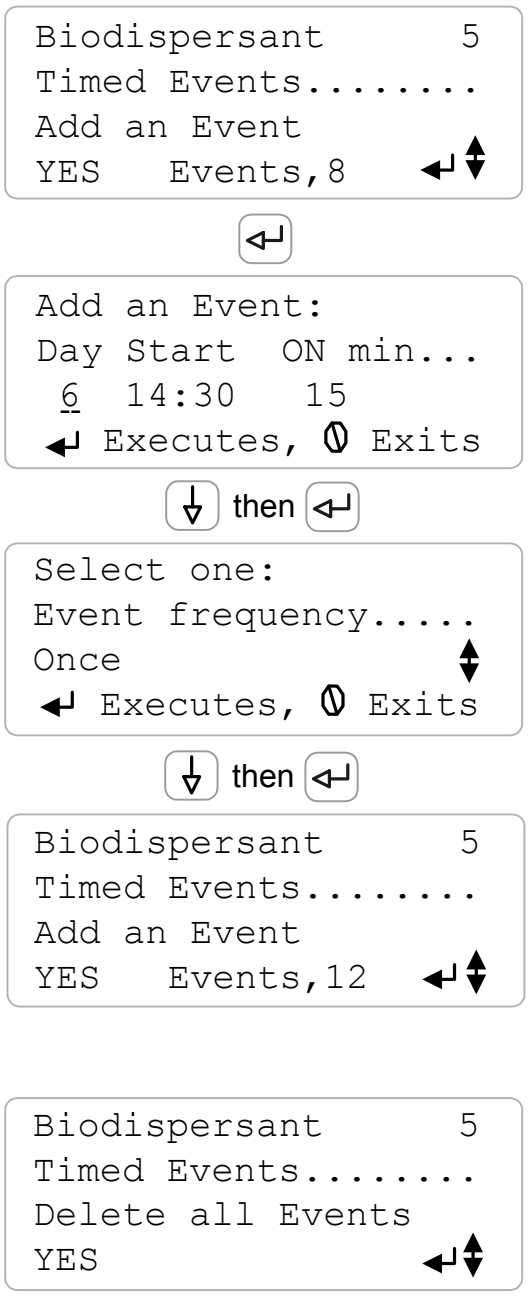
7 Day Cycles select one of ONCE | DAILY | ALTERNATE DAYS

1 Day Cycles select one of ONCE | HOURLY | ALTERNATE HOURS

In this example, we added weekly events
Increasing the total events from 8 to 12.

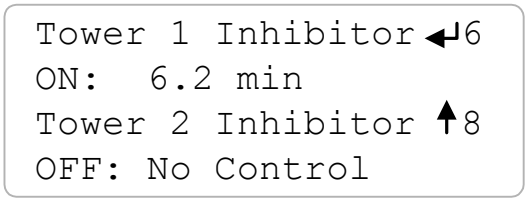
Keying UP DOWN @ Add an Event
Displays the Delete all Events option

Key ENTER to remove all events

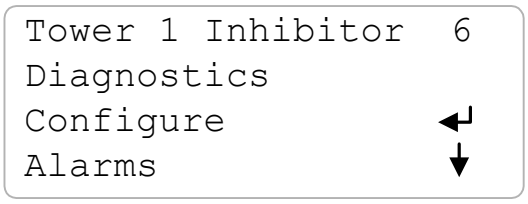


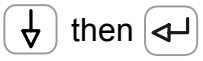
1.6 Adjusting % Feeds 1 of 2

ADJUST BASE FEED
Key UP or DOWN to the pump control
& key ENTER



Key DOWN to Configure & ENTER

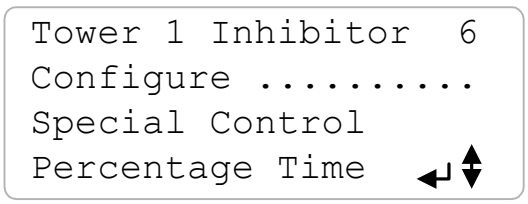


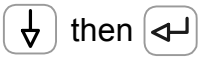


Key DOWN to Special Control & ENTER

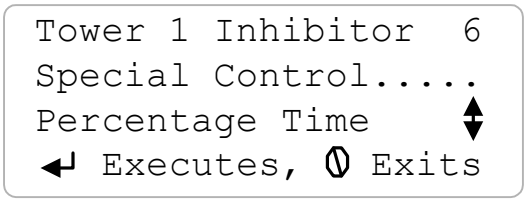
Key enter to View or change existing control

Percentage Time turns ON for user set %
every 5 minutes



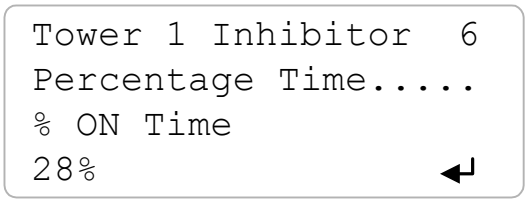


Key ENTER to view adjust current %



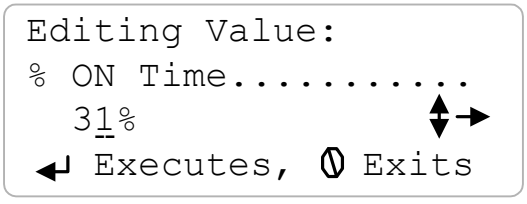
Percentage Time is set to 28%
Pump runs for 84 seconds every 5 minutes

Key ENTER to modify



Key UP DOWN & RIGHT to modify
then key ENTER

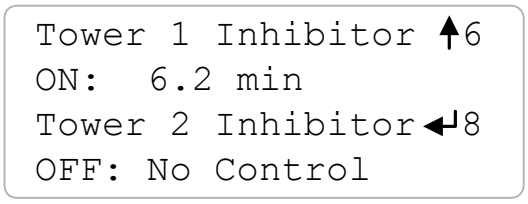
31% is 93 sec. every 5 minutes



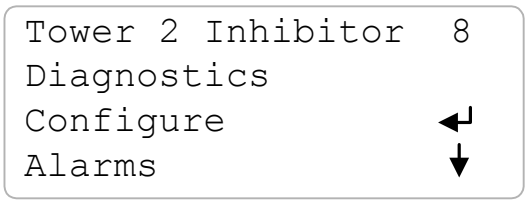
1.6 Adjusting % Feeds 2 of 2

ADJUST % BLEED FEEDS

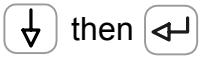
Key UP or DOWN to the pump control & key ENTER



Key DOWN to Configure & ENTER

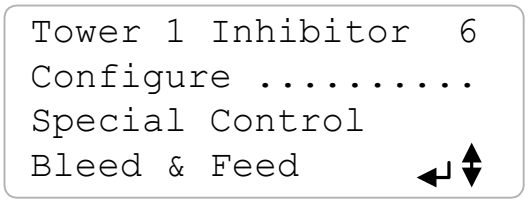


then

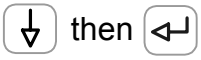


Key DOWN to Special Control & ENTER

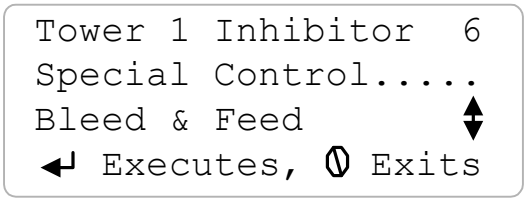
Key enter to View or change existing control



then



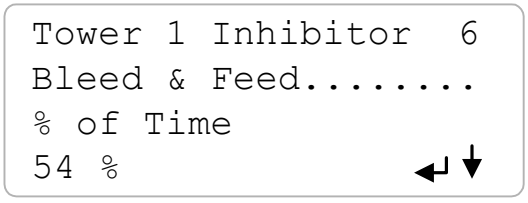
Key DOWN if you wish to switch from BLEED & FEED to BLEED THEN FEED



Key DOWN to % of Time & ENTER

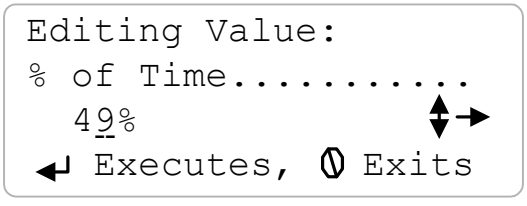
then then

Percentage Time is set to 54%
Pump runs for 162 seconds every 5 minutes



Key ENTER to modify

Key UP DOWN & RIGHT to modify then key ENTER



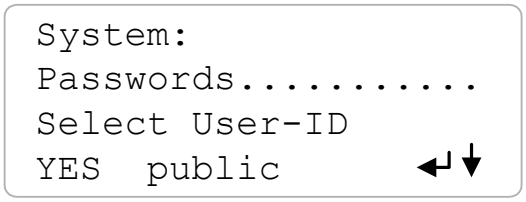
49% is 147 sec. every 5 minutes

then

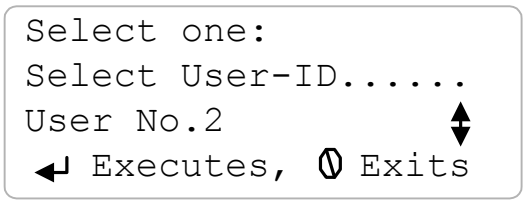
1.7 Userid – Passwords

IGNORE IF PASSWORDS NOT ON IN YOUR CONTROLLER

This display appear if passwords are ON
And you select a non-diagnostic option

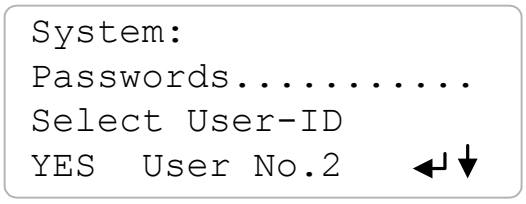


Key ENTER



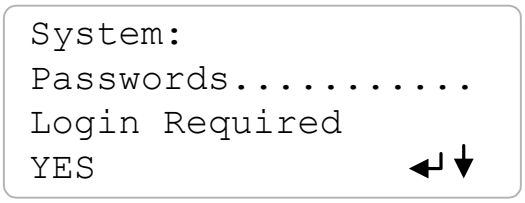
Key UP DOWN to select your user ID

then

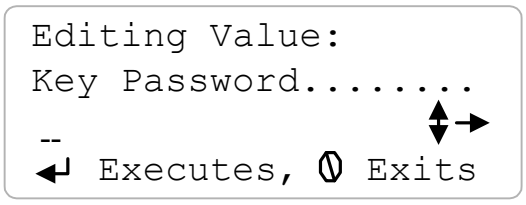


Key & ENTER
You are now Userid User No.2

.Key DOWN



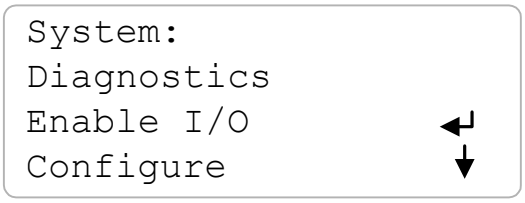
Key & ENTER to Login



Key User No.2 password using
UP DOWN and RIGHT

Then key ENTER

then

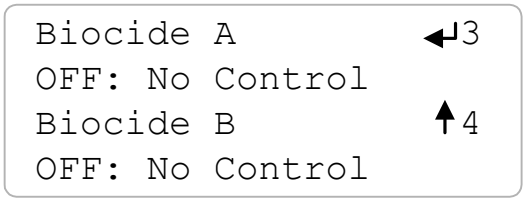


You're logged in, Password OK

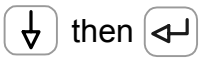
Key EXIT to view to end password entry

2.1 Setting Biocide Prebleed-Lockout 1 of 2

Key UP or DOWN to the biocide pump control & key ENTER



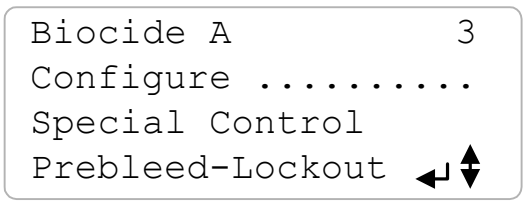
Key DOWN to Configure & ENTER



Key DOWN to Special Control & ENTER

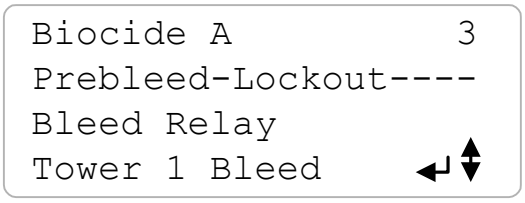
If not set to Prebleed-Lockout, key UP DOWN

Key ENTER to adjust Prebleed-Lockout parameters



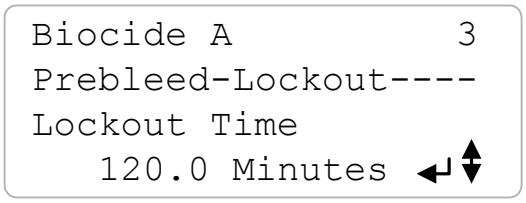
'Bleed Relay' prebleeds before each biocide feed and is locked-out after each feed event

Key ENTER to modify



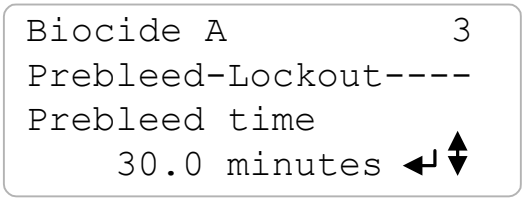
'Lockout Time' turns OFF the bleed relay during biocide kill time

Key ENTER to modify



'Prebleed Time' turns ON the bleed relay reducing the tower conductivity before a biocide feed event

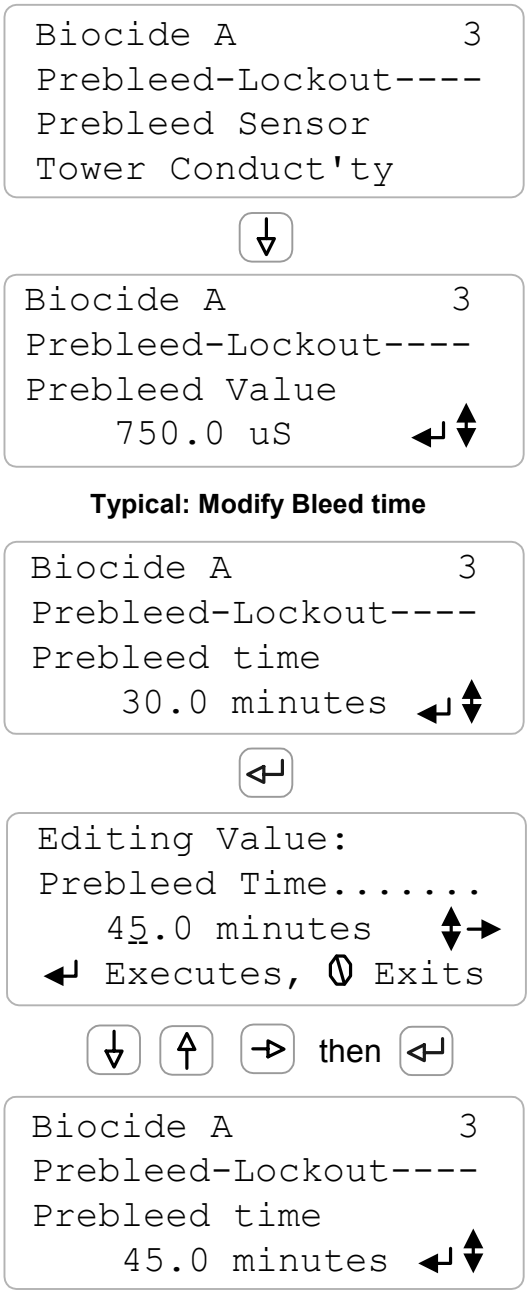
Key ENTER to modify



Continued on Page 2

2.1 Setting Biocide Prebleed-Lockout 2 of 2

.
You can ‘Prebleed’ until this sensor measures the conductivity that you set
.
Key ENTER to modify
.
.
This is the ‘Prebleed’ conductivity target
.
‘Prebleed’ ends at this conductivity OR at the end of ‘Prebleed Time’
.
Key ENTER to modify
Set high to control on ‘Prebleed Time’ only
.
.
.
All Prebleed-Lockout parameters are modified by ENTER when the parameter is displayed
.
.
.
.
.
.
Key UP DOWN & RIGHT to modify then key ENTER
.
.
.
.
.
.
Bleed solenoid or valve now turns ON For 45 minutes before each feed event on Biocide A, powered by Relay No.3
.
.



Typical: Modify Bleed time

2.2 Adjusting Boiler Blowdown Timing 1 of 2

.

Key UP or DOWN to the boiler blowdown control & key ENTER

.

This example is using Relay No.2

.

It's been ON for 1.2 minutes either Blowing down OR Sampling

.

.

.

Key DOWN to Configure & ENTER

.

.

.

.

.

Key DOWN to Special Control & ENTER

.

.

Key ENTER twice to view or adjust timing

.

.

'Sampling' opens the blowdown valve so the conductivity sensor gets a new sample.

.

Key ENTER to modify

.

.

.

.

'Measure' cools the sample at the conductivity sensor. At the end of 'Measure' conductivity is compared to the ON – OFF setpoints.

.

Key ENTER to modify

.

.

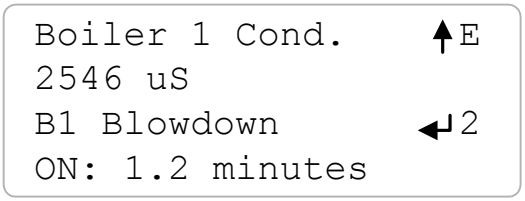
.

If the conductivity is above the TURN ON setpoint, the valve opens for the Blowdown Time

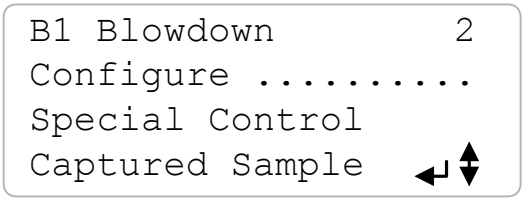
.

Key ENTER to modify

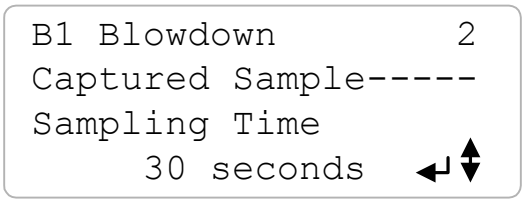
.

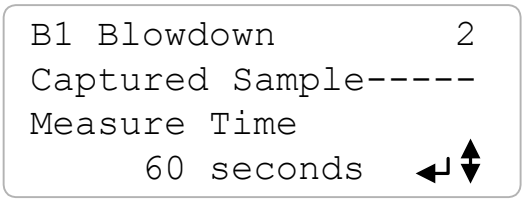


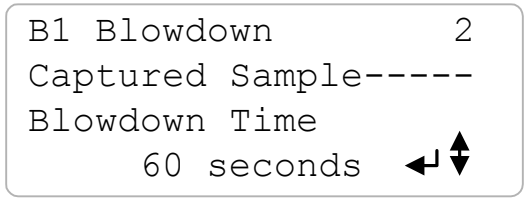
then



then then







Continued on Page 2

2.2 Adjusting Boiler Blowdown Timing 2 of 2

If the measured conductivity is below the TURN OFF setpoint, the next Sample occurs after the 'Re-Sample delay'

.

If the measured conductivity is above the TURN OFF setpoint, Blowdown Time's are followed by Measure Times as the boiler conductivity falls.

.

Key ENTER to modify

.

If your installation does not include a Fail-to-Sample sensor 'none' will be displayed

.

.

.

Key UP DOWN to Blowdown Time & ENTER

.

Key ENTER to adjust timing

.

.

.

.

.

Key UP DOWN & RIGHT to modify then key ENTER

.

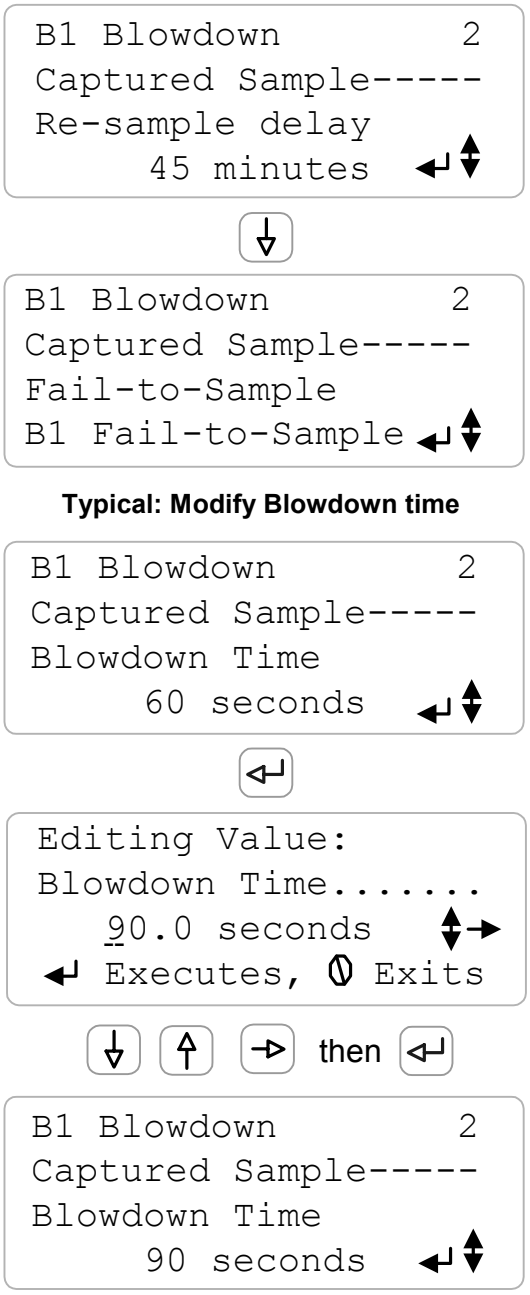
.

.

We've increased the Blowdown Time from 60 to 90 seconds

.

Sampling Time, Measure Time and Re-sample delay are adjusted using the same key sequence



Typical: Modify Blowdown time

2.3 Sensor Diagnostics 1 of 2

Key UP or DOWN to the desired sensor & key ENTER

This example is a cooling tower conductivity sensor Connected to input 'E'

Key ENTER at Diagnostics

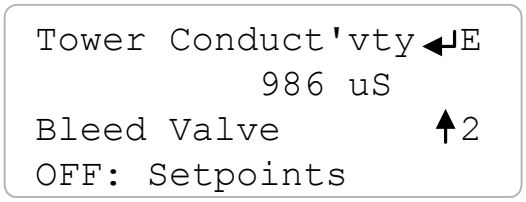
Each I/O type has it's own set of Diagnostics

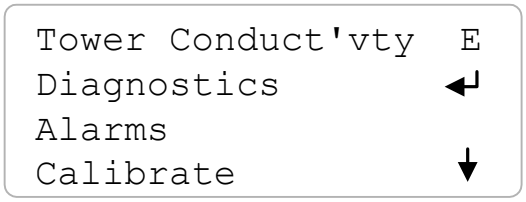
Sensors have driver cards
Water Meters and contact sets connect directly to top-center terminal blocks

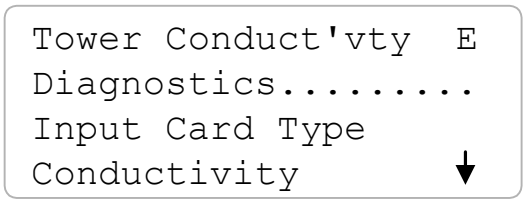
'Operational' sensors are not Alarmed
This example is a sensor operating outside of the HIGH or LOW alarms

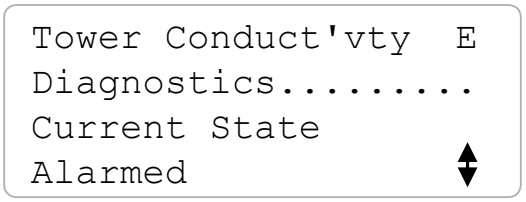
Current displayed value of the sensor and sensor units

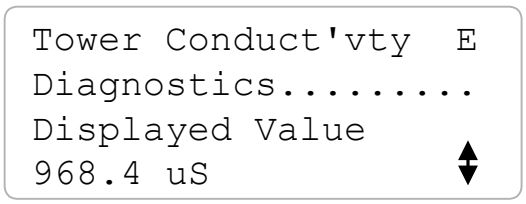
An increasing Gain indicates a fouled sensor
Gain Multiplier changes with sensor calibration

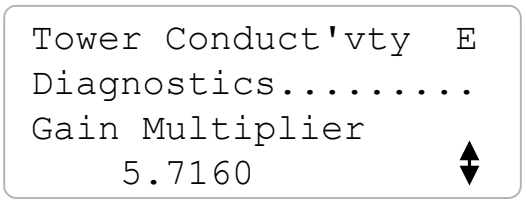






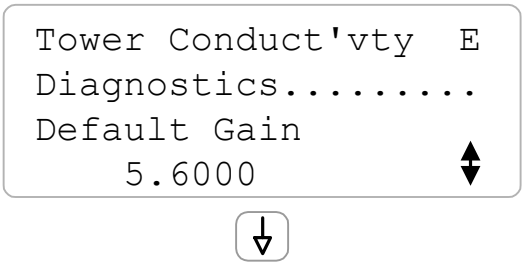






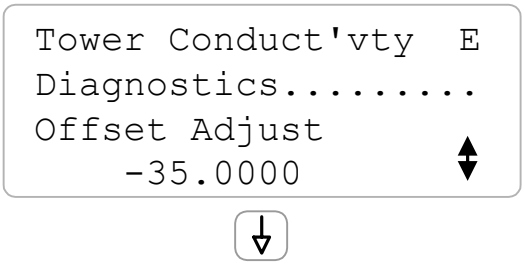
Continued on Page 2

Selecting ‘Reset to Factory’ during sensor calibration sets the Gain Multiplier to the Default Gain

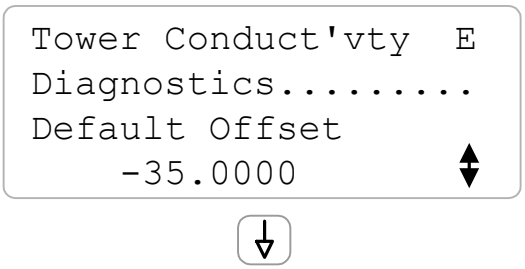


Conductivity adjusts Gain Multiplier to calibrate

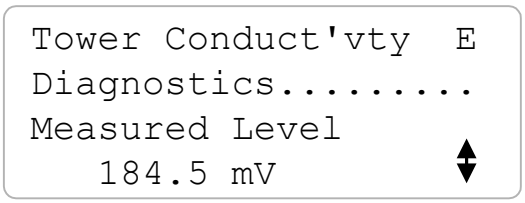
pH, ORP and temperature modifies Offset Adjust to calibrate



Selecting ‘Reset to Factory’ during sensor calibration sets the Offset Adjust to the Default Offset

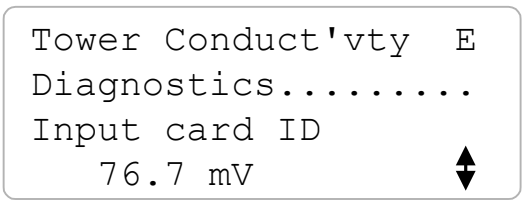


Measured Level is the raw sensor level Before Gain Multiplier and Offset Adjust are applied

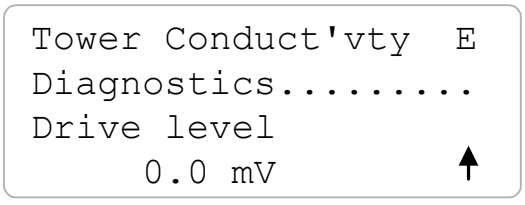


Each driver card range and configuration jumper setting has a unique ID used by the controller to auto-configure

Watermeters and contact sets do not require IDs



Some driver cards have internal drive levels Corrosion Rate cards use Drive Level to correct for DC isolation offsets

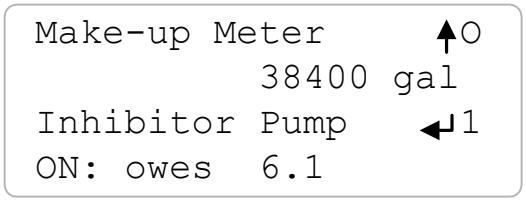


Key EXIT to return to sensor menu

INHIBITOR FEED EXAMPLE page 1

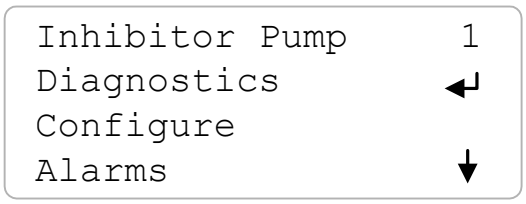
Key UP DOWN to Inhibitor Pump & ENTER.

The pump is ON and owes 6.1 minutes of ON time



Key ENTER at Diagnostics

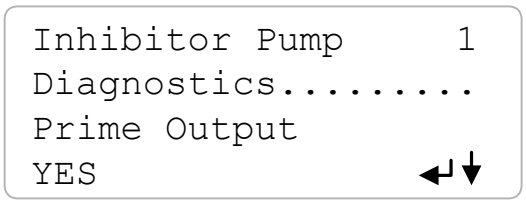
Each control type has it's own set of Diagnostics



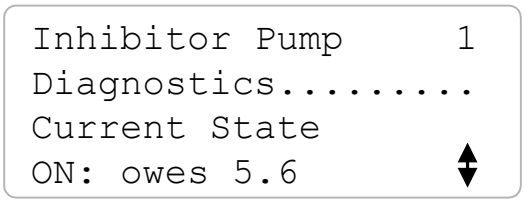
Key ENTER to turn ON the Pump for 5 minutes

WARNING: Immediately turns ON pump Unless blocked, interlocked or on biocide lockout

Select Alarms then Reset Alarm & Time to end Prime Output

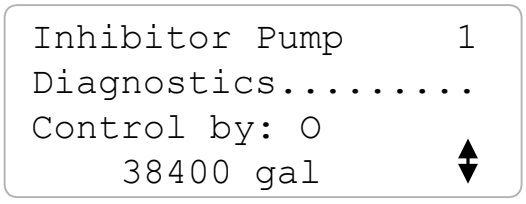


Current State displays Interlocked, Blocked, Timed Out, status messages

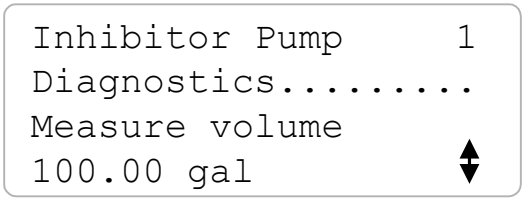


Controlling sensor in this example is water meter 'O'

Current value of control displayed



Volume controls measure a user set volume before turning ON the pump In this example 100 gallons



Continued on Page 2

INHIBITOR FEED EXAMPLE page 2

In this example, after each 100 gallons, the Inhibitor pump turns ON for 20 seconds.

```
Inhibitor Pump     1
Diagnostics.........
Then turn ON for
    20 sec
```

```
Inhibitor Pump     1
Diagnostics.........
Last fed at
    38300 gal
```

Water meter volume when last feed occurred

Event Cycles may repeat every 1,7 or 28 days

This example has 8 events which repeat every 4 weeks, 28 days

Today is Day 9, Monday of week No.2

```
Inhibitor Pump     1
Diagnostics.........
28 Day Event Cycle
8 events, Day 9
```

```
Inhibitor Pump     1
Diagnostics.........
minutes ON today
   110.6 minutes
```

Today's Inhibitor pump ON time from midnight

```
Inhibitor Pump     1
Diagnostics.........
Time Owed
   0.3 minutes
```

Inhibitor pump ON Time Owed
Increases while the cooling tower is making up and decreases to zero when the make-up float closes.

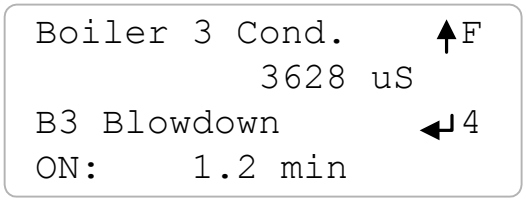
```
Inhibitor Pump     1
Diagnostics.........
Special Control
none
```

Varying Cycles and Feed Verification status Displays follow the Special Control display

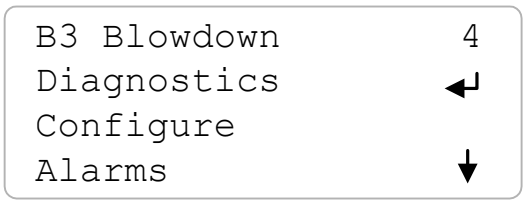
CAPTURED SAMPLE EXAMPLE page 1

Key UP DOWN to the blowdown control & ENTER.

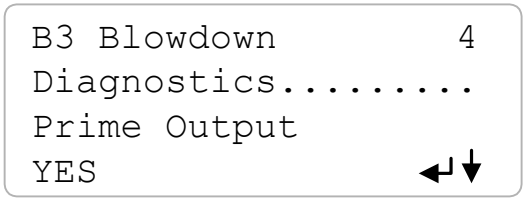
Blowdown valve is ON and has been ON for 1.2 minutes



Key ENTER at Diagnostics

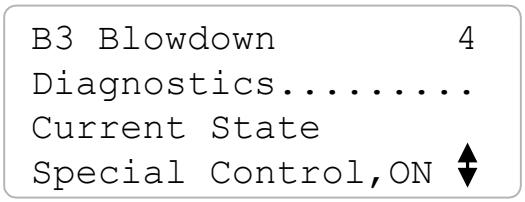


Each control type has it's own set of Diagnostics

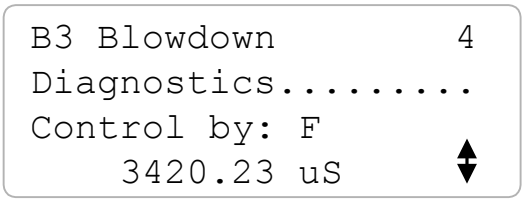


Priming overrides boiler timing, turning ON the blowdown valve for 5 minutes

Select Alarms then Reset Alarm & Time to end Prime Output.

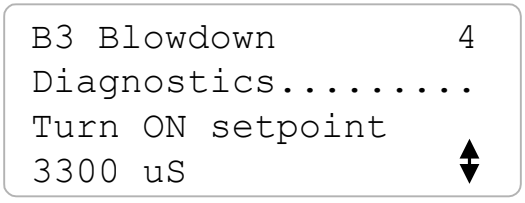


Current State displays that the Captured Sample Special Control has turned ON the Blowdown



Controlling sensor in this example is sensor 'F'

Current value of controlling sensor displayed



Controller checks Turn ON Setpoint at the end of every Measure period

Continued on Page 2

CAPTURED SAMPLE EXAMPLE page 2

Controller checks Turn OFF Setpoint at the end of every Measure period.

Rising Setpoint blows down above Turn ON and samples only below Turn OFF.

It would be unusual to have timed feed events on a boiler blowdown valve.

In this example there are 0 events set and its day 4, Wednesday today

Today's ON time for the blowdown valve from midnight

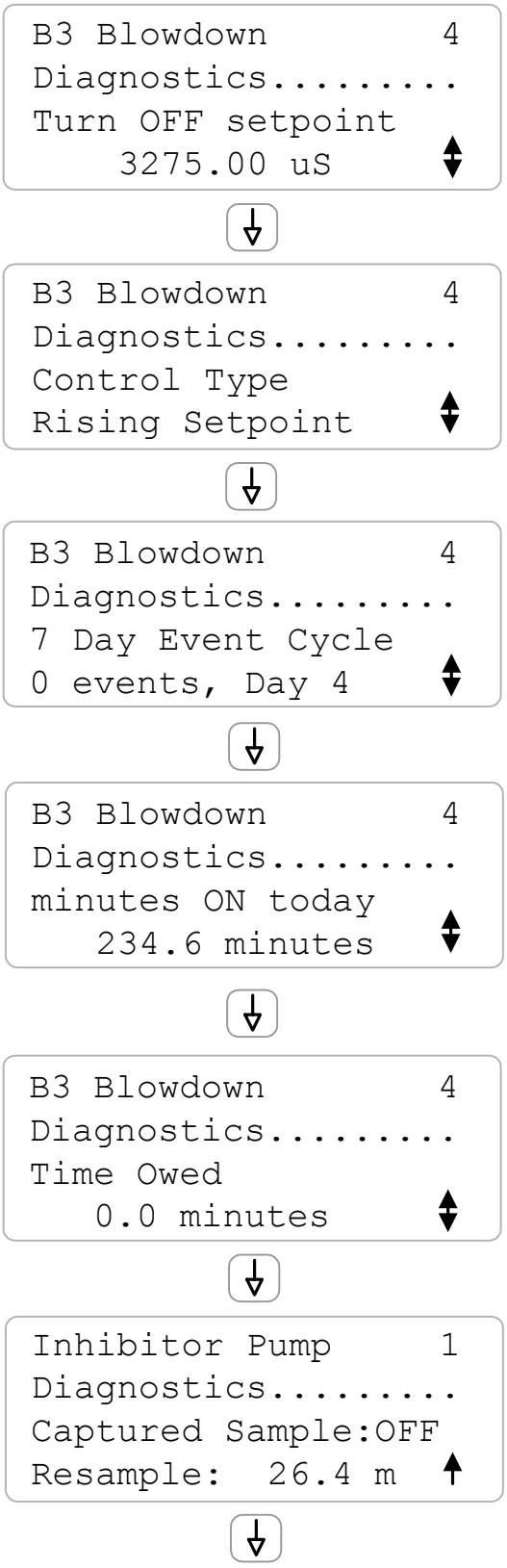
Captured Sample, Time Owed would usually be zero

If Prime Output is active, Time Owed will count down from 5 minutes.

Displays the Captured Sample ON/OFF state and which timer is counting down

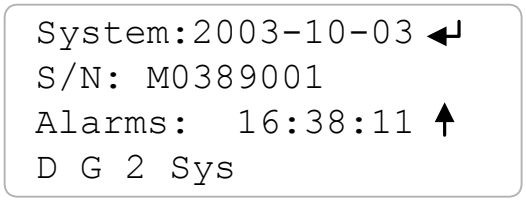
SAMPLE | MEASURE | BLOWDOWN | RESAMPLE are the four captured sample states

Varying Cycles and Fail-to-Sample status Displays follow the state display

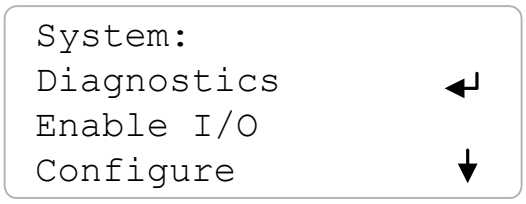


2.5 System Diagnostics 1 of 2

Power ON display
OR key UP DOWN to System: & ENTER.



Key ENTER at Diagnostics

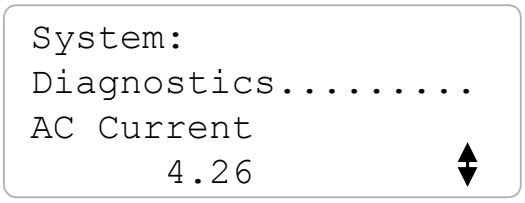


Firmware version is followed by the two modules that form the base controller

M7 is a 7 analog, 7 digital input module
M14 is a 14 analog, 12 digital input module

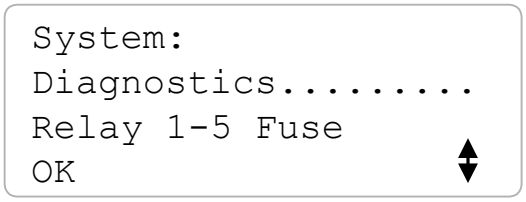
PR10 is a 10 relay output; PR5 a 5 relay output

PR10 controllers include an AC Current Transformer
AC Current is the total controller current including All pumps, valve & solenoid current



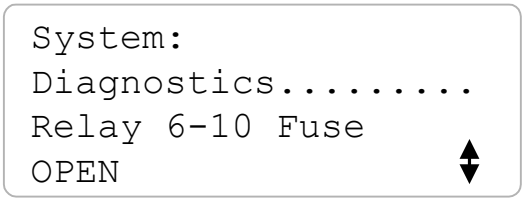
OK is an intact, Relay 1 to 5 load fuse

OPEN is a failed fuse.
Pumps & Solenoids controlled by relays 1-5 are OFF.



OK is an intact, Relay 6 to 10 load fuse

OPEN is a failed fuse.
Pumps & Solenoids controlled by relays 6-10 are OFF.



Continued on Page 2

2.5 System Diagnostics 2 of 2

Current state of alarm contacts

.

The controller may be configured to OPEN or CLOSE alarm contacts on alarm.

.

Displays the current state of the dry contacts at the AL1 & AL2 terminal block on the PR5 or PR10 module

.

.

.

Increasing watchdog resets indicate external electrical spikes or internal controller faults

.

.

.

.

.

.

Date and time of most recent full control reset

.

.

.

.

.

.

A Default Admin Password has not been changed from the factory default

.

.

.

.

.

.

Internal calibration check
Factor required to correct internal 2.5V reference
1 +/- 0.05

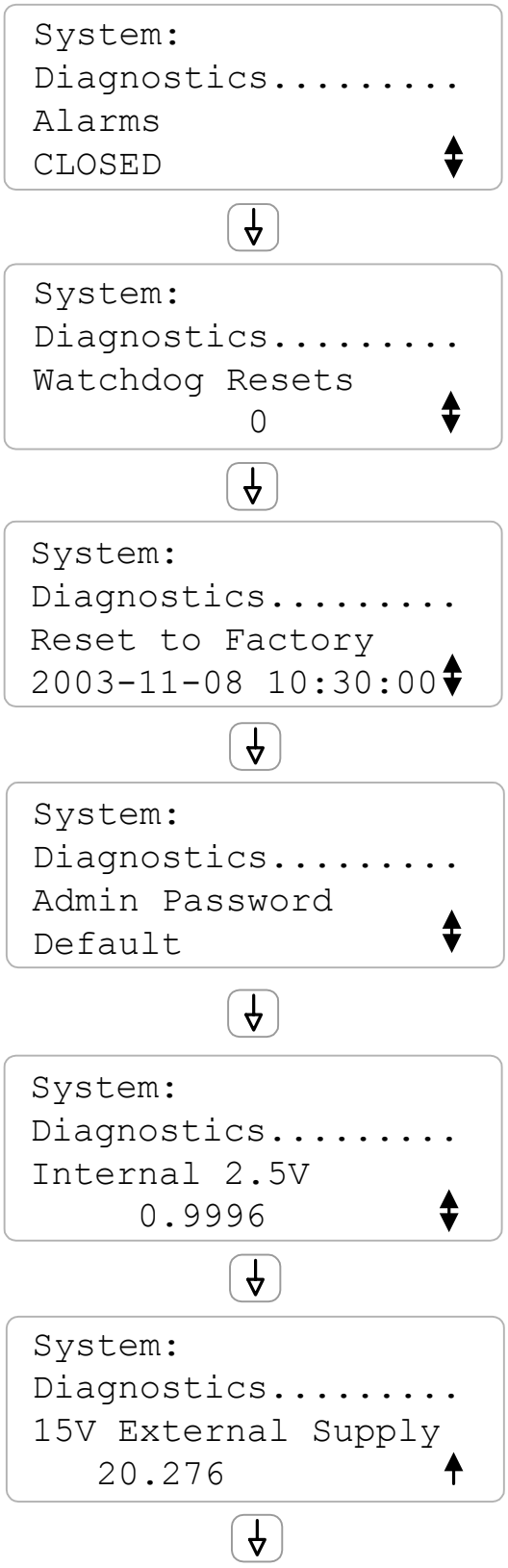
.

.

Current loop and turbine water meter power supply
Thermally fused. Will read <10V if there is wiring a loop or meter fault

.

Internal 12V Relay Supply, Ethernet Option & Feed Verify Option displays follow the 15V display.



3.1 Read this first!

ONE CONTROLLER – MANY APPLICATIONS
Controllers are shipped configured with a wide range of sensors
for one or more cooling towers, multiple boilers, hot & chilled closed loops,
condensate monitoring, waste water control and monitoring…

YOUR CONTROLLER – SENSOR SET
The installation instructions for your specific controller are detailed
in the HELP section YELLOW pages.
HELP is the last tab in the manual binder.

YOUR APPLICATION CHANGES
The controller can be completely reconfigured using the keypad or optional browser
Feed methods and interlocking can be changed.
pH control can be switched to ORP

A tower controller can be switched to waste water or boiler-condensate controls

You need to automate sensor cleaning, measure more water meters,
Feed based on steam production, Bleed on the ratio of make-up & bleed volume…

YOU NEED TO ADD ANOTHER PH, ORP, BOILER CONDUCTIVITY…
Upgrade kits can expand the controller to 14 analog sensors,
10 watermeter-digital inputs and 10 Relay controls

The controller recognizes new sensor drivers and auto-configures.
The digital inputs can be switched between water meter inputs to contact closure inputs.

THE REST OF SECTION 3.
Not all of the following sections apply to your controller or application.
You may need some of these functions as your application evolves.

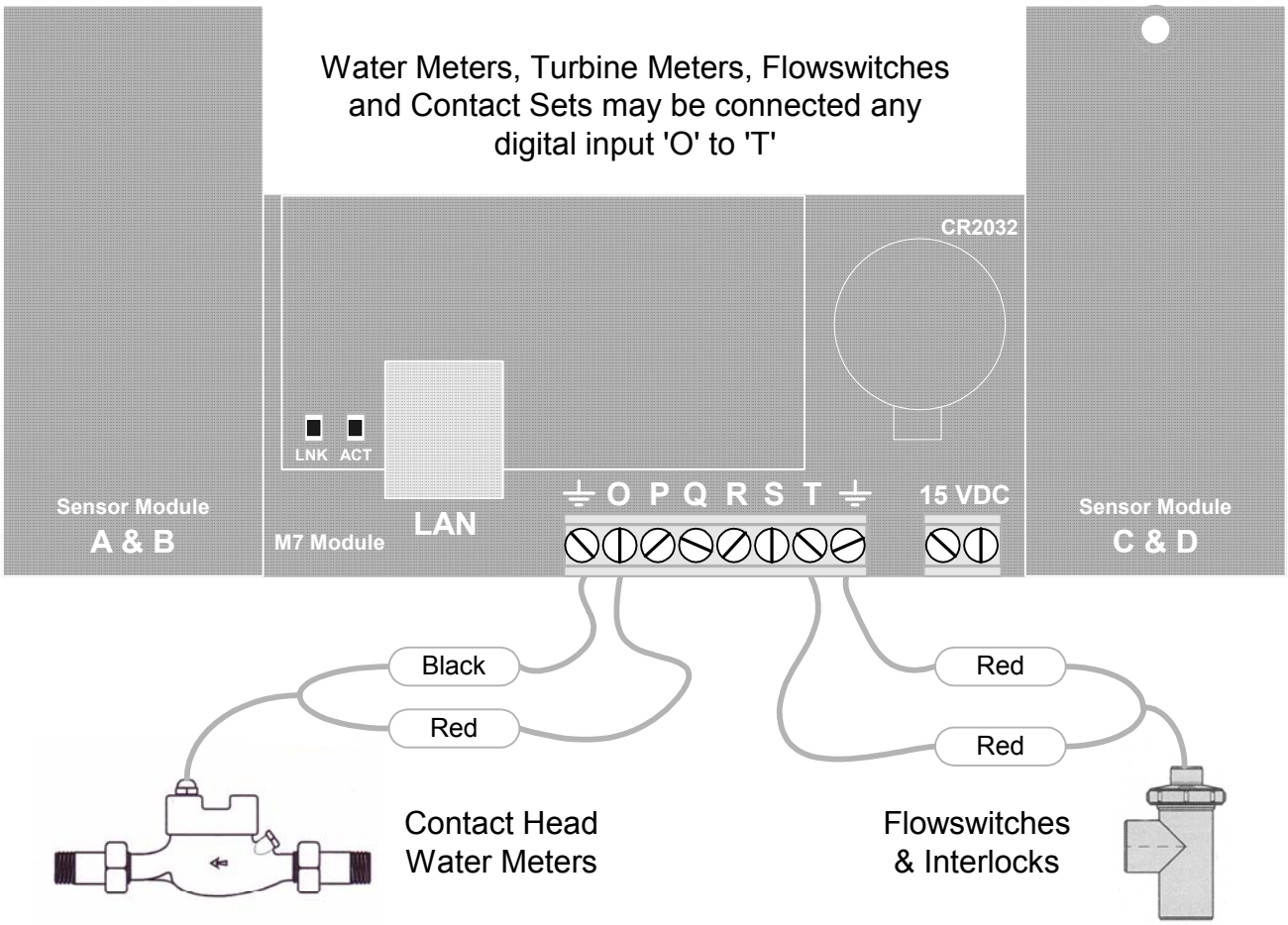
3.2 Connect Sensors 1 of 4

M7 Type Controllers
Water meters are typically connected to inputs O,P & Q.
Flowswitches, fail-to-sample sensors and contact sets connected to R, S & T.

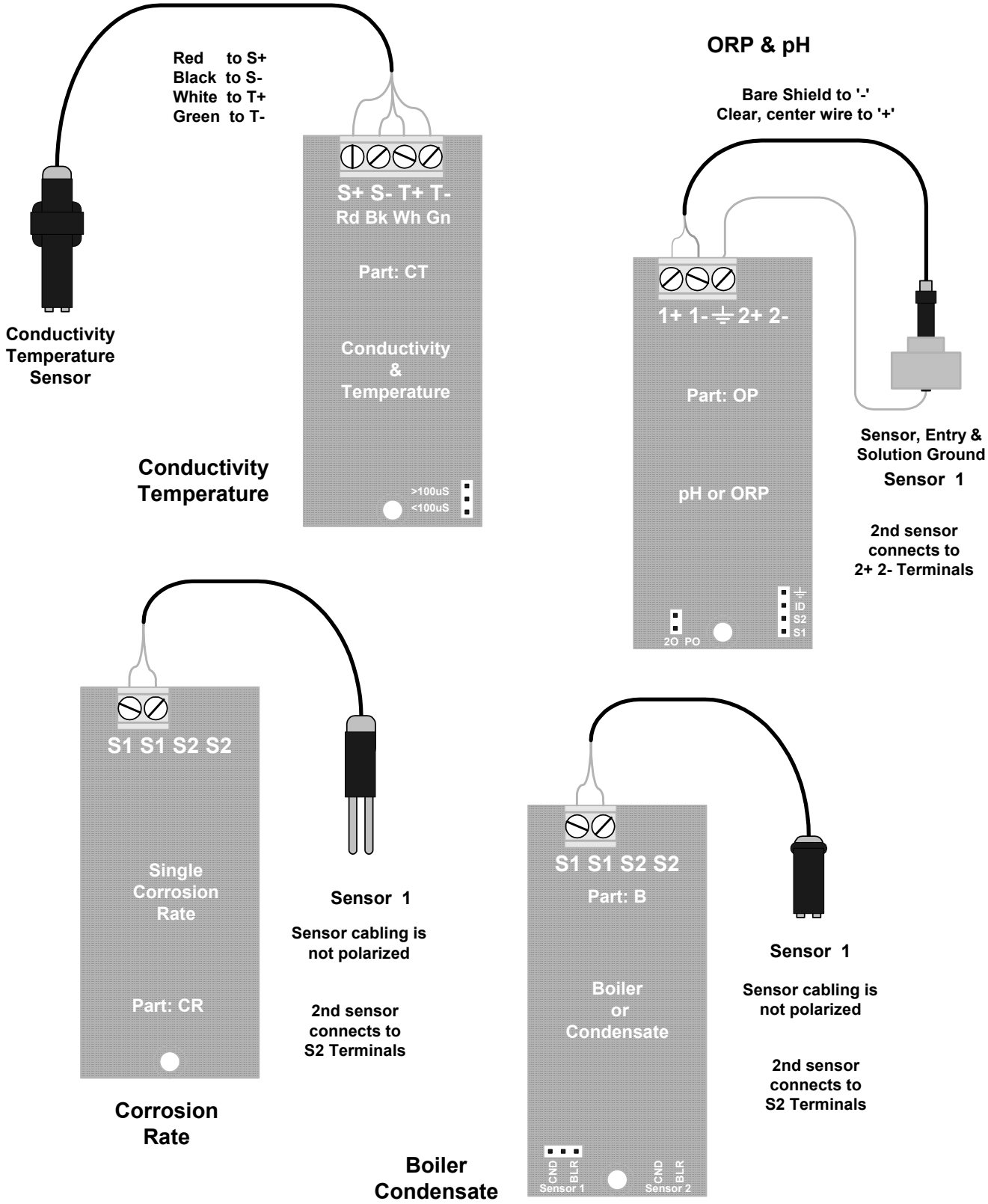
M14 Type Controllers
Water meters are typically connected to inputs O,P & Q and U,V & W.
Flowswitches, fail-to-sample sensors and contact sets connected to R, S & T and X,Y & Z.

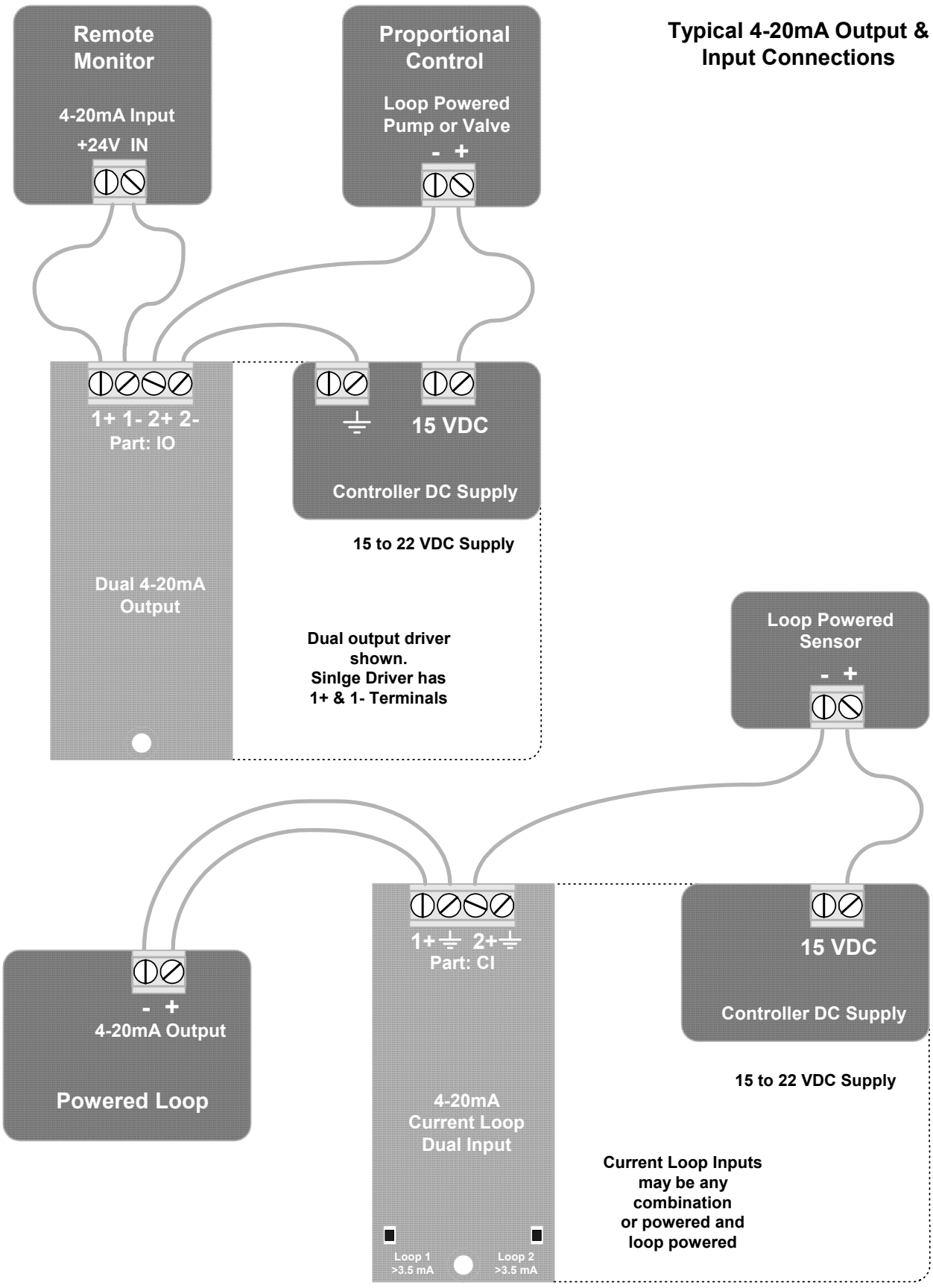
Digital Inputs
Inputs ‘O’ to ‘Z’ may be user configured for water meters and volume measurements OR contact closure and state, interlocking functions

Typical Water Meter & Flowswitch Connections

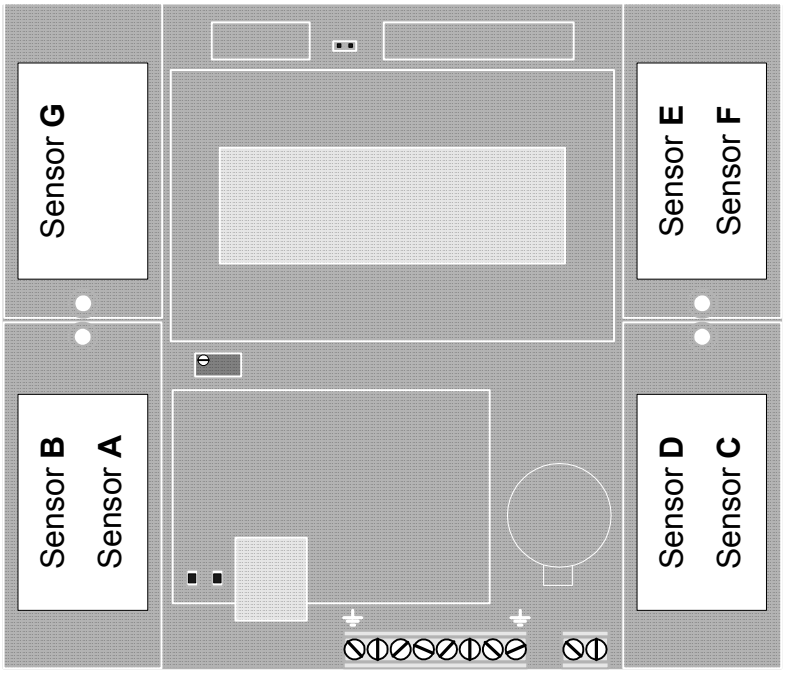


Typical Sensor Driver Connections

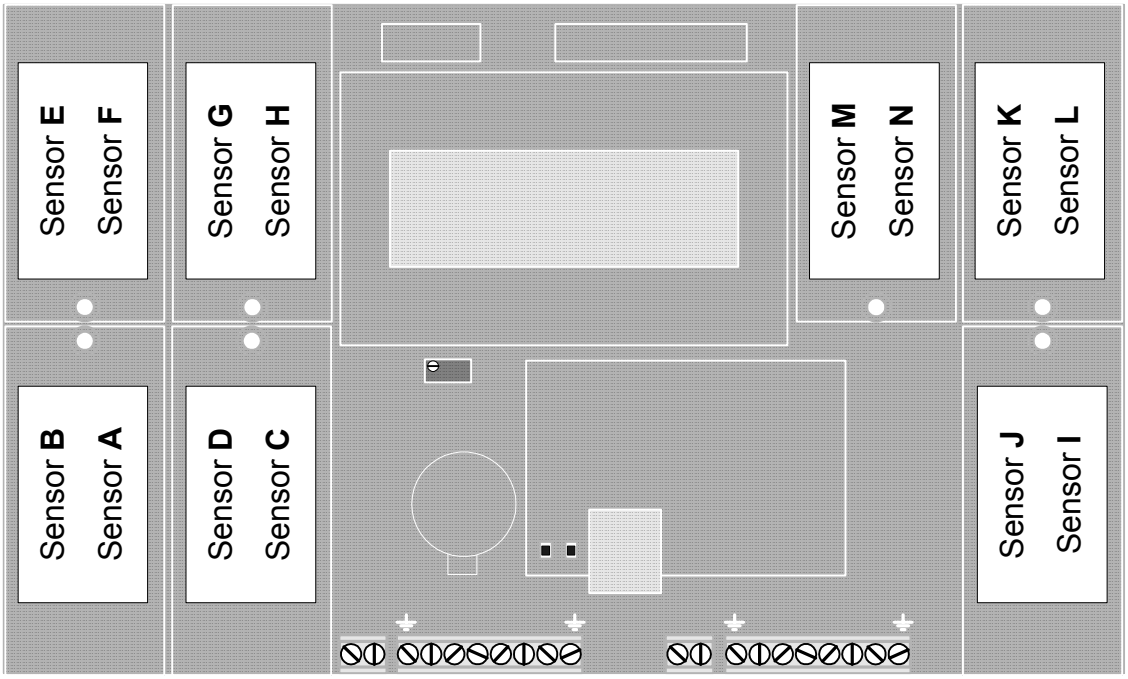



Typical 4-20mA Output & Input Connections
Remote Monitor
4-20mA Input
+24V IN
Proportional Control
Loop Powered Pump or Valve
- +
1+ 1- 2+ 2-
Part: IO
15 VDC
Controller DC Supply
15 to 22 VDC Supply
Dual 4-20mA Output
Dual output driver shown.
Sinlge Driver has
1+ & 1- Terminals
Loop Powered Sensor
- +
- +
4-20mA Output
Powered Loop
1+ 2+
Part: CI
15 VDC
Controller DC Supply
15 to 22 VDC Supply
4-20mA Current Loop Dual Input
Loop 1 >3.5 mA
Loop 2 >3.5 mA
Current Loop Inputs may be any combination or powered and loop powered

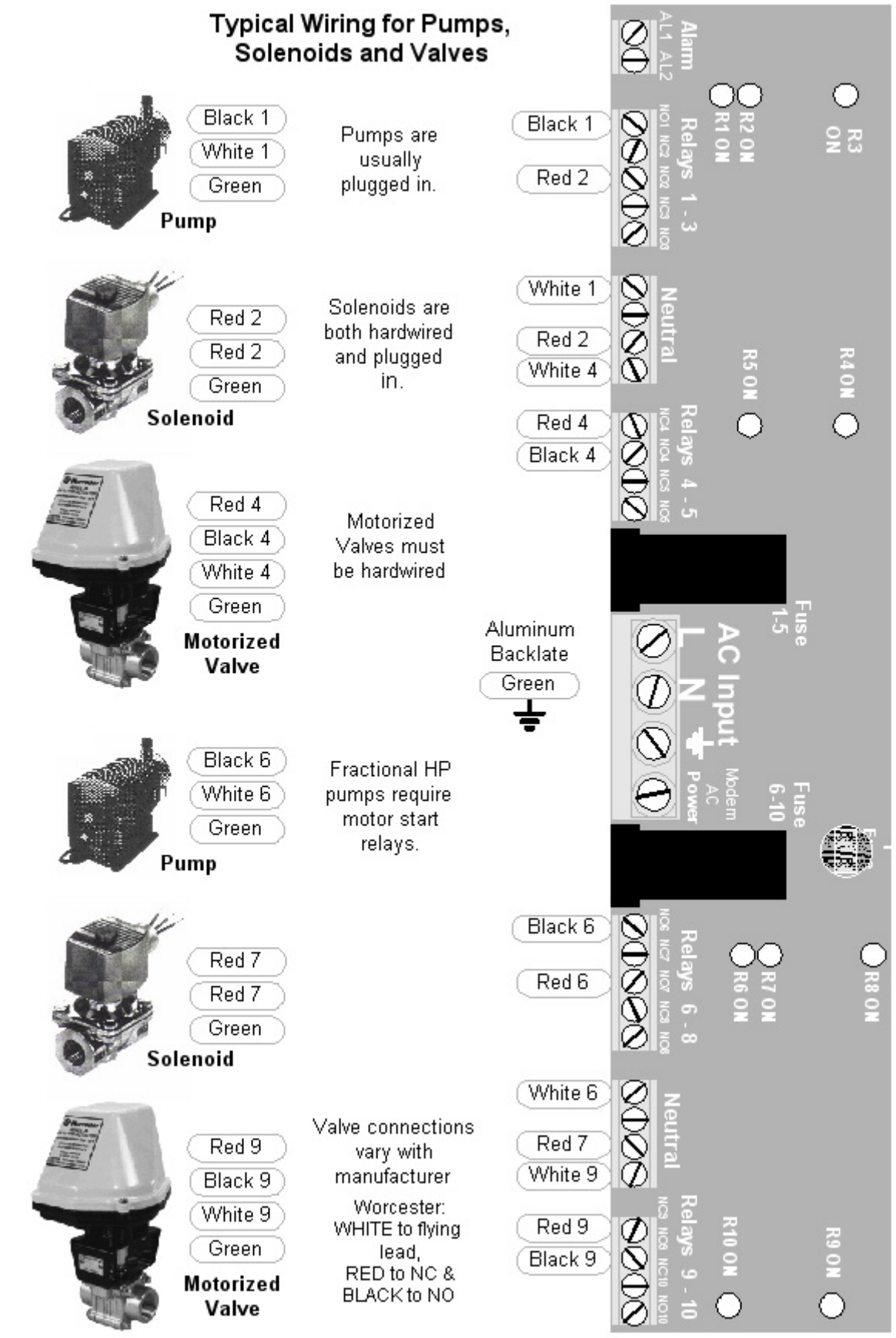
M7 Module
Sensor Locations



M14 Module
Sensor Locations



3.3 Connect Pumps,Valves,Solenoids

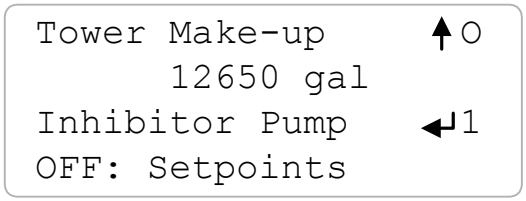


VERIFY SENSORS MATCH CONTROLS

Controlling sensors are followed by the controlled pumps, valve & solenoids.

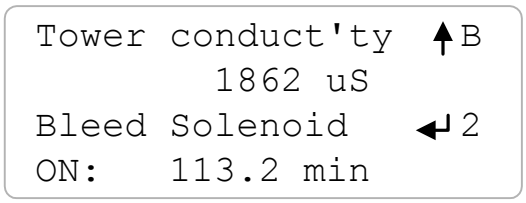
Make-meter connected to input 'O'.
Controls the inhibitor pump powered by Relay 1.

Key ENTER to verify, modify pump setpoints



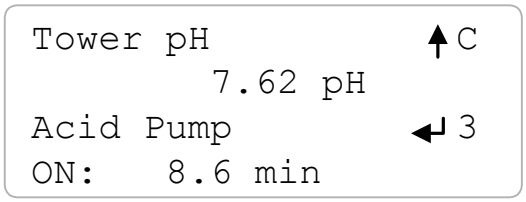
Conductivity Sensor connected to 'B'
Controls the bleed solenoid powered by Relay 2

Key ENTER to verify, modify bleed setpoints



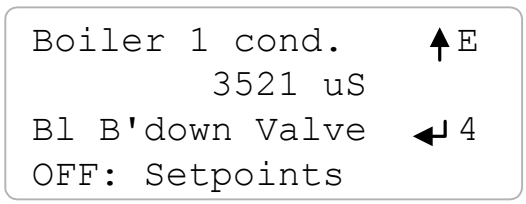
pH Sensor connected to 'C'
Controls the acid pump powered by Relay 3

Key ENTER to verify, modify acid feed setpoints
Page 2 shows key sequence

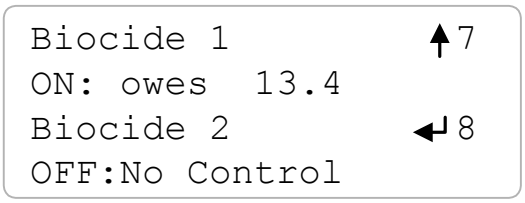


Boiler Conductivity Sensor connected to 'E'
Controls the blowdown valve powered by Relay 4

Key ENTER to verify, modify blowdown setpoints



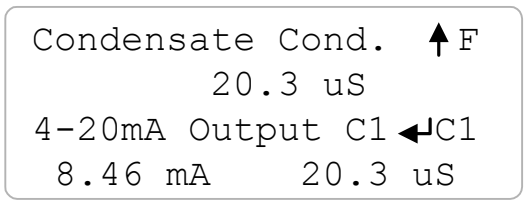
Biocides follow sensor no used for control
As you key UP DOWN



Sensors may be used to control 4-20mA outputs
In controllers with IO Driver cards

Condensate Monitoring Sensor connected to 'F'
Controls the C1 4-20mA control

Key ENTER to verify, modify 4-20mA span



VERIFY – MODIFY SETPOINTS

The Tower pH sensor at input 'C'
Controls the acid pump powered by relay 3

.

Key ENTER at Acid Pump to verify-modify setpoints

.
.
.
.
.

Key DOWN to Configure and key ENTER

.
.
.
.
.

Key DOWN to Turn ON Setpoint

Its' currently 8.25pH, Key ENTER to Modify.

.

Key DOWN to verify-modify Turn OFF Setpoint.

.
.
.
.

Key ENTER at 4-20mA display

.

Key DOWN to Configure & key ENTER

.
.
.
.
.
.
.
.

4mA level = 0uS

.

Key ENTER to modify or DOWN
to verify-modify 20mA Level

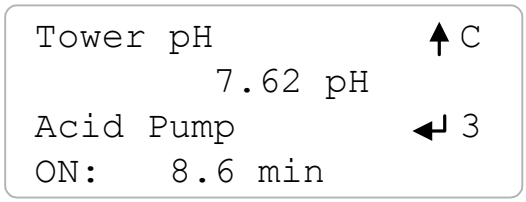
.
.

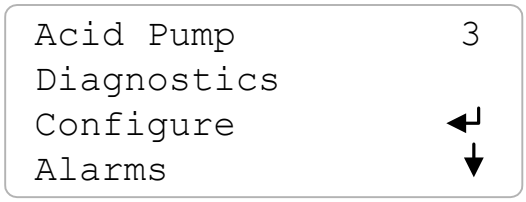
20mA level = 100uS

.

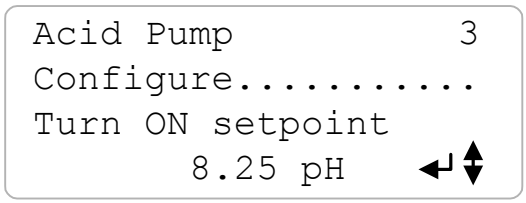
Key ENTER to modify

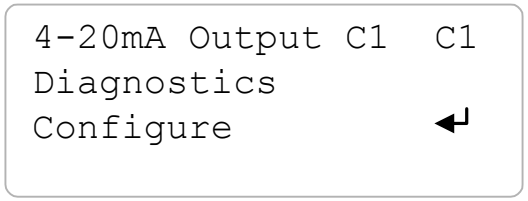
.



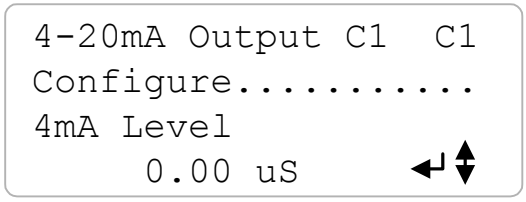


then

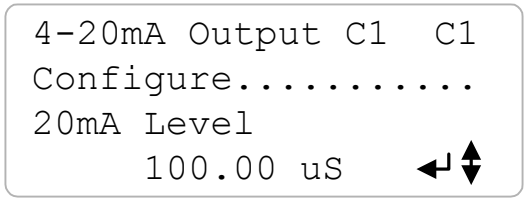




then



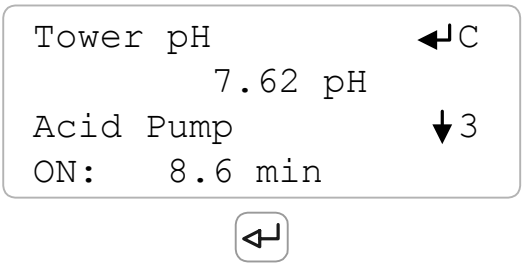
or



3.5 Setting Sensor Alarms

VERIFY – MODIFY ALARMS

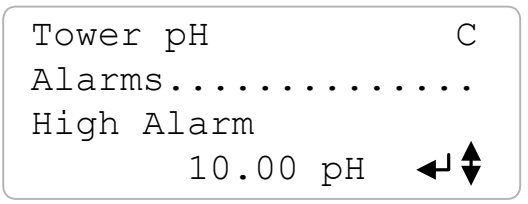
Key UP DOWN to the target sensor and key ENTER



Key DOWN to Alarms and key ENTER

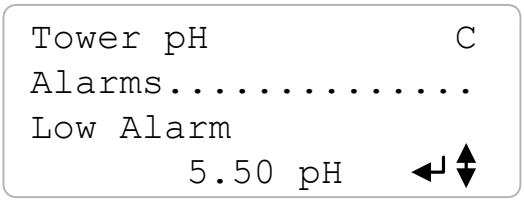
then

Key ENTER to modify High Alarm or DOWN for Low Alarm



or

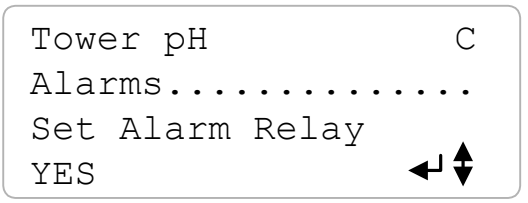
Key ENTER to modify Low Alarm or DOWN for Alarm Relay



or

A Tower pH alarm will trip the controller alarm relay

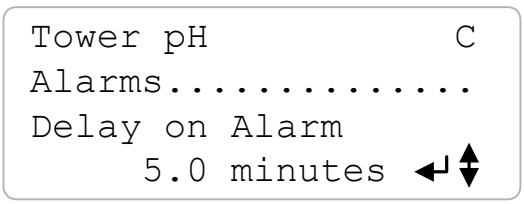
Key ENTER & UP DOWN to select NO to not set the alarm relay on a pH alarm



or

A high or low alarm will register 5 minutes after it occurs, to block alarms on transients

Key ENTER to modify
A delay of 0.0 minutes will alarm immediately.



VERIFY – MODIFY
FEED LIMIT ALARMS

Key UP DOWN to the target control and key ENTER

.
.
.
.
.
.

Key DOWN to Alarms and key ENTER

.
.
.

An acid pump limit timer prevents overfeed on pH sensor fault.

.
.

Key ENTER to modify Minutes/Actuation or DOWN for Minutes/Day

.
.
.
.
.

Key ENTER to modify Minutes/Day or DOWN for action on alarm

.
.

Acid pumps are usually set to Turn OFF on Alarm

Bleed controls are usually set to NOT Turn OFF on alarm.

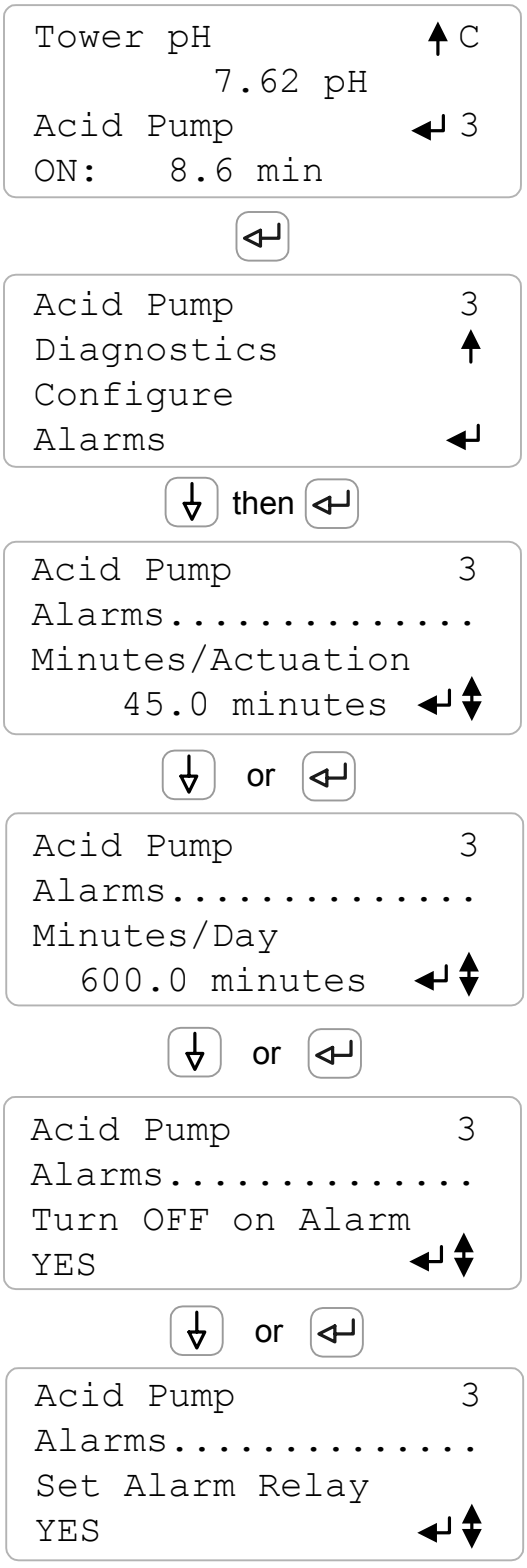
.
.
.

A feed limit alarm will trip the controller alarm relay

Key ENTER & UP DOWN to select NO to not set the alarm relay on feed limiting.

.

Key down to view Reset & Most Recent Alarm.



3.7 Verify Interlocks

INTERLOCKS PREVENT CONTROLS FROM TURNING ON

Key UP DOWN to the target control and key ENTER

.
.
.
.
.

Key DOWN to Configure and key ENTER then key DOWN to Interlocked by

.
.
.
.

In this example, when the Flowswitch connected to input 'T' closes, the Tower Bleed can operate

.

Key ENTER to modify the interlock

.
.
.

In the 2nd example, Steam Treatment is being fed based on Steam demand

.
.

Key ENTER , then key DOWN to Configure and key ENTER

.
.
.
.

Key DOWN to Interlocked by

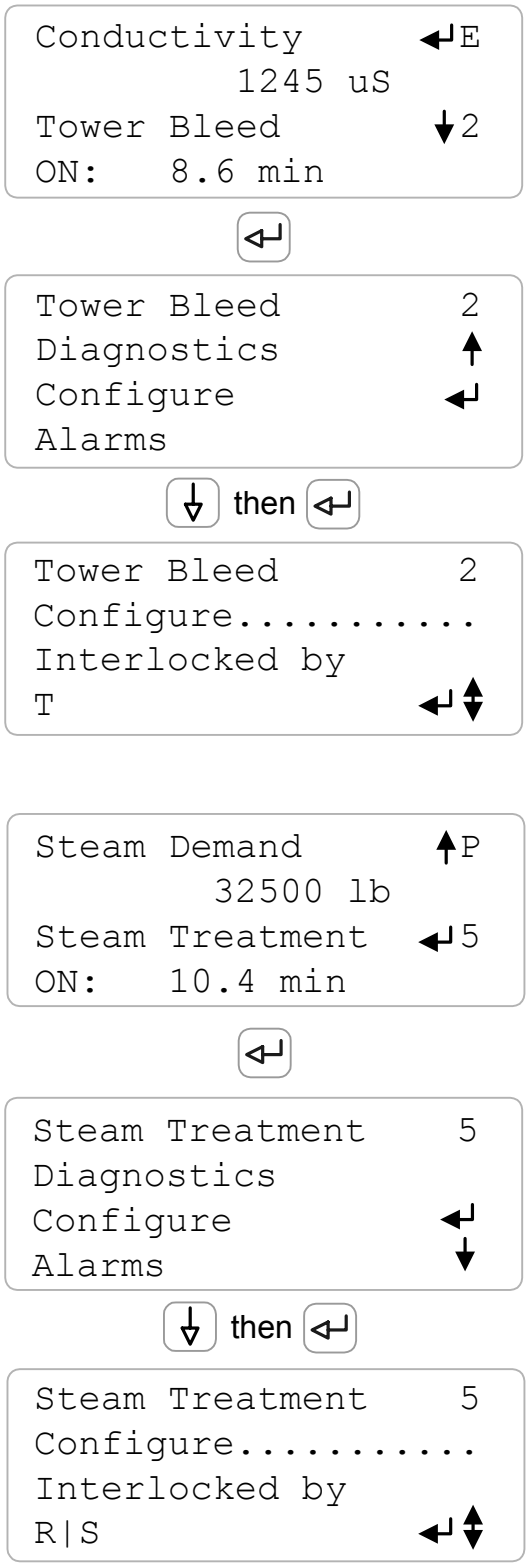
An R | S, 'ORS' requiring either R or S contact sets closed to operate the pump

.

R+S 'ANDS', requiring both R & S contact set to be closed to operate the pump

.

In this example, R & S may close when Boiler s1 & 2 are ON-line



3.8 Verify Blocking Relays

BLOCKING PREVENTS TWO CONTROLS FROM TURNING ON AT THE SAME TIME

This example shows an Inhibitor Pump,1 blocked when the Oxidant Pump,3 is ON to prevent Inhibitor – Oxidant reaction

.
.

Key ENTER

Key DOWN to Configure and key ENTER then key DOWN to Blocking Relays

.
.
.

This example shows that Relay 1 is OFF whenever relay 3 is ON

.

Key ENTER to modify the blocking relay Selecting 'none' removes the block

.
.
.

This example shows an Inhibitor Pump turned OFF when Relay 2 is ON.

.

Relay 2 is a tower bleed solenoid. This block stops Inhibitor from being pumped down the tower drain

.
.

Key ENTER , then key DOWN to Configure and key ENTER

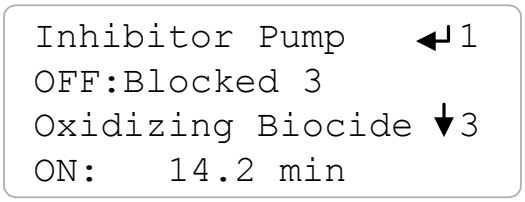
.
.

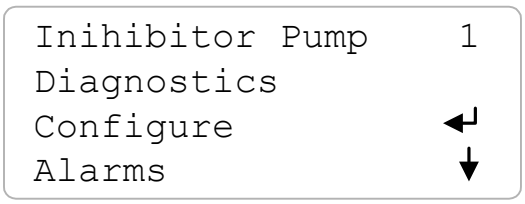
Key DOWN to Blocking Relays

A '2+3' block would prevent the Inhibitor from feeding during bleed AND Oxidant feed.

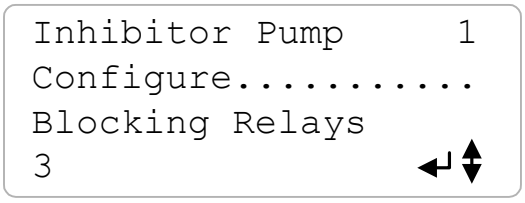
.

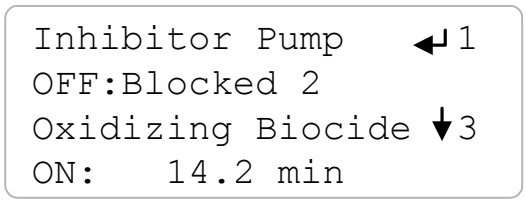
Key ENTER to modify the blocking relays

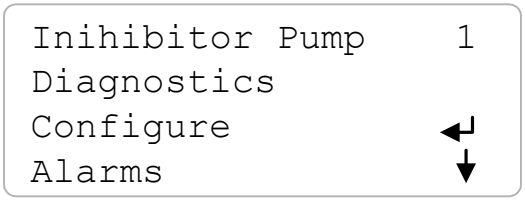




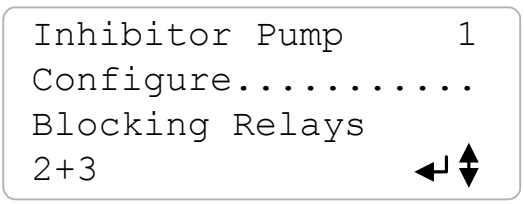
↓ then ↵







↓ then ↵

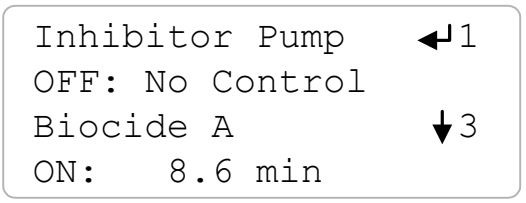


3.9 Selecting Special Controls

This example shows an Inhibitor Pump with 'Bleed then Feed' Special Control

.
.

Key ENTER



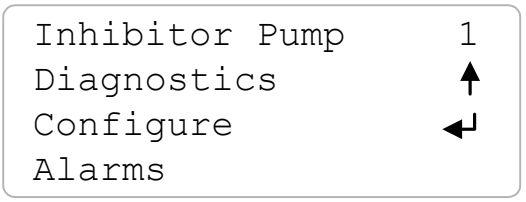
Key DOWN to Configure and key ENTER
then key DOWN to Special Control

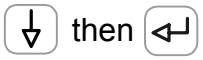
.

Displays current special control

.

Key UP DOWN to view available Special Controls
Meter controlled relays do not have Special Controls





No Control & sensor controlled relays can select from:
Bleed & Feed, **Bleed then Feed**, **Captured Sample**, **% Time**, **Prebleed-Lockout**, **Time Modulation**, **Holding Time** and **Time Modulation**

.

Key ENTER to view, modify current Special Control

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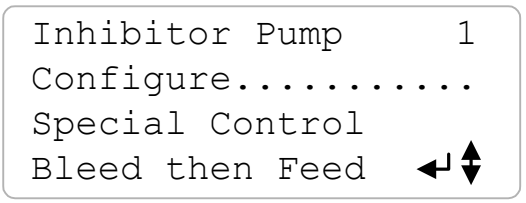
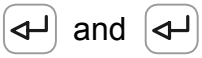
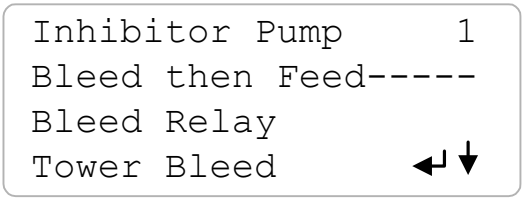
.
.
.





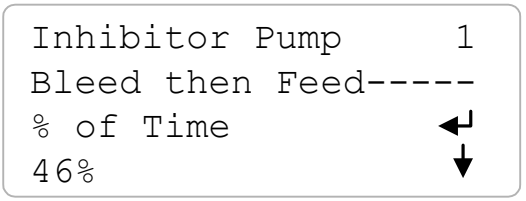


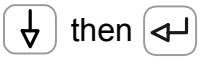
Key ENTER to modify the Bleed Relay
Or DOWN to view the % of Time

.
.
.

In this Bleed Then Feed example:
For every 5 minutes of Tower Bleed time,
the Inhibitor runs for 46% or 136 seconds
AFTER the bleed turns OFF

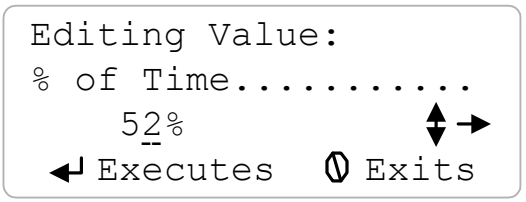
.
.
.





Key ENTER to modify the % of Time
This example increase the % of time from 46% to 52%

.
.



Special Controls are detailed in the on-line
M714_Tech, technical service manual

3.10 Modifying Variable Cycles 1 of 2

Variable Cycles may be used where varying make-up conductivity cause water treatment fault.

Requires a make-up conductivity sensor

.

Key ENTER

.

.

.

.

Key DOWN to Variable Cycles and key ENTER

.

.

.

.

.

.

Key ENTER to modify Low Range

.

.

When the Make-up Conductivity is less than Low Range
Bleed is controlled at Low Cycles

.

Key ENTER to modify the Low Cycles

.

.

.

.

.

.

Key ENTER to modify Medium Range

.

.

When the Make-up Conductivity is less than Medium Range & greater than Low Range
Bleed is controlled at Medium Cycles

.

.

Key ENTER to modify the Medium Cycles

.

.

```
Conductivity        E
      1384 uS
Tower Bleed         2
ON:   8.6 min
```

↵

```
Tower Bleed         2
Timed Events        ↑
Setup
Variable Cycles     ↵
```

↓ then ↵

```
Tower Bleed         2
Variable Cycles.....
Low Range
      350 uS        ↵↕
```

↓ or ↵

```
Tower Bleed         2
Variable Cycles.....
Low Cycles
   6.100 cycles     ↵↓
```

↓ or ↵

```
Tower Bleed         2
Variable Cycles.....
Med. Range
      650 uS        ↵↓
```

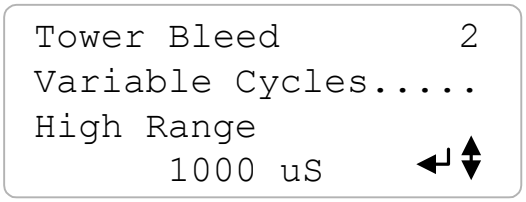
↓ or ↵

```
Tower Bleed         2
Variable Cycles.....
Med. Cycles
    4.250 cycles    ↵↓
```

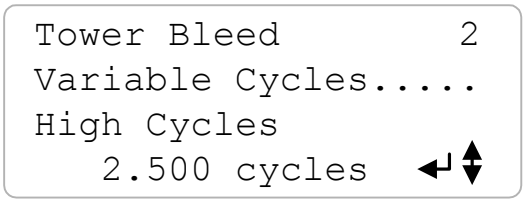
↓ or ↵ **Continued on Page 2**

3.10 Modifying Variable Cycles 2 of 2

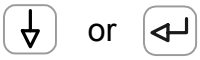
Key ENTER to modify High Range



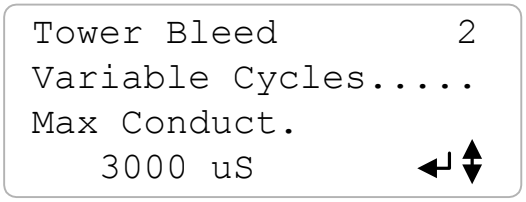
When the Make-up Conductivity is less than High Range & greater than Med. Range Bleed is controlled at High Cycles



Key ENTER to modify the High Cycles



When the Tower Conductivity exceeds Maximum Conductivity the Bleed is controlled at Max Conductivity



Key ENTER to modify the Maximum Conductivity

Variable Cycles Primer

Variable Cycles must be set to YES in the Bleed control **Configure** menu option

The bleed relay must be controlled by a conductivity ratio.
Example: Control Equation is **E/F** where **E** = Tower Conductivity & **F** = Makeup Conductivity.
The Control Equation may be modified in the Bleed control **Configure** menu option

Variable Cycles modifies bleed setpoints as make-up conductivity changes
Setpoint adjustment is blocked when Variable Cycles is controlling.

Bleed Setpoint units are set to 'cycles' when Variable Cycles are selected.

You will need to modify the Range and Cycle Setpoints for your site makeup water chemistry and water treatment program

3.11 Modifying Feed Verification 1 of 2

Controller Option: Feed Verification calculates Inhibitor ppm and Inhibitor tank level with fail-to-feed alarms.

Requires a feed verification meter on the inhibitor chemical pump feed.

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Key ENTER

.

.

.

Key DOWN to Feed Verify and key ENTER

.

.

.

The Verify Meter measures the volume pumped by the inhibitor pump

.

Key ENTER to modify Verify Meter sensor location

.

.

.

Inventory Location logs tank level, lowering level as inhibitor is pumped

.

Key ENTER to modify Inventory location

.

.

.

ppm location logs the calculated ppm based on volume pumped and the method used to calculate cycles

.

Key ENTER to modify ppm location

.

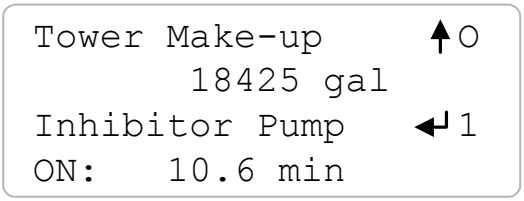
.

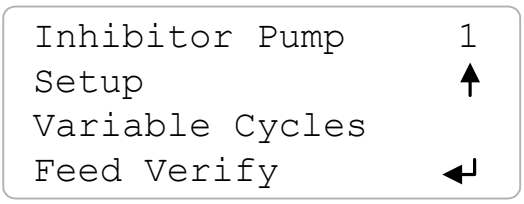
One of three methods is used to calculate cycles
Fixed Cycles | Bleed Cycles | Meter Cycles

.

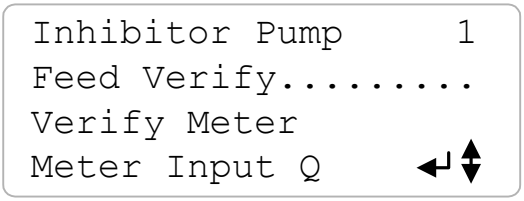
Key ENTER to modify the cycles method

.

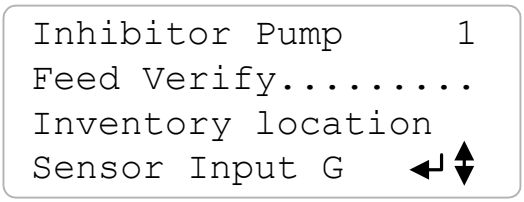




then



or



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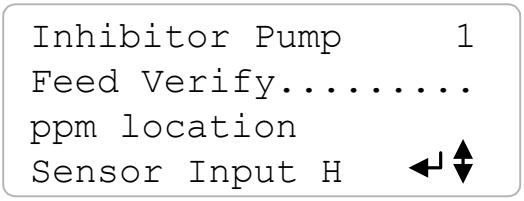
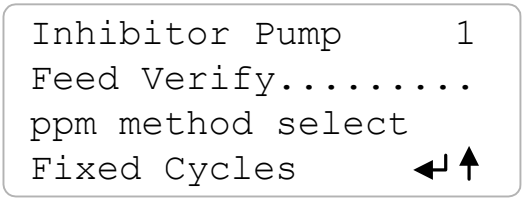


or



Continued on Page 2

Fixed Cycles applies a user set cycles to calculate ppm

Key ENTER to view-modify cycles

```
Select one:
ppm method select...
Fixed Cycles
↵ Executes  Exits
```

ppm is calculated using 3.5 cycles of concentration
Key ENTER to modify

```
Inhibitor Pump     1
ppm method select---
Fixed Cycles
    3.500 cycles  ↵
```

Key UP DOWN and RIGHT to modify then ENTER

Increasing the concentration from 3.5 to 4.23 increases the calculated ppm.

```
Inhibitor Pump     1
Fixed Cycles........
    4.230 cycles
↵ Executes  Exits
```

then

Feed Verification Primer

Feed Verification must be set to YES in the Inhibitor pump control **Configure** menu option

The Inhibitor pump relay must be controlled by the make-up water meter.

A fail-to-feed alarm is set on the feed verification meter input if the meter does not measure volume after the pump has been ON for 30 seconds

Meter Cycles ppm calculation requires a water meter on the tower bleed.
Cycles of concentration is calculated using ratio of the Make-up to Bleed meter volumes

Bleed Cycles ppm calculation requires the conductivity of the tower make-up.
Cycles of concentration is calculated using ratio of the Tower to Make-up conductivities

3.12 Time & Date

Time & Date are battery backed
Adjusting Timer & Date may not be required on start-up

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.

Key ENTER at System:

.
.
.
.

Key DOWN to Time & Date and key ENTER

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.
.
.
.

Displays current Date and Time

.
.

Key ENTER to modify

.
.
.
.

Key UP DOWN and RIGHT to modify the Date and Time

.
.

Key ENTER

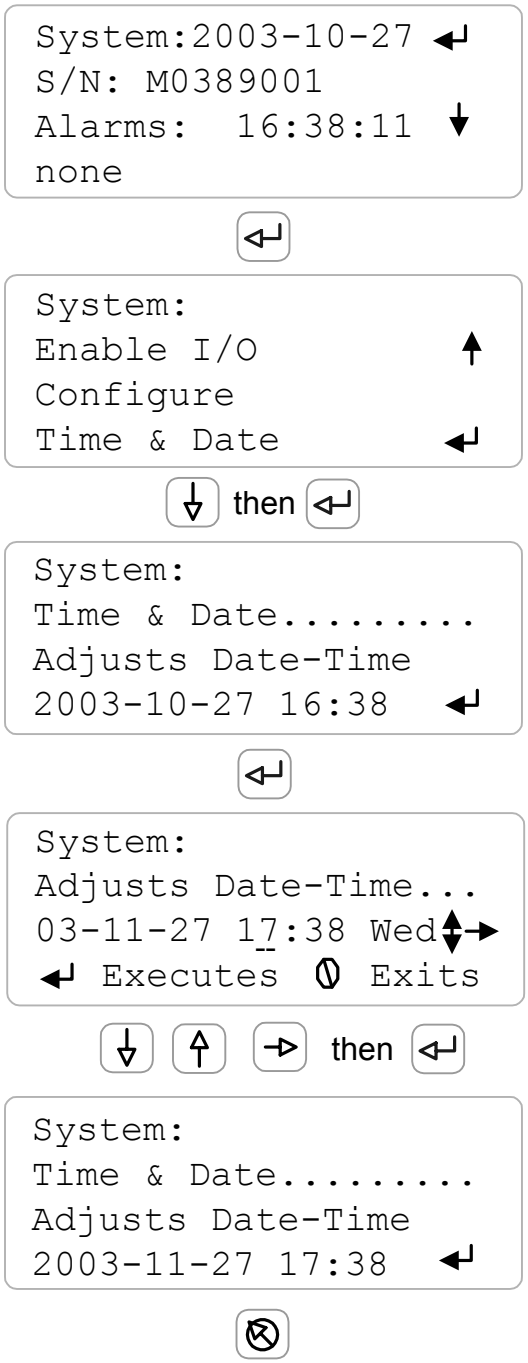
.
.

Displays modified Date & Time

.

EXIT returns to System:

.



4.1 Spare Parts

Fusing

Protects	Rating / Type	Manufacturer - Vendor
Power Relays Fuse 1-5 & Fuse 6-10	 6.3 Amps @ 120VAC 3.15 Amps @ 250VAC 5mm x 20mm, Fast Acting	Littlelfuse, Type 217, 250VAC Digikey Part# F953-ND Digikey Part# F950-ND www.digikey.com 1-800-344-4539
Controller – Modem Control Fuse	 1 Amp @ 120VAC ½ Amp @ 250VAC	Cooper Bussmann, PC-TRON, PCC Series, 250VAC Digikey Part# 283-2118-ND Digikey Part# 283-2120-ND www.digikey.com 1-800-344-4539

Controller Parts

Part#	Description
Fuses-M	120VAC Fuse Kit, 20 x 6.3A Relay Fuses, 4 x 1 Amp control fuses
Cable-Xover	Crossover cable, Controller RJ45 to Notebook NIC
Mod-LCD4	Replacement 4x20 LCD Display
Mod-M3000	Micro controller module
Mod-M7	Seven analog, Six digital input module
Mod-M14	Fourteen analog, Twelve digital input module
Mod-PR5	Five power relay, power module
Mod-PR10	Ten power relay, power module
Modem	Modem, serial cable & power cube
PBOX4	120VAC Four Plug box, flex conduit & fittings, pre-wired
PBOX2	120VAC Two Plug box, flex conduit & fittings, pre-wired
H-SEN6	Sensor entry gland, six cable seal

Replacement Sensors and Upgrade Kits
Refer to 4.2 Technical Support

4.2 Technical Support

[Insert OEM contact, site information]

Other Keypad Functions
Navigation to keypad functions is detailed in Section 4.4, Keypad Navigator

Upgrade Kits
Controls can be added to installed controllers.
Upgrade kits include sensor, entry fitting, driver card and installation instructions

On-Line Help
Internet HELP is linked in real time by browser users
with internet accessible controllers

Keypad connect to www.aquatrac.com/help with ‘iNet HELP#’ from LCD display

Browser Users Manual
Download **M714_browse** from www.aquatrac.com

Controller Technical Manual
Download **M714_tech** from www.aquatrac.com

Controllers configured M7-PR5, M7-PR10, M14-PR5 & M14-PR10

Analog – Digital I/O	Rating - Detail	Notes
Analog Inputs	**M7**: 7 Analog Sensors **M14**: 14 Analog Sensors	3 Dual & 1 Single Driver 7 Dual Drivers Auto-configure on Driver installation and removal
4-20 ma Outputs	0 to 8, DC isolated, loop powered. Nominal 0.1% resolution. Auto polarity correction field wiring.	Single & Dual Drivers Each 4-20mA output uses an Analog Input. Auto-configure on Driver installation and removal
Digital Inputs	**M7**: 6 **M14**: 12 Dry Contacts, 250mS response Water Meters, 400 Hz max 0.5mA @ 5VDC measurement current	User configurable as water meters or contact sets. Contact head meters software debounced. Turbine-Paddle wheel rating = Seametrics max pulse rate.
Relay Outputs	**M7**: 5 1 SPST, 4 SPDT **M14**: 10 2 SPST, 8 SPDT	Relays rated 10A, 120VAC Fused in sets of 5 relays Detection and Alarm on fusing
Alarm Relay	Dry contact set, Unfused	User selected NO or NC
Load Current	**PR10** Only	Measures total AC load current

Communications User Interface	Rating – Detail	Notes
Keypad - LCD	5 Key Tactile feedback: UP / DOWN / ENTER / EXIT / RIGHT 4 Line x 20 Character, Backlit	Scan rate 100mS nominal User adjustable contrast
10 BaseT, TCP-IP Ethernet LAN (Optional)	HTML, Telnet micro Web Server Full command, control, reconfigure via browser. Network parameters and ports User set.	Password, UserID protected. Browser can show LCD is real time. Auto-configures views linking sensors and controls. HELP links for on-line users.
Modem (Optional)	56K, V.90 Remote Telnet access. Dedicated controller serial port.	Dial-out on alarm to pager or PC Forced dial-out diagnostics

Controls	Rating - Detail	Notes
ON/OFF	User set deadband and controlling sensor(s) or contact set. User defined rising, falling or between Setpoints or active only during timed events	Any relay can be user configured for any Control. Control by up to 4 analog sensors using +,-,x & / math
Biocide Feed (Timed Events)	28 Events per relay 1 minute resolution Lockout, Prebleed on both time and conductivity.	Each relay can be set to 1,7 or 28 day cycle. Timed events may exist concurrently with other controls
Proportional 4-20mA	User defined control by sensor or relay control equation. Auto-Manual switching.	Software ZERO & SPAN adjust. Interlocked current loops go to 4mA
Proportional ON/OFF	Timed Modulation and Timed Cycling Special Controls	ON time modified by Setpoint to actual delta.
Volumetric	User set, measure volume & pump ON time. Sequential control, measures Makeup volume, then bleeds for user set volume.	Rate-to-Volume conversion routes analog input to Water Meter(s).
Timed	Bleed & Feed and Bleed then Feed Includes % of Bleed Time. User set % Time Prime Holding Time	% Bleed & Feed based on 5 minute period. % Time & Prime on 5 minute period. Holding time averages sensor values for control.
Captured Sample – Boilers	Sample / Measure / Blowdown / Resample user set timing. Fail-to-Sample sensor support included.	Any sensor may be used. Support for high pressure sites
Interlocking	1 to 4 contact set inputs, AND & OR support	Relay OFF when contact set opens.
Blocking	1 to 4 relays may block any other relay	Support for common Oxidant –Inhibitor feed. If Blocking relay ON, this relay OFF

Controls	Rating - Detail	Notes
Alarms – Feed Limit Timers	Minutes / Actuation Minutes / Day User defined trip alarm relay, and/or dial-out	User defined OFF on Feed Limit Auto reset on Bleed & Feed and Bleed then Feed
Variable Cycles	Three user defined ranges of make-up conductivity and target cycles. User defined maximum tower conductivity.	Requires control by the ratio of analog sensors. 1% deadband on cycles and maximum conductivity
Feed Verification (Option)	ppm calculation based on volume fed and cycles of concentration. Alarm on fail to feed. User selected cycles method: Fixed, Ratio of Tower/Makeup conductivity, Ratio of Makeup/Bleed Volume.	Requires feed volume meter or 4-20mA input on feed rate. Fail-to-to feed is no volume fed after 30 seconds

Data Logging	Rating - Detail	Notes
Log Content	Analog Inputs: Min, Max & Average Digital -Water Meters: Volume Digital-Contact Set: ON Time	Year to date included for Meters
Log Size	600 entries for each of 26 analog and digital inputs and each of 10 relay outputs 21,600 Entries Total	600 entries = 25 Days at 60 minutes Logging Rate
Logging Rate	User set independently for each I/O from 5 to 1440 minutes / entry	Default 60 minutes
Log File Format XML	User defined start & end date for XML download	.dtd defines date stamping for each of 21,600 log entries

System	Rating - Detail	Notes
Controller Configuration	User selected Save and Restore to FLASH memory	Makes current configuration factory default.
Watchdog	1 sec. Hardware relay lockout	Active on power up and firmware blocked
Field Upgrades	Enable ETHERNET, Feed Verification. Add Sensors and Drivers	Upgrades locked to Serial# and date limited.

Electrical	Rating - Detail	Notes
AC Input	120 or 240 VAC, 50/60Hz,	Switch selectable
Fusing	**PR10 Module** 13.6 Amps @ 120VAC 6.8 Amps @ 240VAC **PR5 Module** 7.3 Amps @ 120VAC 4.15Amps @ 240VAC	5x20mm, 120VAC fusing: Relays 1-5 & 6-10: 6.3A ea. Control: 1A
Surge-Spike Suppression	Relays 2-5 and 7-10, NO contacts snubbed 0.1uF, 150R Varistor on control AC input	Controller, transformer isolated from AC line
AC Terminals	AC Input: AWG 12, 240mm^2 AC Outputs: AWG 14, 150mm^2	Electrical grounds at bottom of aluminum backplate
Sensor, Digital Input Terminals	AWG 22, 0.25 – 0.50mm^2	MAX AWG14, 150 150mm^2
DC Loop – Turbine Meter Power	15 – 22 VDC, unregulated Thermally fused @ 200mA	Field wiring terminals on **M7** & **M14**

Mechanical	Rating	Notes
Enclosure	Non-metallic, NEMA4X, IP65 11.5”W x 13.5”H x 7”D 295mm W x 345mm H x 175mm D	Nominal dimensions, excluding entry fittings and flexible conduit. Enclosure door hinged left. Allow 12”, left for door opening. Allow 24”, below for cable-conduit access.
120VAC Plug Boxes	Rated for outdoor use. 2 & 4 plug boxes provided with 36” of flexible non-metallic conduit	Plug boxes no included at hardwired and 240VAC sites.

Activity	Top Level UP DOWN to:	then DOWN & ENTER	then & Notes
4-20mA Output MANUAL-AUTO	Output C1..C8	Configure	ENTER & ENTER to toggle MANUAL-AUTO
4-20mA Output Control Modify	Output C1..C8	Configure	DOWN to Control by:
4-20mA Output C1..C8 Location	Output C1..C8	Diagnostic	DOWN to Output Card @: See Section 3.2, 4 of 4
Alarm Relay OPEN-CLOSE	System:	Configure	DOWN to Alarm opens contacts
Biocide Cycle: Set 1, 7,28 days	Output 1..10	Setup	DOWN to Event Cycle
Contact Set to Meter: Modify	Input O..Z	Configure	DOWN to Digital Input Type ENTER, DOWN to Contact Head OR Turbine Meter
Control Type (Action on Setpoints)	Output 1..10	Configure	DOWN to Control Type Rising/Falling & Between Setpoints OR Active only during Timed Events
Default Configuration LOAD	System:	Configure	DOWN to Load Configuration Restores Default Controller
Default Configuration SAVE	System:	Configure	DOWN to Save Configuration Makes current configuration the default
Disable Input	Input A..Z	Configure	DOWN to Disable Input
Disable Output	Output 1..10 C1..C8	Setup	DOWN to Disable Output

4.4 Keypad Navigator 2 of 2

Activity	Top Level UP DOWN to:	then DOWN & ENTER	then & Notes
Enable I/O	System:	Enable I/O	DOWN to inputs or outputs Key ENTER & DOWN to select
Input Name: Modify	Input A..Z	Configure	DOWN to Description
Input Resolution: Modify	Input A..Z	Configure	DOWN to Digits after decimal LCD & Browser display
Input Units: Modify	Input A..Z	Configure	DOWN to Displayed Units
LAN: IP, Netmask, Gateway, MAC, Ports	System:	LAN Setup	**WARNING !** Do not modify network parameters without site IT permission.
Metric: ON-OFF	System:	Configure	DOWN to Metric Units
Meter to Contact Set: Modify	Input O..Z	Configure	DOWN to Digital Input Type ENTER, DOWN to Contact Set
Output Name: Modify	Output 1..10	Setup	DOWN to Description
Password: Modify	System:	Passwords	DOWN to New Password for current userid
Passwords: ON-OFF	System:	Configure	DOWN to Keypad Password
Upgrade: Reset Passwords	System:	Upgrade	Requires upgrade code Linked to controller serial#