

Browser Manual

ProMinent DCM 500 series

Aquatic Water Quality Controller

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Sidebars:

Are used to explain typical uses for feed and control functions.

Sidebars are at the bottom of the page detailing the function.

New users & users new to automated controls will find these explanations helpful.

DCM500 series controllers are shipped preconfigured.

This manual supports re-configuration required as you add and modify the way you feed chemicals and manage filters, heaters and sensors

Users may re-name controller inputs & outputs @ each site. The physical connection points for inputs & outputs are designated by letters (A-Z) for inputs & numbers (1-9) for outputs.

Inputs:

Sensors & 4-20mA outputs: **A to N**

Flowswitches, Contact sets & Water Meters: **O to Z**

Outputs:

120VAC Relay Outputs: **1 to 5**. (Relays 2-5 are SPDT, Relay1 is SPST)

Dry Contact or Pulse Stream Outputs: **6 to 9** (24VDC & 250mA max)

Using letters & numbers provides a compact, generic way of defining a control;

Example: The sensor connected to input '**B**' controls the pump connected to relay '**4**' when the flowswitch connected to input '**P**' is closed. Users label **B,4 & P** with site specific names.

Complex controls can be defined by letters (sensors) & numbers (pumps & solenoids).

Inputs & outputs don't need to have fixed functions & a more flexible controller results.

DCM500 Browser

1.0 Day-to-Day Browsing

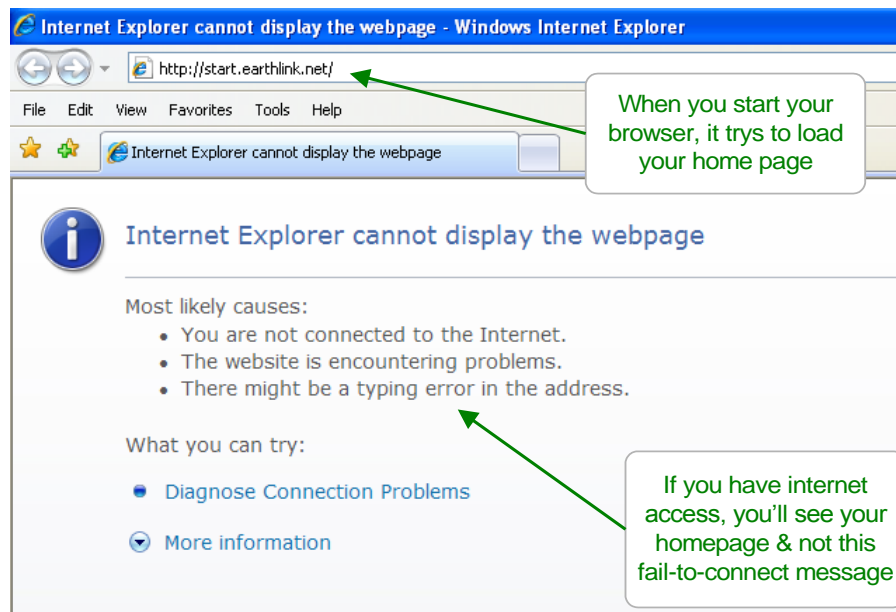
1.1 Connect

On-Site using a Notebook PC

- A. You'll need an Ethernet cross-over cable available from office supply & electronics stores;
Example: **Office Depot #8333370**, 10 ft. long, \$14.99.
- B. You'll need to set up a new connection in your notebook or PC.
Refer to Section 9.

Open the controller enclosure door and jack into the controller Ethernet jack located on the center of the upper controller circuit board.

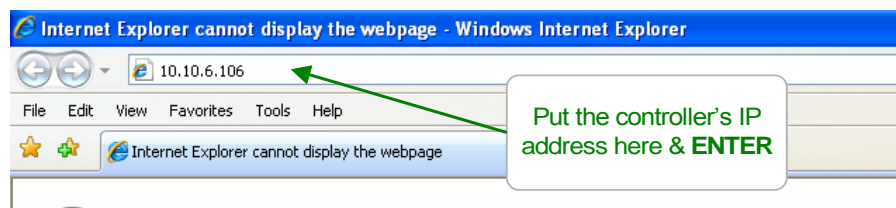
If you need command & control only, start **Internet Explorer** or **Mozilla's Firefox**.
If you also require reporting, start ProMinent's **Trackster** application.



Notebook PC & Over the Site LAN

Key the controller IP address into the PC's browser address.

You can find the controller's IP address using the controller keypad (default = **10.10.6.106**).
Refer to Section 9.



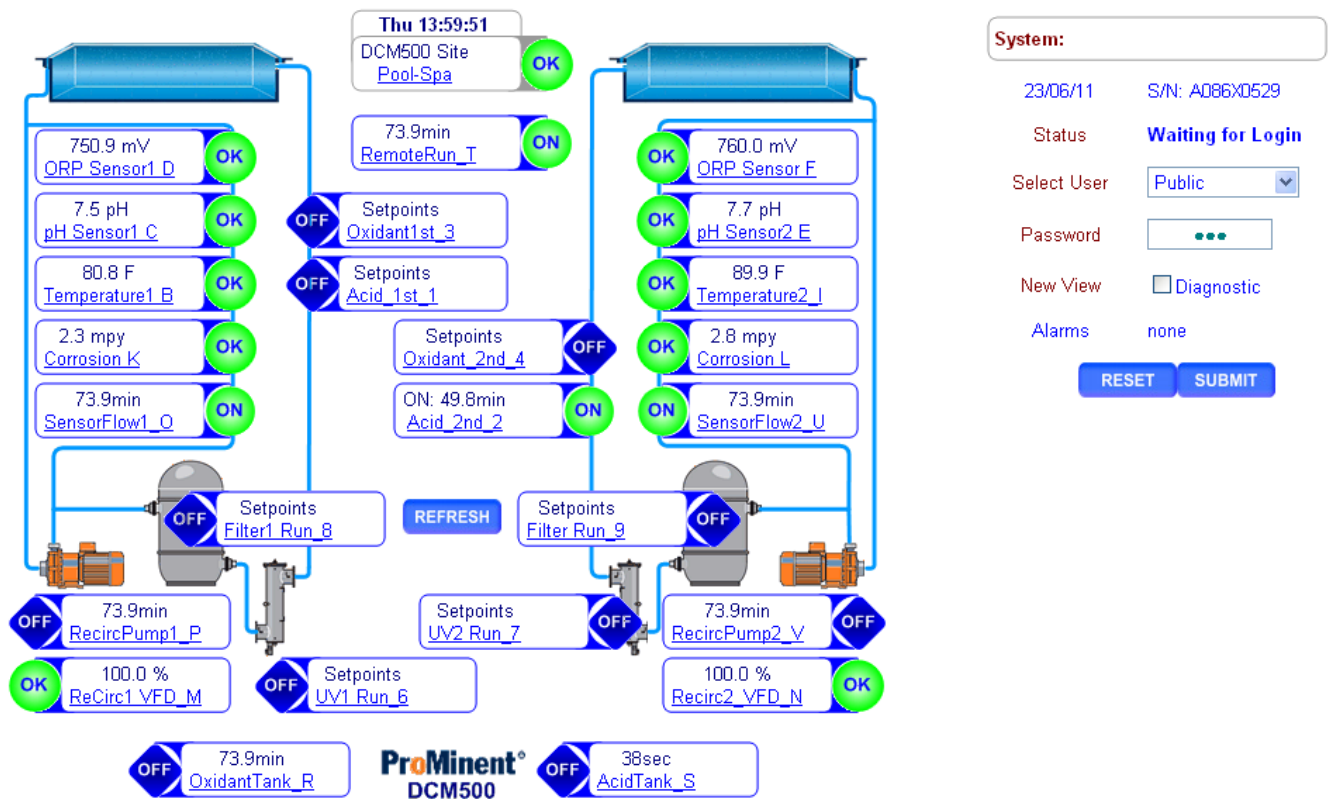
DCM500 Browser

1.1 Connect continued

Remotely using a VPN

If the site has provided you with VPN (Virtual Private Network) access to the site LAN, you'll need to start the VPN application on your PC to gain access to the site's LAN. Once connected to the site LAN, follow the previous, '**Over the Site LAN**' procedure.

Here's what you'll see in your browser on first connect.
Your 'View' may differ; this is a DCM500 pool –spa typical.



Note: System & Diagnostic views are optimized for limited resolution displays, notebooks & PCs at 1024 x 768 pixels.

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1.2 Log-in

Pull down the **Select User** list and select a user id.

Key in the **Password** for the selected user ID & press **SUBMIT**.

Status updates you on an incorrect password.

Once you've logged in you can change your user ID & password.

Login

System:

06/11/07 S/N: A000X0005

Status: **Waiting for Login**

Select User:

Password:

New View: ☐ Diagnostic

Alarms: none

Login view displays on connection

Select Diagnostic view without Login

Select User

System:

06/11/07 S/N: A000X0005

Status: **Waiting for Login**

Select User:

Password:

New View: ☐ Diagnostic

Alarms: none

Select your user name

Enter the password for the selected User and press **SUBMIT**

Once you've logged in, the controller's home page changes to show your user ID, **Current User**.

Press the link at any sensor, meter, pump, solenoid or valve to view or modify.

If the controller I/O parameter is not visible on the System view, select **Diagnostic** view & **SUBMIT**.

Logged In

System:

06/11/07 S/N: A000X0005

Status: **Logged In**

Current User: **Configure6**

Logout: ☐ Yes

New View: ☐ Diagnostic

Alarms, Events and Timers: ☐ Reset All

Alarms: none

System menu now available

You're logged on as user **Configure6**

Ends priming & biofeed events. Zeroes owed time & volume.

Default Passwords:

The factory default passwords are:

Operator1 = 1 Operator2 = 2 Operator3 = 3 Operator4 = 4.

Configure5 = 5 Configure6 = 6 Configure7 = 7 Administrator = AAAA

There are 3 password levels, Operator, Configure and Administrator.

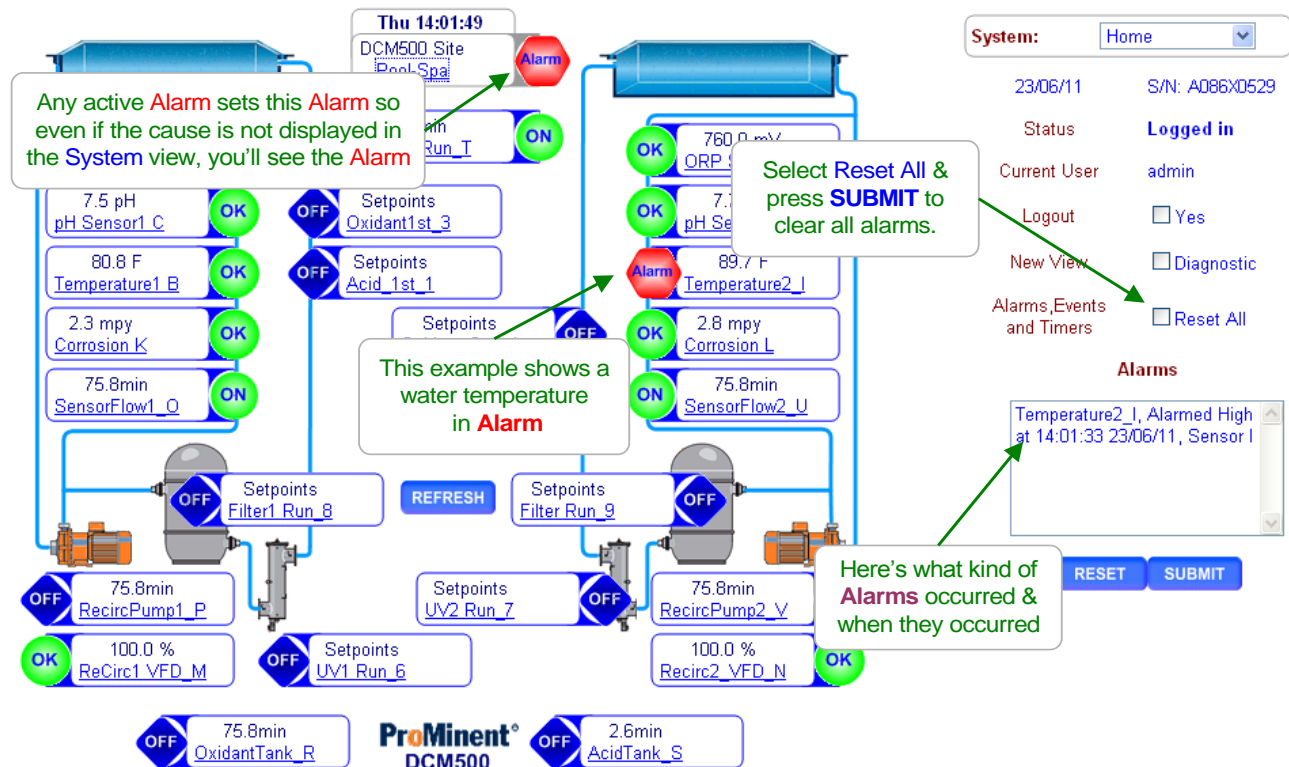
The User IDs are used in the controller's keypress log.

WARNING: 5 incorrect passwords, blocks logon until 7:00AM or until a power OFF/ON.

1.3 Checking & Clearing Alarms

Alarms display as **RED Alarm** hexagons.

Any alarm also sets the System alarm which displays on both the **System** & **Diagnostic** views beside the Day-Time display. If an alarm occurs on an input-output that is not displayed in the view, the System alarm alerts you that the alarm has occurred.



Sidebar:

Sensor alarms will re-trip after the user set 'Delay' unless the fault is corrected.
Relay controlled pumps will alarm on ON time. Frequency controlled pumps alarm on volume.

Individual input-output alarms may be cleared by selecting the input or output link and then selecting **Alarms** from the pull down menu at the top of the left side of the screen.

Internet Explorer users can e-mail this or any page by selecting **File /Send/ Page by E-mail** on the IE tool bar.

If you are not on-site & do not have VPN or cell modem controller access, show on-site staff how to e-mail you on alarm.

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1.4 View & Adjust Setpoints

Setpoint values vary with the use of the pump or solenoid.

The following, typical example changes the pH controlled, acid pump setpoints.

Diagnostic Screen:

- Links display the **Diagnostic** first. Pull down this menu & select **Configure**
- Click on the **Acid_2nd_2** link
- Diagnostic** displays a summary of the link. In this example, the acid pump has been ON for **53** minutes today & **53** minutes this feed cycle
- Acid_2nd_2:2 **Diagnostic**
- Status: **Operational, ON**
- Mode: **Auto** (Manual, OFF)
- Control by: **E** (7.7 pH)
- TurnON setpoint: **7.5 pH**
- TurnOFF setpoint: **7.4 pH**
- Control Type: **Feed Acid**
- 53.0m ON today 53.0m ON, actuation
- Buttons: **REFRESH** **SUBMIT**

Configuration Screen:

- Edit one or both **setpoints** and then **SUBMIT**
- When either the **RemoteRun** contact connected to input 'T' or the **SensorFlow2** flowswitch connected to input 'U' opens, the acid pump **stops**.
- Acid_2nd_2:2 **Configure**
- Control by: **E**
- TurnON setpoint: **7.5 pH**
- TurnOFF setpoint: **7.4 pH**
- Interlocked: **T+U**
- Blocked by: **none**
- Control Type: **Feed Acid**
- Special Control: **None**
- Buttons: **RESET** **SUBMIT**
- Feed Acid** turns ON the **Acid_2nd** pump when the pH is greater than **TurnON** and off when the pH is less than **TurnOFF**
- Configure** displays the current **Acid_2nd** set-up and allows you to modify. You'll need to be logged in at the **Configure** or **Admin** password to modify.

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1.4 View & Adjust Setpoints continued

Pumps controlled by ORP, ppm, pH or conductivity have setpoints limited by the High and Low Alarm setpoints. If you attempt to adjust a control setpoint outside of the alarm limits, you'll get an **Alarms-Limits Status** message.

'**Interlocked**', '**Blocked by**', '**Control Type**' and '**Special Control**' are detailed in following sections of this manual.

Interlocked turns off pumps & solenoids when flowswitch & RUN-STOP contact sets turn OFF.

Blocked by prevents a pump from turning ON when another pump or solenoid is ON.

Control Type selects the setpoint order. For example, when you feed **Feed Caustic**, **TurnON** is less than **TurnOFF**. **Feed Acid**, reverses the setpoint order.

Special Control selections vary with sensor and output type.

For example,

Oxidant feeds may select PID control.

Outputs without a controlling sensor may be used switch the re-circulation pump rate.

Sidebar:

Relays controlled by sensors power Pumps and Solenoids ON and OFF.
(Relays are outputs **1** to **5**)

Frequency controlled Pumps feed chemicals at varying rates.
(Frequency controlled pumps are outputs **6** to **9**)

Digital Outputs are dry contacts rated 24VDC & 250mA and are either ON/closed or OFF/open
(Digital Outputs, DO are outputs **6** to **9**. Outputs **6** to **9** are user configurable as frequency or DO)

ON-OFF Acid pumps typically use setpoints 0.05 pH apart so that the delay between feeding acid and measuring it's pH does not cause wide pH swings.

Pay attention to the number **:1** to **:9** that follows the pump or solenoid name.

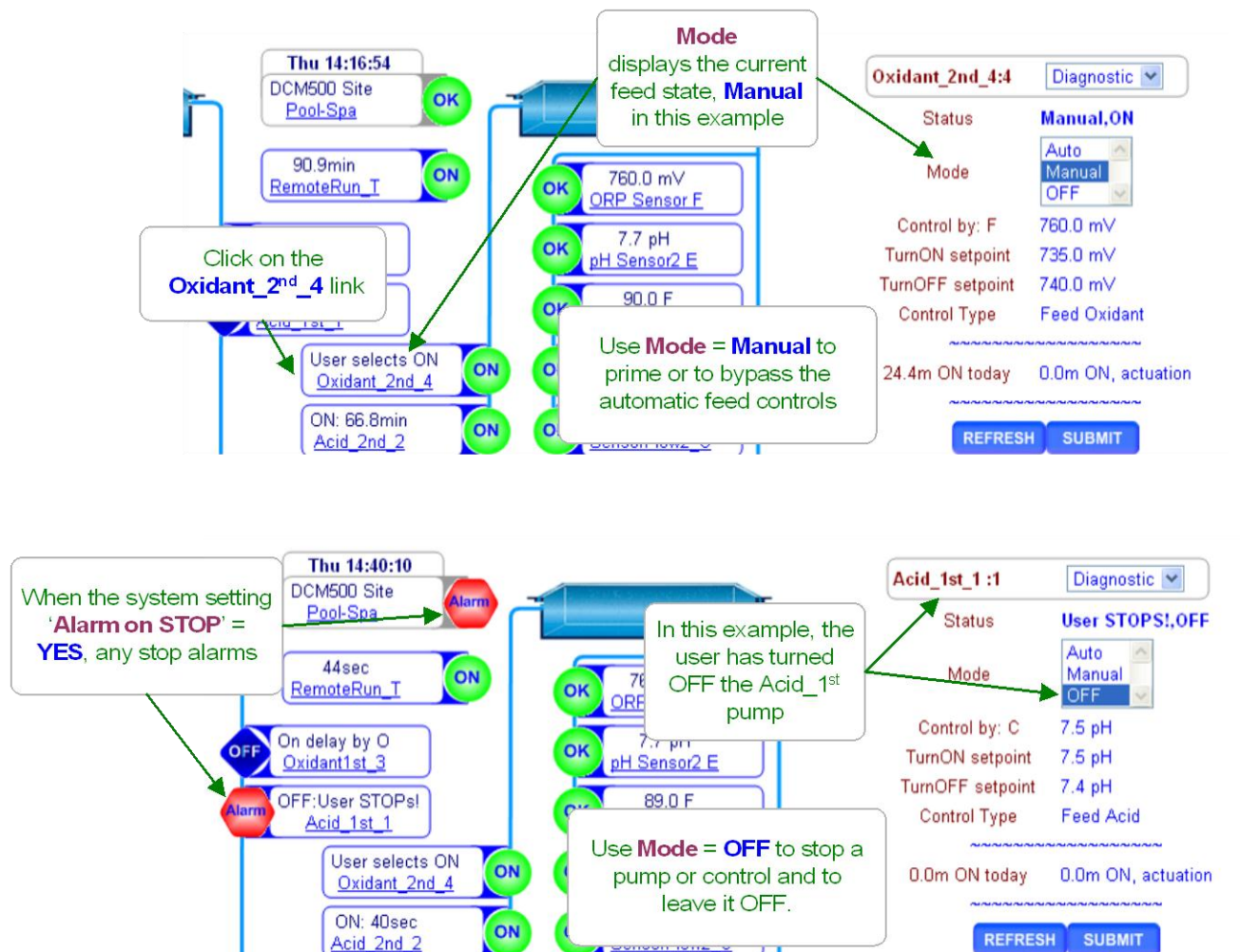
It's the physical location on the lower controller circuit board that connects to the pump, valve or solenoid.

You may modify the name of the pump, DO or solenoid but you'll need to know which output is controlling so you can check that the **1** to **9 GREEN** indicating light is ON when the pump, contact set or solenoid is ON.

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1.5 HOA: Manual-OFF-Auto

Controlled outputs default to '**Auto**' allowing the DCM500 to control the pump, solenoid or DO. '**Manual**' overrides controls and turns ON the output for priming & testing of pumps & solenoids. '**OFF**' turns OFF the pump or solenoid and opens digital outputs. Cycling controller power has no effect on an '**OFF**' pump or solenoid.



Sidebar:

Manual may also be used to slug feed on system start-up in addition to testing pumps, dry contact outputs or solenoids.

Safeguards: A pump or solenoid that is Interlocked, Blocked or OFF on alarm will not turn ON when **Manual** is selected. This safeguard blocks feeding acid into a non-flowing line. Feed Limiting will turn OFF **Manual** on time or volume limit if configured for **OFF on Alarm**.

If the green LED on the lower controller circuit board is ON, the pump or valve connected to that output 1 to 9 should also be ON

2.0 Chemical Feed Controls

2.1 Sensor Controlled ON/OFF Feed

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

The screenshot displays the configuration interface for two chemical feed pumps: **OxidantPump3 :3** and **BoostPump_4:4**. Each pump has a 'Configure' dropdown menu in the top right corner.

OxidantPump3 :3 Configuration:

- Control by:** D (The ORP sensor connected to input 'D' controls the Oxidant Pump connected to relay 3)
- TurnON setpoint:** 735.0 mV (The pump turns ON when the ORP falls below 735mV and turns OFF when the ORP exceeds 740mV)
- TurnOFF setpoint:** 740.0 mV
- Interlocked:** 0:SensorFlow_O (When the SensorFlow switch connected to input 'O', opens the pump turns OFF)
- Blocked by:** 4:BoostPump_4 (In this example we're blocking, stopping OxidantPump3 when the BoostPump turns ON. Blocked by = None allows both pumps to run at the same time)
- Control Type:** Feed Oxidant (Control Type options vary with sensor type.)
- Special Control:** None
- Buttons:** RESET, SUBMIT

BoostPump_4:4 Configuration:

- Control by:** D (Any number of controls may share the same sensor. In this example, the ORP sensor @ 'D' is used to control pump relays 3 & 4)
- TurnON setpoint:** 720.0 mV
- TurnOFF setpoint:** 740.0 mV
- Interlocked:** 0:SensorFlow_O (Up to 4 contact sets may be used to Interlock a control)
- Blocked by:** none
- Control Type:** Feed Oxidant
- Special Control:** None
- Buttons:** RESET, SUBMIT

Annotations:

- Setpoints are limited automatically to the controlling sensor high and low alarm settings
- When the **SensorFlow** switch connected to input 'O', opens the pump turns OFF
- Control Type options vary with sensor type.
- Up to 4 contact sets may be used to **Interlock** a control

Sidebar

Setpoints may be set incorrectly. Sensors eventually fail. Solenoids & Pumps fault. Refer to **Section 2.5 Limiting Feed & Alarms** to control a fault response.

DCM500 Browser

2.1 Sensor Controlled ON/OFF Feed continued

Control type:

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

The screenshot shows the configuration page for 'AcidPump_1:1'. The 'Configure' dropdown is open, showing options: 'Feed Acid', 'Feed Caustic', and 'Between Sets'. The 'Control Type' is currently set to 'Feed Acid'. Callout boxes provide additional information:

- Control Type** sets the setpoint order. **Feed Acid** turns ON as the pH rises, so **ON** must > **OFF**.
- If you set **Control Type** = **Feed Caustic**, the controller will switch the setpoint order.
- Control Type** = **Between Sets** seldom used with pH & ORP sensors; more useful with temperature sensors.

Other visible fields include: Control by: C, TurnON setpoint: 7.50 pH, TurnOFF setpoint: 7.45 pH, Interlocked: O:ContactSet_O, Blocked by: none, and Special Control: Feed Acid. There are RESET and SUBMIT buttons at the bottom.

Each sensor pump control uses a **Control type** set by the chemical fed. ORP, pH, ppm and conductivity sensors have **Control types** specific to the sensor.

For example, when select a conductivity sensor, the Control Type options are **Lower TDS** & **Raise TDS**.

Sidebar:

Control Type is not applicable or displayed for water meter based feeds.

Between Sets turns ON a pump or solenoid whenever the controlling sensor value is between the TurnON & TurnOFF setpoints. This **Control Type** finds use in blocking and sequential PLC type controls.

Setpoint Order:

The controller will automatically switch the setpoints to fit the selected **Control Type**, inserting a **Setpoints Switched** message into the **Status** line of the left hand side of the page.

2.2 Proportional Feed

Special Control: Time Modulate for ON-OFF Pumps

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

Time Modulate allows an ON/OFF pump to operate like a frequency or 4-20mA controlled pump.

This **Special Control** is used feed proportionally to a sensor value.

ON-OFF pumps are typically set to maximum stroke and rate when **Time Modulate** is selected.

Acid Feed :4 Configure

Control by: C

TurnON setpoint 8.00 pH

TurnOFF setpoint 7.00 pH

Interlocked S:Flowswitch

Blocked by none

Control Type Rising Set

Special Control Time Modulate

Period 120 seconds

RESET SUBMIT

Time Modulate Special Control
typically widens the difference between setpoints

Select the **Time Modulate Special Control**

Pump ON time varies from 0 to 120 sec. in every 120 seconds

Sidebar:

Frequency controlled pumps connected to controller outputs '6' to '9' are proportionally controlled as the controlling sensor varies the pump frequency.

Often there is a need to proportionally control an ON/OFF pump connected to one of the controller power relays '1' to '5'.

Examples: The pump may be oversized for the application or turning down the pump stroke or frequency may cause loss of prime or feed line blocking.

The Time Modulate Special Control:

Turns OFF below the **TurnOFF** setpoint and is always ON above the **Turn ON** setpoint.

Between setpoints, linearly increases the ON time from zero @ the **TurnOFF** to always ON at the **Turn ON** setpoint.

Example: Period=120 seconds, pH **Turn ON** = 7, pH **TurnOFF** = 8, current pH = 7.4.

ON time = 48 seconds in every 120 seconds, OFF time = 72 seconds in every 120 seconds.

Time Modulate Special Control works for acid & caustic, oxidant & de-chlor, rising & falling setpoints.

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2.2 Proportional Feed

Frequency Controlled Pumps

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

Frequency controlled pumps modify the feed rate as the value of the controlling sensor changes.

In this example, the pump frequency increases as the ORP falls towards 300mV. At 300mV the oxidant is fed at the maximum rate, decreasing as the ORP increases.

If this example was an anti-chlor pump, the **100%ON Setpoint** would be greater than the **TurnOFF setpoint**. As anti-chlor feeds, the ORP decreases.

Oxidant Pump:6 Configure

Control by: G

100%ON Setpoint: 300.0 mV

TurnOFF setpoint: 350.0 mV

Copy Volume to: none

Interlocked: S:Flowswitch

Blocked by: none

Control Type: Always

Special Control: None

RESET SUBMIT

Frequency controlled pumps are :6 to :9

At **300mV** and less, the pump feeds at Maximum SPM

Above **350mV** the pump is OFF

Control Type is either **Always** or **During Events**

Oxidant Pump:6 Diagnostic

Status: Operational,ON

Prime Output: 0 mL

Control by: G 312.4 mV

100%ON Setpoint: 300.0 mV

TurnOFF setpoint: 350.0 mV

Control Type: Between Sets

28 Day Event Cycle: 0 Events Day 11

Volume today: 0.410G

REFRESH SUBMIT

Diagnostic displays when you select **Oxidant Pump**

Controlling sensor location, **G** & it's present value

Feeding @ **75.2%** of the pump's rated maximum SPM.
 $0.752 = 1 - (312 - 300) / (350 - 300)$

ON: 39sec ON

Feed@ 75.20% ON

Setpoints OFF

Sidebar:

In this example the pump is rated @ 180 SPM, Strokes per Minute, and pumps 0.1mL stroke so we're pumping (180 x 0.1 x 0.752) 13.54 ml/minute or 0.215 Gallons/hour

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2.3 Base Feed

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

Dispersant :4 [Configure](#)

Control by:

Interlocked:

Blocked by:

Special Control:

% ON Time:

[RESET](#) [SUBMIT](#)

Set **Special Control** to **Percent Time** to base feed

The ON-OFF pump connected to relay **4**, will be ON for **5%** of every 5 minutes

Oxidant:7 [Configure](#)

Control by:

Copy Volume to:

Interlocked:

Blocked by:

Special Control:

Feed:

[SUBMIT](#)

Set **Special Control** to **Base Feed**

The pump connected to frequency control **7**, will feed at **4.5 mL/min**

ON-OFF Pumps: Setting the **% ON Time** greater than 100%, sets the % to 100.
5% ON time is 15 seconds ON in every 5 minutes (0.05 x 300 seconds).

Frequency Controlled Pumps: If you set a **Feed** rate greater than the pump rating, the controller will set the feed rate to pump maximum SPM. If the pump is rated 180 strokes/minute & 0.1mL stroke, the rate will be set to **18mL/min**.

Sidebar:

Base Feeds are used to continuously feed a chemical.

In some cases, as a temporary measure while a sensor is replaced or a water meter repaired or to pre-treat a system on start-up

Concentration is modified by changing the frequency controlled pump (**6 to 9**) feed rate or relay (**1 to 5**) **% ON Time**.

DCM500 Browser

2.4 PID Controls

Each of the four frequency controlled pumps, outputs 6 to 9, can be configured for PID (Proportional-Integral-Derivative) control. The 0-100% ON pump control can also be used to control a 4-20mA output for pump which does not have frequency control.

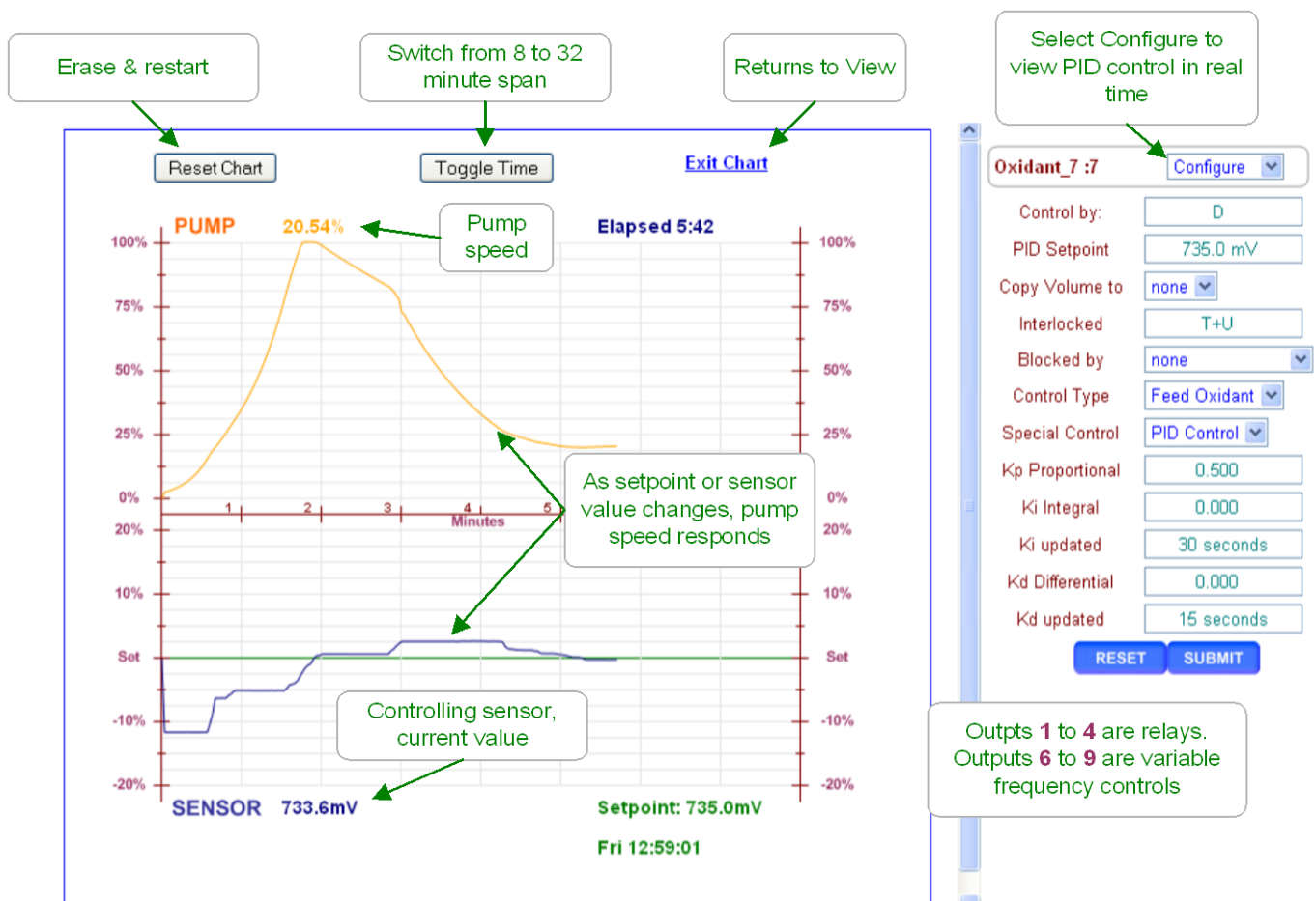
Relay outputs 1 to 5 may also be configured for PID control, implemented by continuously modifying the pump-powering relay ON & OFF times.

Users of the Firefox Mozilla browser can view a real time 'chart' of pump rate versus setpoint as they adjust Kp, Ki & Kd to tune the PID loop response

The 'chart' HTML tag is not supported by Internet Explorer prior to Version 9.

Chart time spans of 8/16 minutes and 32/64 minutes are supported.

Set a pump **Special Control** = **PID Control** & charting will start on the next **SUBMIT** & re-start every time you select **Configure** on the pump.



2.4 PID Controls

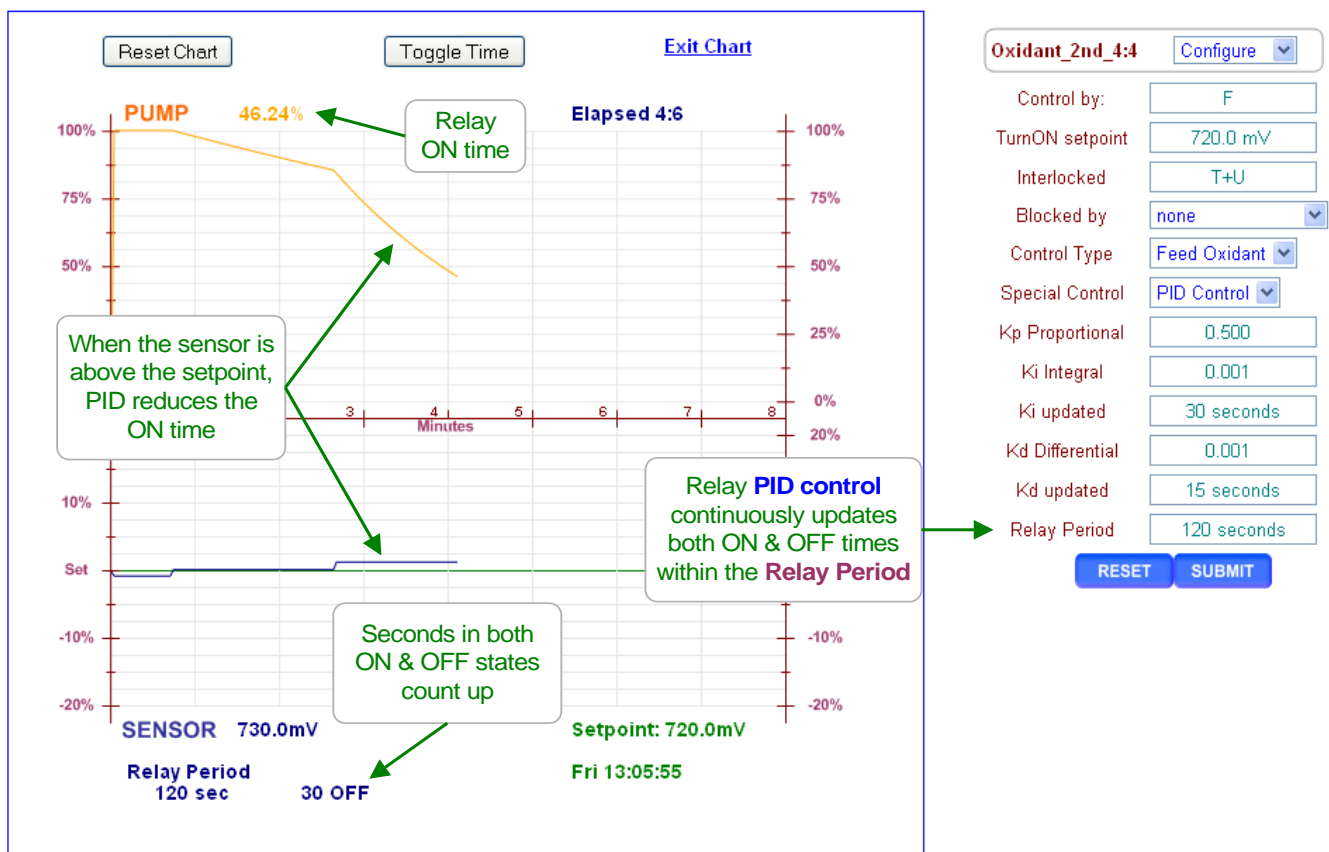
Most aquatics systems have a delay between feeding the chemical and the controlling sensor measuring the effect of the fed chemical.

This delay effectively adds to the **Kp** value to make PID feed systems oscillate & means that few aquatics chemical feed systems will need **Ki**.

The default **Ki** & **Kd** settings (0.001) disable the Integral & Derivative control.

Most feed systems and slow responding systems in particular will benefit from frequent (**Kd Updated** = 1), differential control (**Kd** > 1.0).

ON/OFF pump PID controls include the **Relay Period** field and the real time chart includes a display of the ON & OFF times within each **Relay Period**.



2.5 Oxidant Feed Controls

Pumps and solenoids controlled by ORP and oxidant ppm sensors have additional, optional controls.

Control Assist selection only displays if an assist sensor is installed & enabled. For example, if you are controlling using a ppm sensor, ORP sensors (if installed) will display in the **Control Assist** selector.

The screenshot shows the 'Setup' page for 'OxidantPump3 :3'. The form includes the following fields and callouts:

- Description:** OxidantPump3. Callout: 'Any pump controlled by an ORP or ppm sensor has extra controls for oxidant feed'.
- Control Assist:** E:Oxidant. Callout: 'Overrides the pump control when **Assist** sensor exceeds its high or low alarm'.
- Event Controls:** ☒ Yes, ☐ No. Callout: 'Event Controls replace the pump control setpoints during user defined event periods'.
- Event setpoint:** 735.0 mV.
- Off Setpoint:** 740.0 mV.
- Event Cycle:** 7 Days (selected from 24 Hours, 7 Days, 28 Days). Callout: 'Event Controls allow up to 28 events in each user selected Event Cycle period.'
- pH Lockout:** C:pH Sensor C.
- Lockout mode:** high & low pH (selected from high & low pH, high pH only). Callout: 'A **pH Lockout** sensor turns OFF this oxidant pump when the sensor exceeds its high or low alarm limits'.
- Boost Pump:** ☒ No, ☐ Yes. Callout: 'Lockout Mode selects which pH alarms turn OFF the oxidant pump'.
- Disable output:** ☒ No, ☐ Yes. Callout: 'Boost Pump is used by the LCD display to auto-select the primary oxidant feed pump'.

Buttons: RESET, SUBMIT

Sidebar:

Control Assist forces ON the oxidant feed @ the low **Assist** sensor alarm and forces OFF the feed at the high **Assist** sensor alarm, overriding the controlling sensor as a redundant failsafe.

Event Controls are used to implement periods of high oxidant or low ppm typically when the water feature or pool is unused or offline.

If **Event Controls** = **No**, neither the **Events** pull-down option and Event sub-fields on the **Setup** page do not display.

2.5 Oxidant Feed Controls

If **Setup Event Controls** = **Yes**, pull down & select **Events** on the oxidant pump or solenoid pull down to view and/or set events.

OxidantPump3 :3 **Events**

Status: **No Events set**

Select Activity: **Add an Event**

Start Day: **2 1-7**

Start Time: **6:00 HH:MM**

ON Time: **120 minutes**

Event frequency: **Once**
Alternate Days
Daily

Select the **OxidantPump3** link in the View & pull down the **Diagnostic** selector to **Events**

Edit the **Day**, **Time** & **ON Time** duration. Select an **Event Frequency** & **SUBMIT**

OxidantPump3 :3 **Events**

Status: **Events Added**

Select Activity: **Add an Event**
Edit an Event
Delete an Event
Delete all Events

Select for Edit & Delete: **Day 2 @ 06:00 for 120 minutes**

Values for Add & Edit

Start Day: **2 1-7**

Start Time: **6:00 HH:MM**

ON Time: **120 minutes**

Event frequency: **Once**
Alternate Days
Daily

Events may be edited, deleted & replicated

Pull down this selector to view existing events & select an event for editing & deleting.

These fields apply to the selected event on **SUBMIT**. Use **Event Frequency** to replicate an edited event

2.6 'Simple' ON/OFF Controls

Frequency controlled outputs **6** to **9** may be re-configured as dry contact ON/OFF outputs by selecting the **Simple ON/OFF Special Control**. The **Simple ON/OFF** option is available for outputs controlled by sensors connected to inputs 'A' to 'N'.

Special Control = Simple ON/OFF is used to control devices, filters, UV's.. that require a dry contact to operate.

Relay outputs **1** to **5** are powered at AC line voltage and would require an Interposing relay to convert control to a dry contact set.

Simple_9 :9 **Configure**

Control by: B

TurnON setpoint 84.0 F

TurnOFF setpoint 70.0 F

Interlocked Q+T

Blocked by none

Control Type Rising Set

Special Control Simple ON/OFF

RESET None PID Control Simple ON/OFF

Select **Simple ON/OFF** to make a variable frequency output, a dry contact, ON/OFF output

Simple_9 :9 **Diagnostic**

Status Operational,OFF

Mode Auto Manual OFF

Control by: B 82.1 F

TurnON setpoint 84.0 F

TurnOFF setpoint 70.0 F

Control Type Rising Set

0.0m ON today 0.0m ON, actuation

Simple ON/OFF OFF

REFRESH SUBMIT

Simple ON/OFF controls report and log ON time, not volume pumped

Simple ON/OFF controls by pH, ORP and amperometric oxidant sensors, do not require pump type selection and do not have the added control options in the **Setup** page.

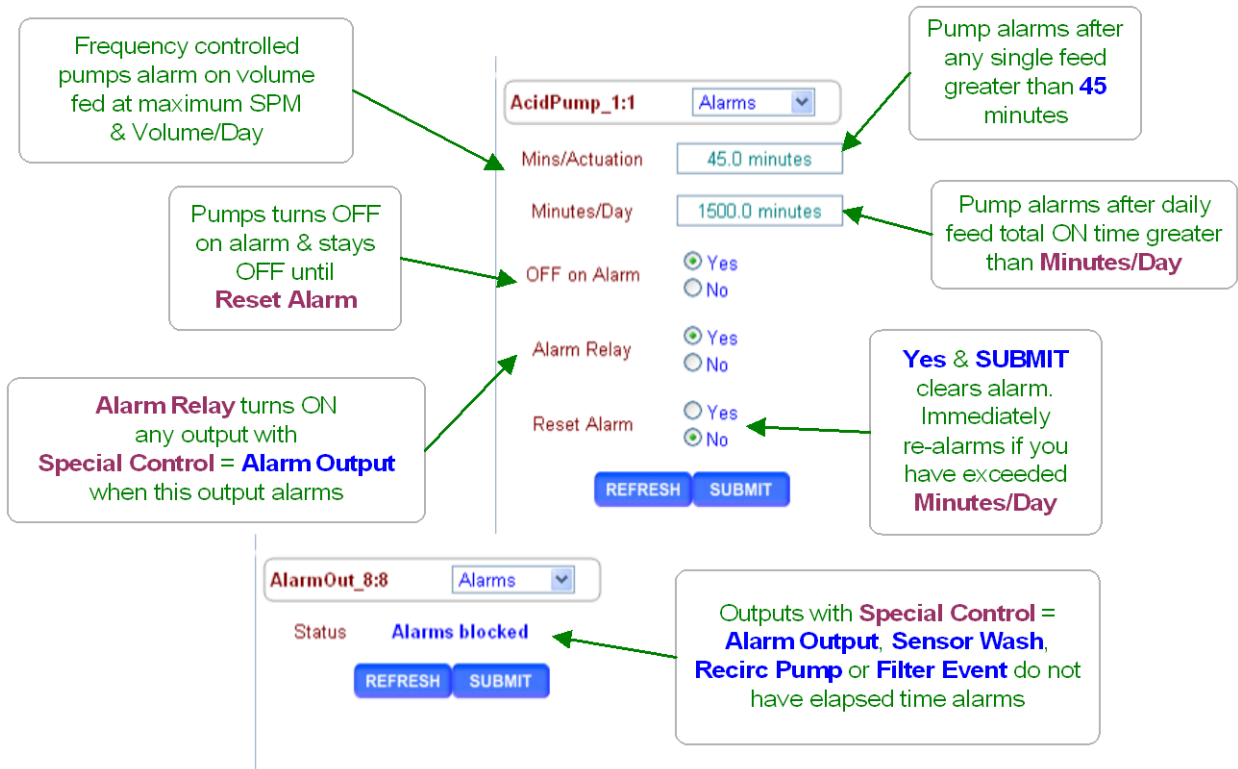
Sidebar:

Digital outputs **6** to **9** are DC isolated, floating, non-polarized, electronic contact sets. thermally fused @ 250mA & 30VDC.
Do not switch AC line voltages with these contact sets.

Thermal fusing prevents damage to the contact set due to wiring errors, recovering automatically when the wiring fault is corrected.

2.7 Limiting Feed & Alarms

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Alarms**.



Sidebar:

Feed Limits are times for pumps & solenoids controlled by relays **1 to 5** and volumes for frequency controlled outputs **6 to 9**.

Set the limits so that worst case operation on the hottest day or highest load will not trip the limit, avoiding nuisance alarms. In more critical applications, run the limit close to actual operating volume or time & use the limit alarms to flag atypical system operation.

Chemical feeds other than Oxidant & Acid feeds are usually all set to **OFF on alarm** since an overfeed indicates an operating problem which requires correction whereas continuing to feed Oxidant or Acid may put users at risk.

Typically you are only concerned with either the **Actuation** or **Day** limit.

Examples:

Oxidant feeds usually use the **Actuation** limit to prevent overfeeds & to detect loss of feed, setting the **Day** limit so it never trips.

Acid feeds would use both **Actuation** and **Day** limits since different fault types trip each limit alarm.

Note: **Minutes Day** > **1440** will not alarm

2.8 No Feed on No Flow

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.

The screenshot shows the configuration page for 'Acid Feed :4'. The 'Interlocked' dropdown is set to 'S.Flowswitch'. The 'Configure' button is highlighted in the top right corner. Annotations explain the functionality of these elements.

Annotations:

- Pull down this selector to view all possible Interlocks and '**none**'. Select & **SUBMIT** to change **Interlocked**
- Each Pump, Valve & Solenoid views & selects it's Interlock on the **Configure** page
- The **Acid Feed** pump connected to Relay '4' is **Interlocked** to the **Flowswitch** connected to input '**S**'
- In this example, whenever the **Flowswitch 'S'** is OFF, the **Acid Feed** pump is OFF.

Configuration Parameters:

- Control by: C
- TurnON setpoint: 8.00 pH
- TurnOFF setpoint: 7.00 pH
- Interlocked: S.Flowswitch
- Blocked by: none
- Control Type: Rising Set
- Special Control: Time Modulate
- Period: 120 seconds

Buttons: RESET, SUBMIT

Sidebar:

Interlocks are contact sets that must be closed for a Pump to feed, a Solenoid to open or a Valve to operate.

Aquatics sites use a flowswitch installed in the sensor header to detect that the pool/spa/water feature is operating & it's OK to feed chemicals, backwash filters, run electrolyzers, reduce conductivity...

One or more closed contact sets may be required to **Interlock** a pump.

Examples:

If both the sensor sample flow (Input '**O**') and the recirculation pump are ON(Input '**P**') enable the oxidant pump. The oxidant pump **Interlocked** = **O+P**

If there is flow in the recirculating line (Input '**P**') and the tank level switch (Input '**T**') shows chemical available, feed chemical. The chemical pump **Interlocked** = **P+T**

Interlocks may be **ORed** using the '**/**' symbol or **ANDed** using the '**+**' symbol.
The controller prevents a mix of **ORs** and **ANDs** in any one **Interlock**.

2.9 Blocking a Feed

Select the link on the chemical feed pump that you wish to block and pull down the top, right menu, selecting **Configure**.

Inhibitor :1 [Configure](#)

Control by: [No control](#)

Interlocked: [S:Flowswitch](#)

Blocked by: [7:Oxidant](#)

Special Control: [2:Bleed Valve](#)

Bleed Output: [3:Biocide](#)

% of Time: [4:Acid Feed](#)

[5:CIO2 Feed](#)

[6:Oxidant Pump](#)

[7:Oxidant](#)

[8:Frequency_8](#)

[9:Frequency_9](#)

[More than one](#)

[none](#)

[RESET](#)

[SUBMIT](#)

Pull down the **Blocked by** selector to view all other pumps, valves & solenoids.

In this example, select the pump you wish to block the **Inhibitor** pump & **SUBMIT**

In this example, the **Inhibitor** pump will turn OFF whenever the **Oxidant** pump turns ON

Sidebar:

Blocking prevents one or more chemicals from feeding at the same time. If you are owed time or volume on the blocked pump, the controller remembers and feeds when the block clears.

A pump may be **Blocked** by one or more other pumps, solenoids or valves.

Examples:

1. You may wish to prevent oxidant and acid feeds during a filter backwash. Blocking the Acid pump connected to Relay '1' and Oxidant pump connected to Relay '3' with the connected filter backwash run connected to Relay '5'.
Acid& Oxidant Pumps **Blocked by** = '5'.

2. Some chemicals are degraded by high levels of oxidant. The Flocculant pump is connected to Relay '5' & the Oxidant pump connected to frequency control '7'. Flocculant **Blocked by** = '7'

Caution: Be careful **Blocking** with frequency outputs '6' to '9' that are controlled by a sensor to ensure that they occasionally turn OFF to allow the blocked pump to feed.

DCM500 Browser

2.10 Feed Diagnostics

Select the link on the target chemical feed pump. The pump **Diagnostic** displays on the right.

Wed 15:22:30
Polar Fibers
Tower 4B
OK
REFRESH

Setpoints
Inhibitor OFF

ON: 54sec
Bleed Valve ON

Setpoints
Biocide OFF

Setpoints
Acid Feed OFF

ON: 39sec
ClO2 Feed ON

Feed@ 75.20%
Oxidant Pump ON

Setpoints
Oxidant OFF

View displays feed rate of 75.2%

Oxidant Pump:6 Diagnostic

Status Operational, ON

Prime Output 0 mL

Control by: G 312.4 mV

100%ON Setpoint 300.0 mV

TurnOFF setpoint 350.0 mV

Control Type Between Sets

28 Day Event Cycle 0 Events Day 11

Volume today 0.410G

REFRESH SUBMIT

The **Oxidant Pump** is controlled by **6** frequency output

Present value of the ORP sensor connected to input 'G' and controlling **Oxidant Pump**

The **Oxidant Pump** has pumped **0.410** Gallons from midnight.

The **Oxidant Pump** controlling sensor is **312.4mV** which is **75.2%** of the difference between setpoints. A pump rated @ 180 SPM & 0.1ml/stroke would be pumping 13.5mL/minute

Calculation:
 $75.2\% = (350 - 312.4) / (350 - 300) \times 100\%$
 $13.5 \text{ mL/min} = 180 \text{ SPM} \times 0.742 \times 0.1 \text{ mL}$

Sidebar:

Diagnostics vary with the output type and control.

Relays '1' to '5' use ON time instead of the volumes of Frequency controls '6' to '9'.

The main menu displays **Blocked** & the blocking output OR **Lockout** & the **Interlock** input OR **Alarmed** if a pump cannot feed.

Diagnostic tells you a lot about the operation of the aquatics system and is invaluable if you have a configuration problem or feed fault.

Even if you have **Passwords** turned ON, any user can still view the **Diagnostics**.

An uniformed user reading you the **Diagnostic** screen sequence may save you a site trip.

2.9 Feed Diagnostics

The screenshot displays the 'Feed Diagnostics' section of the DCM500 Browser, showing several diagnostic screens for different pumps and filters. Annotations explain the data presented on each screen:

- AcidPump_1:1**: Shows the current value of the controlling sensor (7.48 pH) and its location ('C'). The pump is 'Operational, ON' in 'Auto' mode. It also displays ON time statistics (10.1m ON today, 10.1m ON, actuation).
- OxidantPump3 :3**: Shows the pump is 'Blocked by 4, OFF' in 'Auto' mode. It displays ON time statistics (0.0m ON today, 0.0m ON, actuation) and a 7 Day Event Cycle of 0 Events Day 2.
- OxidantPump_3 :3**: Shows the pump is in 'Special Control, ON' mode. It displays ON time statistics (2.7m ON today, 2.7m ON, actuation) and a Time Modulate Period of 120 seconds with an ON Countdown of 97 seconds.
- RecircControl7:7**: Shows the pump is 'Operational, ON' in 'Auto' mode. It displays a 7 Day Event Cycle of 15 Events Day 2 and a Time Owed of 4.8 min.
- FilterRun_9:9**: Shows the filter is 'Operational, OFF' in 'Auto' mode. It displays a 28 Day Event Cycle of 4 Events Day 2 and a Time Owed of 4.8 min.

Annotations provide additional context:

- The pump on Relay 3 is OFF because the Relay 4 pump is ON.
- This Oxidant feed pump has zero override feed events set.
- The Time Modulate Special Control is ON for 97 more seconds.
- The #7 digital output is ON for 4.8 more minutes. Set **End Event** to **Yes** & **SUBMIT** to end now.
- The #9 digital output has 4 backwash events set and repeats every 28 days, 4 weeks. Today is **Day 2, Monday**.

3.0 Event Controls

3.1 Five Types of Events

Alarm : Sensor Wash : Recirc Pump : Filter : Oxidant Controlled (refer to Section 2.5)

Events turn on a pump, solenoid or valve for user set time (Relay & Digital Outputs) or volume (Frequency controlled pumps) at a user set day & time or on alarm.

Non-Alarm events are repeated every Day, Week or Four Week cycle.



3.2 Setting & Viewing Events

Select the link on the target output, pump or solenoid and pull down the top, right menu, selecting **Setup** to modify the event cycle or **Events** to view, add or modify events.

Sensor Wash, Recirc Pump & Filter Events
Special Controls and Oxidant feeds display the **Events** selection

Select **Setup** to change the event cycle from 1 to 7 to 28 days

To add a new event select **Add an Event**

Select **Setup** to change the event cycle from 1 to 7 to 28 days

Edit the **Start Day** (Sunday = day 1)
Start Time & ON Time

Event frequency selections vary with selected cycle days

Select frequency and **SUBMIT**

Up to 28 events may be scheduled for each relay, pump or digital output (DO)

Pull down the selector to view active event set

In this example the Re-circ pump VFD runs @ a lower speed from midnight to 6:00 AM & from 10:00 PM to midnight, every day

Sidebar:

Event Day can be set from **1** to **28** for Pumps set on a 28 day **Event Cycle** and from **1** to **7** for controllers set on a 7 day **Event Cycle** or always **1** on a 1 day **Event Cycle**.

Events repeat every **1, 7** or **28** days.

Relays '1' to '5' & Digital Outputs feed time in minutes.

Frequency controlled outputs '6' to '9' feed volume in mL.

4.0 Sensors

4.1 Sensor Calibration

Select the link on the target sensor and pull down the top, right menu, selecting **Calibrate**.

The image shows two side-by-side screenshots of the DCM500 Browser interface. The left screenshot shows the 'Calibrate' page for a 'Conductivity :A' sensor. It has a dropdown menu set to 'Calibrate', an input field with '2156.1 uS', a 'Factory Reset' section with 'Yes' and 'No' radio buttons, and 'RESET' and 'SUBMIT' buttons. A green arrow points from the 'SUBMIT' button to a text box. The right screenshot shows the 'Diagnostic' page for the same sensor. It has a dropdown menu set to 'Diagnostic' and displays various sensor parameters. A green arrow points from the 'SUBMIT' button on the left page to the 'Status' field on the right page. Another green arrow points from the 'Gain Multiply' field to a text box. A third green arrow points from the 'Offset Adjust' field to another text box. There are three text boxes with green text and arrows pointing to specific parts of the interface.

Calibration Page:

Conductivity :A **Calibrate**

Enter value

Factory Reset ☐ Yes ☒ No

RESET **SUBMIT**

Put the grab sample value of the sensor here & **SUBMIT**

Factory Reset returns the sensor back to it's default value. It's useful when you are trying to identify a faulted sensor or correct an incorrect calibration.

Diagnostic Page:

Conductivity :A **Diagnostic**

Status **Sensor Calibrated**

Sensor type Conductivity

Period Maximum 2047.8 uS

Period Minimum 2005.0 uS

Period Average 2035.0 uS

Sample size 494

Current Period 15 minutes

Log Period 60 minutes

Compensation Thermal Comp

Measured Level 365.2 mV

Gain Multiply 5.8347

Default Gain 5.6000

Offset Adjust -35.0000

Default Offset -35.0000

Input card ID 75 mV

REFRESH

After **SUBMIT** The controller displays the **Diagnostic** page & **Sensor Calibrated Status**

Sensors are measured in millivolts and then **Gain & Offset** are applied to convert to user units, **uS** in this example

Calibration modifies either **Gain** or **Offset**. If either gets too far from **Default** values, the sensor will fail to calibrate

Sidebar:

Single Point Calibration: All sensors but some 4-20mA inputs can be single point calibrated. Measure a grab sample from the sensor installation line and calibrate the sensor based on the grab sample. It's the simplest, most repeatable method.

Corrosion rate sensors are not calibrated.

Process control and monitoring only sites which may operate over a wide sensor range benefit from 2 point calibration. For these users, the DCM500 supports direct set of sensor OFFSET & GAIN.

Calibration Faults: Refer to the next page for options on fault.

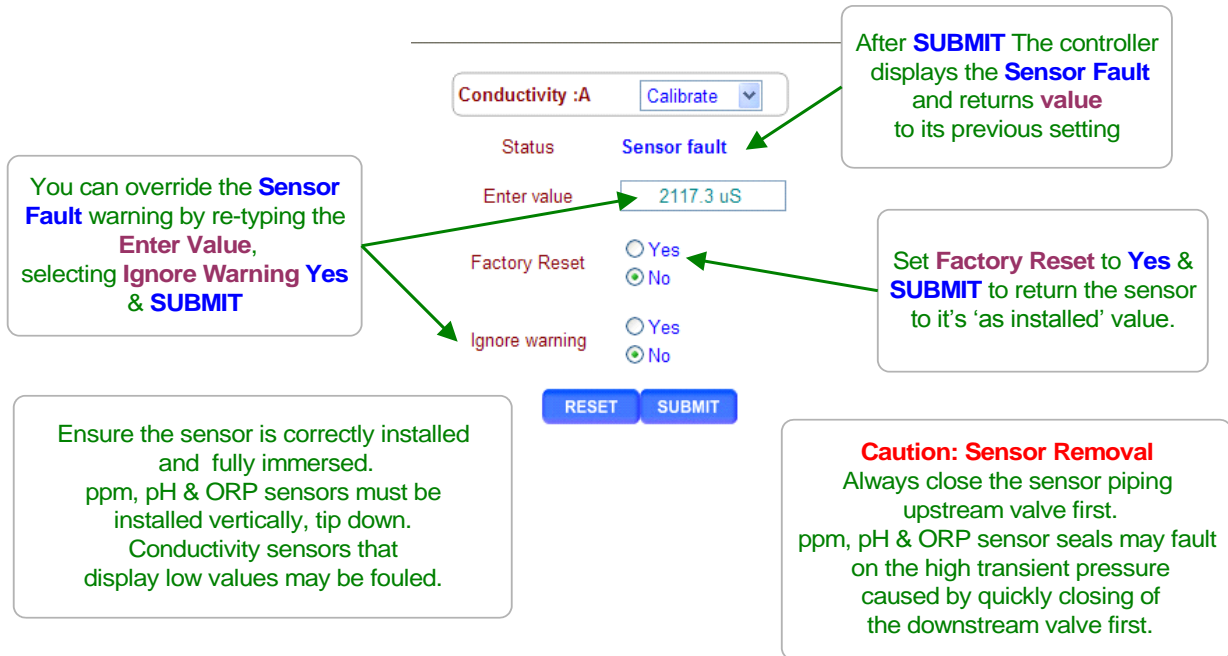
LSI-Ryznar, Inventory and Manual Input sensors

Use **Calibrate** when you fill a tank to correct the **Inventory** level.

Use **Calibrate** after you measure alkalinity or hardness to update **LSI_Ryznar**

4.1 Sensor Calibration

This page displays on a failure to calibrate. Although, you may elect to ignore and bypass this warning it's usually telling you there's a problem. You may have forced to sensor to read a value, but it may not track changes in ppm, conductivity, pH, ORP, temperature, GPM...



Sidebar:

Sensor Fault: The DCM500 verifies that sensor OFFSET or GAIN required to make the sensor read it's new value are within the range of typical sensor operation. If out of range, **Sensor Fault** displays.

Fault Cause varies with sensor type.

Conductivity: Fouling lowers the measured value. Remove and inspect. Whitish deposits indicate high calcium. If no visible fouling clean, with alcohol or solvent then **Factory Reset**.

ORP: Verify sensor cable not shortened & firmly connected. Verify not visibly fouled. If stream contains organics, clean with alcohol or solvent. If stream high in iron or copper restore platinum surface with Aqua Regia or equal.

pH: Verify solution ground connected & excess sensor cable coiled at sensor, not in enclosure. Verify sensor cable not shortened & firmly connected. Then replace if no recovery after **Factory Reset**. pH sensor life decreases with handling and temperature extremes.

Temperature: Verify color coding correct and sensor wires firmly connected. Inspect sensor for damage or leaking.

4.2 LSI-Ryznar Calculation

LSI-Ryznar calculations use a combination of measured sensor & manual test values.

LSI-Ryznar_J :J Configure

Description: LSI-Ryznar_J

Gain Multiply: 6.5000

Offset Adjust: 6.0000 ppm

Display units: ppm

Decimal digits: 1

Compensation: LSI-RSI

pH Sensor: C:pH Sensor C

Conduct. Sensor: A:Conductivity A

Thermal Sensor: B:Temperature B

uS to TDS: 0.670

Disable Input: ☐ Yes ☒ No

REFRESH **SUBMIT**

LSI-Ryznar_J :J Calibrate

Status: Calculation Updated

CaCO3 Hardness: 210.0

Alkalinity: 95.0

Conductivity: 3000

RESET **SUBMIT**

LSI > LSI Scaling displays a **Scaling** alarm.

RYZ, Ryznar alarms display both **Scaling** & **Corrode** alarms.

SensorInput_J :J Alarms

LSI Scaling: 0.0

RYZ Corrode: 8.0

RYZ Scaling: 6.0

Alarm Relay: ☒ Yes ☐ No

Delay on Alarm: 5.0 minutes

RESET **SUBMIT**

SensorInput_J :J Diagnostic

Status: Operational

Sensor type: Calculated

Period Maximum: 0.2

Period Minimum: 0.0

Period Average: 0.1

Sample size: 459

Current Period: 52 minutes

Log Period: 60 minutes

Compensation: LSI-RSI

Ryznar: 7.2

REFRESH

Select **LSI-RSI Compensation** to configure for Langelier -Ryznar calculation

Select the **pH, Conductivity & Temperature** sensors used for the calculation. **Conductivity** optional.

uS to TDS conversion typical for non-brine streams
Brine streams use **0.5**

Enter a manual **Conductivity** measurement. Only displays if **Conduct. Sensor** set to 'None'

Select **Calibrate** to enter chemical test values for **Hardness & Alkalinity**.

Hardness limited 50 to 400ppm
Alkalinity limited 30 to 140ppm

These LSI-Ryznar alarm values are recommended.

Diagnostic for the LSI-Ryznar input shows both **LSI & Ryznar** values. The **LSI** value is logged.

DCM500 Browser

4.3 Sensor Alarms

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.

pH Sensor C:C **Alarms**

High Alarm: 7.8 pH

Low Alarm: 7.2 pH

Alarm Relay: ☒ Yes ☐ No

Delay on Alarm: 5.0 minutes

RESET SUBMIT

ORP Sensor1 D:D **Alarms**

Status: Control limited

High Alarm: 900.0 mV

Low Alarm: 600.0 mV

Alarm Relay: ☒ Yes ☐ No

Delay on Alarm: 5.0 minutes

RESET SUBMIT

ORP Sensor D:D **Alarms**

Status: Alarmed

High Alarm: 900.0 mV

Low Alarm: 600.0 mV

Alarm Relay: ☐ Yes ☒ No

Delay on Alarm: 5.0 minutes

Clear Alarms: ☒ Yes

Alarmed Low: 14:11:59 20/06/11

RESET SUBMIT

Callouts:

- If the sensor measures greater than **High** or less than **Low**, it will Alarm after the **Delay**
- Alarm Relay = Yes** will turn ON any output with **Special Control = Alarm** when this sensor alarms
- Delay** block transient, nuisance alarms. Set to >1440 to prevent alarms (1 day = 1440 minutes)
- Blocks, if you attempt to adjust an alarm on a pH, ppm or ORP sensor used for control to a value outside of the present control setpoints
- pH, ORP and ppm pump & solenoid controls block setpoints outside of the controlling sensor alarm range
- Alarms do not auto-clear so that problems that occur when you are not viewing the controller are not missed
- If an input is **Alarmed**, the time-date stamp will display with the cause of the alarm
- Set **Clear Alarms = Yes**, and **SUBMIT** to acknowledge & clear the alarm

Sidebar:

Clear Alarms: Resets the **Delay on Alarm** time

If the **Delay on Alarm** is set to zero minutes and the sensor is above the **High Alarm** or below the **Low Alarm**, the sensor alarm will immediately re-trip.

Aquatics sites: Water meters & Contact sets also have alarms & these are set to not trip.

DCM500 Browser

4.4 Sensor Configure

Select the link on the target sensor and pull down the top, right menu, selecting **Configure**.

Conductivity :A Configure

Description Conductivity

Gain Multiply 5.6000

Offset Adjust -35.0000 uS

Display units uS

Decimal digits 1

Compensation Thermal Comp.

Thermal Sensor B:Temperature

Compensation 0.970 %/deg

Disable Input ☐ Yes ☒ No

Callouts:

- Edit Description** for up to 14 letters & numbers. Changes the View on **SUBMIT**
- Gain or Offset** are modified by the controller when you Calibrate the sensor
- Display Units** may be set to any three characters
- Decimal digits** sets the number of digits displayed after the decimal point.
- Pull down and select the **Thermal Sensor** built into the conductivity sensor or installed in the same stream
- The DCM500 won't let you **Disable** a sensor used for control or compensation.

Buttons: REFRESH SUBMIT

Legend:

If the I/O expansion card is installed, sensor I/O in the 'H' to 'N' space displays adding:

- H** = 4-20mA input, **I** = Temperature,
- K & L** = Corrosion rate sensors
- M & N** = 4-20mA outputs

Sidebar:

Description: Text is rejected if it contains HTML delimiters like < >.

Avoid assigning duplicate or similar names for sensors, requiring the user to identify using only the identifying letter 'A' to 'N'.

Each sensor has only one name. It's the same for both Keypad-LCD and Browser users and is included in the controller data logs.

Resolution: When you select the number of digits displayed after the decimal:

1. Keep the number to a minimum to unclutter the display, making sensor values easier to read & remember.
2. pH is typically displayed with 2 digits of resolution & ORP with 0 or 1 digits after the decimal point
3. Conductivity is usually not measured with more than 1uS resolution & is never controlled within 1uS so it's not necessary to display fractional uS.

The displayed resolution of a sensor does not alter the data log resolution or the resolution used for control or the accuracy of sensor calculations.

Disabling a sensor removes it from the display and all selection menus used for control and compensation. Data logging stops for disabled sensors.

DCM500 Browser

4.5 Sensor Compensation

4.5.1 ppm Sensors

Select the link on the target sensor and pull down the top, right menu, selecting **Configure**.

Oxidant :F **Configure**

Description: Oxidant
Gain Multiply: 1.0000
Offset Adjust: 0.0000 ppm
Display units: ppm
Decimal digits: 1
Compensation: Oxidant
Sensor Type: CLE3
pH Sensor: C:pH Sensor C
Disable Input: ☐ Yes ☒ No

Oxidant_E :E **Diagnostic**

Status: **Operational**
Sensor type: Oxidant

Period Maximum: 5.0 ppm
Period Minimum: 2.9 ppm
Period Average: 4.2 ppm

Sample size: 48
Current Period: 50 minutes
Log Period: 60 minutes

Compensation: 2.80ppm HOBr

Measured Level: 3.5 mV
Gain Multiply: 1.0383
Default Gain: 1.0000
Offset Adjust: 0.0000
Default Offset: 0.0000

Oxidant_E :E **Calibrate**

Enter value: 5.1 ppm
Factory Reset: ☐ Yes ☒ No

Annotations:

- Pull down & select from 1 of 6 oxidant sensors (points to the 'Oxidant' dropdown in the 'Configure' page).
- 4-20mA input **Compensation** may be set to **Oxidant** (points to the 'Compensation' dropdown in the 'Configure' page).
- Oxidant sensors requiring pH compensation will display a **pH Sensor** selector (points to the 'pH Sensor' dropdown in the 'Configure' page).
- Chlorine & Bromine sensors that are pH corrected, display ppm @ the current pH on the **Diagnostic** page (points to the 'Compensation' field in the 'Diagnostic' page).
- DPD ppm measurements take time, during which the actual ppm value may change. The DCM500 corrects for any change in value by capturing the raw sensor reading when **Calibrate** is selected. (points to the 'Calibrate' dropdown in the 'Calibrate' page).
- Selecting oxidant **Calibrate** saves the current raw ppm sensor value which is applied on **SUBMIT** (points to the 'Enter value' field in the 'Calibrate' page).

Sidebar:

ppm oxidant sensors use a DC isolated 4-20mA, 'CII' card, usually located in the E-F slot for a maximum of 2 ppm sensors per DCM500.

If you remove **Compensation** from the ppm sensor input, you'll have access to the underlying 4-20mA input calibration parameters.

DCM500 Browser

4.5.1 ppm Sensors cont.

A combined chlorine calculation can be displayed on inputs 'G' or 'H' if the required free & total chlorine sensors are connected & correctly configured. The resulting free chlorine ppm is logged, alarmed & may be used for control like any other sensor, measured or calculated.

Combined CI Compensation displays as an option when both 'CTE' (total) and 'CGE' or 'CLE3' (free) oxidant sensors are installed.

Combined Chlorine measures the difference between Total and Free Chlorine sensors.

Combined CI Compensation may be selected on 4-20mA input 'G' and 4-20mA input 'H' if the I/O expansion card is installed

Removing or changing the **Sensor type** on either the total or free sensor, removes **Combined CI** compensation

If the 'G' or 'H' input used for combined chlorine does not appear in the site view, use **System: View-Config** to switch I/O icons.

Combined CI Compensation Configuration:

Parameter	Value
Status	Operational
Sensor type	4-20mA Input
Period Maximum	10.3 ppm
Period Minimum	0.2 ppm
Period Average	8.0 ppm
Sample size	259
Current Period	8 minutes
Log Period	60 minutes
Compensation	Combined CI
Gain Multiply	1.0000
Offset Adjust	0.0000
Default Offset	-2.5000

CTE Sensor Configuration:

Parameter	Value
Description	CTE Sensor
Gain Multiply	0.0125
Offset Adjust	-2.5000 ppm
Display units	ppm
Decimal digits	1
Compensation	Oxidant
Sensor Type	CTE
Disable Input	<input type="radio"/> Yes <input checked="" type="radio"/> No

Sidebar:

Free & total chlorine sensors use a DC isolated 4-20mA, 'CII' card, located in the E-F slot for a maximum of 2 ppm sensors per DCM500.

The DCM500 will offer the Combined Chlorine compensation if the required sensor are installed in any order on the E-F slot.

4.5 Sensor Compensation

4.5.2 Corrosion Rate

Select the link on the target corrosion rate sensor and pull down the top, right menu, selecting **Configure**.

Corrosion rate sensors installed as an on-site upgrade auto-configure for carbon steel. If you order the controller with a Cupro-Nickel, Copper, Admiralty or Zinc (Galvanizing) corrosion rate included, it will ship correctly configured.

Steel Sensor :D Configure

Description Steel Sensor

Gain Multiply 1.0000

Offset Adjust 0.0000 mpy

Display units mpy

Decimal digits 2

Compensation Corrosion

Alloy Number 1.000

Conduct. Sensor A: Conductivity

Disable Input ☐ Yes ☒ No

Log Period 5 minutes

REFRESH SUBMIT

Callouts:

- If you have more than one corrosion sensor, modify **Description**
- Steel is **Alloy Number = 1**, **Copper = 2**
- Compensation** sets automatically when the sensor driver card is installed
- If a conductivity sensor is installed in the same header, pull down the selector, select the conductivity sensor & **SUBMIT**

Sidebar:

Corrosion Rate Measurements:

Weight loss coupons are commonly used to measure average corrosion rate over the coupon immersion period. The DCM500 corrosion rate measurement uses **LPR** (Linear Polarization Resistance) for a corrosion rate that's updated every 2 minutes.

Although LPR is not as accurate as weight loss, LPR responds immediately to changes in corrosivity & is sensitive enough to detect oxidant overfeeds, low pHs & high levels on calcium, all of which change the corrosion rate

Corrosion rates are measured in mils/year, MPY where 1mil = 0.001".

LPR is a proven technique for real time measurement of general corrosion rates for all of the metals and alloys in typical aquatics systems. It is not useable for aluminum or stainless steels, which pit rather than corrode uniformly.

4.6 Sensor Diagnostics

Select the link on any sensor to view the **Diagnostic** page for the sensor.

Conductivity A:A **Diagnostic**

Status	Sensor type	Sensor Calibrated	Conductivity
Alarmed if tripped.	Period Maximum	2068.2 uS	
	Period Minimum	2066.8 uS	
	Period Average	2067.3 uS	
	Sample size	173	
	Current Period	5 minutes	
	Log Period	5 minutes	
	Compensation	None	
	Measured Level	375.4 mV	
	Gain Multiply	5.3675	
	Default Gain	5.6000	
	Offset Adjust	-35.0000	
	Default Offset	-35.0000	
	Input card ID	75 mV	

REFRESH

Oxidant_E:E **Diagnostic**

Status	Sensor type	Operational	Oxidant
	Period Maximum	5.0 ppm	
	Period Minimum	2.9 ppm	
	Period Average	4.2 ppm	
	Sample size	48	
	Current Period	50 minutes	
	Log Period	60 minutes	
	Compensation	2.80ppm HOBr	
	Measured Level	3.5 mV	
	Gain Multiply	1.0383	
	Default Gain	1.0000	
	Offset Adjust	0.0000	
	Default Offset	0.0000	

Callouts:

- Status** displays Alarmed if tripped.
- If you are controlling conductivity, you'd only expect variation when the bleed opens.
- Here's a possible problem... Conductivities are usually have temperature **Compensation**.
- When you calibrate a conductivity, the controller adjusts the **Gain** to modify the displayed value.
- Input card ID** is checked on each power ON, reconfiguring the controller as sensor cards are added or removed.
- 'E'** indicates where the sensor's connected, independent of the site's sensor name.
- Summary of the sensor variation within 50 minutes of the 60 minute logging period.
- The 4% difference between **Default & Gain** indicates an OK sensor, operating close to Factory default.

Sidebar:

Diagnostic displays how the sensor is configured, compensated and calibrated.

Gain & Default Gain

When you calibrate a ppm or conductivity, the DCM500 adjusts the GAIN to make your measured value match the displayed value.

Offset & Default Offset

When you calibrate a pH, ORP or temperature or corrosion rate, the DCM500 adjusts the OFFSET to make your measured value match the displayed value.

When you two point calibrate a 4-20mA input, the DCM500 adjusts both OFFSET and GAIN.

Inventory and Manual Sensors:

These sensor types use only the OFFSET to set the displayed value.

The controller ignores GAIN for these sensor types.

For example when you fill a tank and **Calibrate** an Inventory sensor to display 48.5 Gallons, **Offset Adjust** will display 48.5.

Measured Level:

pH sensors have a well defined mV to pH relationship.

Example pH7 = 0mV, pH10=176 mV and pH4 = -176 mV.

Displayed sensor value = (GAIN x Measured Level) + OFFSET.

Using this simple equation, you can directly modify the OFFSET & GAIN to get a desired display.

This is seldom done, but it's convenient for atypical sensor types.

4.6 Sensor Diagnostics

Select the link on any sensor to view the **Diagnostic** page for the sensor.

The screenshot shows the 'Steel Sensor :D' diagnostic page. At the top, there is a dropdown menu set to 'Diagnostic'. The page displays various sensor parameters in a table-like format, with some values highlighted in green. Callouts provide additional context for several of these values.

Status	Operational
Sensor type	Corrosion
~~~~~	
Period Maximum	2.43 mpy
Period Minimum	2.43 mpy
Period Average	2.43 mpy
~~~~~	
Sample size	1
Current Period	4 minutes
Log Period	5 minutes
~~~~~	
Compensation	Corrosion
Anodic Level	245.3 mV
Cathodic Level	-286.5 mV
Pitting Level	18.9 mV
~~~~~	
Measured Level	1192.4 mV
Gain Multiply	1.0000
Default Gain	1.0000
Offset Adjust	0.0000
Default Offset	0.0000
~~~~~	
Input card ID	1604 mV
Drive Level	1211.1 mV

At the bottom of the page is a blue button labeled 'REFRESH'.

**Callouts:**

- Corrosion rates vary as temperature changes and corrosive chemicals feed.** (Points to Period Maximum, Minimum, and Average)
- The corrosion rate sensor is connected to input 'D' terminals.** (Points to the Sensor type)
- A corrosion rate measurement takes 2 minutes. A 60 minute Log Period would capture nominally 30 measurements** (Points to Log Period)
- During every 2 minutes, each level is updated as the LPR measurement sequences** (Points to Anodic, Cathodic, and Pitting Levels)
- Measured Level may change after each REFRESH as the measurement sequences through each step.** (Points to Measured Level)

### Sidebar:

**Corrosion Rate** has a unique set of diagnostics.

**Anodic** and **Cathodic** levels should be nominally the same magnitude. If not, the sensor tips may be fouled, debris blocked or pitting.

### Pitting Level

Linear Polarization corrosion rate sensors work correctly unless pitted. Pitting usually only occurs under deposits in heavily fouled systems atypical in aquatics site.

### Alarms:

If the magnitude of **Pitting Level** exceeds the **Anodic** or **Cathodic** level, the controller sets the 'Sensor Pitted' alarm at corrosion rates > 2 mpy.

If a conductivity sensor is selected and more than 50% of the measurement voltage is used to overcome the water resistance, the controller sets the 'Low Conductivity' alarm. These alarms alert you to error in the displayed corrosion rate.

## DCM500 Browser

### 4.7 Water Meters

#### 4.7.1 Configuring a New Meter

Select the link on the meter and pull down the top, right menu, selecting **Configure**.

The screenshot shows the 'Configure' page for a water meter. The form includes the following fields and callouts:

- Make-up :** O (Callout: The water meter is connected to input 'O'.)
- Digital Type:** Volume Meter
- Description:** Make-up (Callout: Modify the **Description** to match the site name)
- Volume/contact:** 100.0 G (Callout: Set **Volume/contact** to the value measured every time the meter contacts close)
- Meter Type:** Contact Meter (Callout: If you are using a turbine or paddlwheel meter, set **Meter Type** to **Turbine Meter** & **SUBMIT** then adjust '**K**' Factor & **SUBMIT**)
- Display units:** G (Callout: If you have set the controller to **U.S. Units**, **Display Units** are 'G'allons. Metric units display 'L'iters)
- Decimal digits:** 0
- Copy Volume to:** none
- Compensation:** None
- Disable Input:** No (radio buttons for Yes/No)
- Log Period:** 60 minutes

Buttons at the bottom: REFRESH, SUBMIT

#### Sidebar:

##### Contact Head Meters

Meters may often be user configured for many Gallon/Contact or Liter/Contact settings. Make sure you get the volume/contact correct or feed concentration errors will occur.

##### Turbine-Paddlewheel Meters

Nominal '**K**' Factors or Pulses-per-Gallon are listed for each pipe size on the manufacturer's web site or on the installation manual supplied with the meter.

When meter are supplied with entry fittings, the actual 'K' factor is frequently labeled on the body of the meter.

##### Common Meter Wiring Errors:

1. Switching wire colors when extending 3 wire meter cables.
2. Routing meter wiring in the same conduit as AC power.  
Meter cables are low voltage. If site practice allows, tie wrap meter cabling to the outside of conduit rather than share a conduit with AC power.

## DCM500 Browser

### 4.7 Water Meters

#### 4.7.1 Configuring a New Meter

Unused controller digital inputs can be enabled and used for either contact set-flows switch inputs or to measure volume as water meters or chemical feed meters.

Select the **Diagnostic** page from the **System Home** page.

**ContactSet_U:U**

Enable I/O ☒ Yes

**SUBMIT**

To enable an unused water meter input, select a grayed out link from 'O' to 'V' in the Diagnostic view. Click on **Yes** & **SUBMIT**

**ContactSet_U:U** **Configure**

Digital Type **Contact Set**

Description **Contact Set**

Invert sense ☐ Yes ☒ No

Compensation **None**

Disable Input ☐ Yes ☒ No

Log Period **5 minutes**

**REFRESH** **SUBMIT**

**ContactSet_U :U** **Configure**

Digital Type **Volume Meter**

Description **ContactSet_U**

Volume/contact **100.0 G**

Meter Type **Contact Meter**

Display units **G**

Decimal digits **0**

Copy Volume to **none**

Compensation **None**

Disable Input ☐ Yes ☒ No

Log Period **5 minutes**

**REFRESH** **SUBMIT**

We've converted controller input 'U' from a **Contact Set** to a **Volume Meter**. Edit the **Description** to reflect the new use.

#### Sidebar:

##### Digital Type

The eight DCM500 inputs 'O' to 'V' may be configured to any combination of meter and contact set inputs. Meter inputs measure volume and contact sets measure state, ON or OFF.

##### Contact Set Debouncing:

Mechanical water meter contact sets bounce when closing or opening. The DCM500 software debounces so that you don't measure extra counts when you select **Contact Meter**.

##### Maximum Turbine Pulse Rate:

**Turbine** pulse streams are not debounced and will measure up to 400 pulses/sec. or Hertz. 400 Hz. is faster than the pulse stream from the Seametrics type meter at maximum '**K**' Factor.

### 4.7 Water Meters

#### 4.7.2 Feed Verification & Inventory

Select the link on the target sensor and pull down the top, right menu, selecting **Configure**.

The screenshot shows the configuration page for 'Feed Verify :Q'. The page includes a top right menu with a 'Configure' dropdown. Below this, various settings are listed with corresponding input fields or dropdowns. Callouts provide additional context for several settings:

- Feed Verify :Q**: The meter installed on the pump outlet or inlet is connected to the 'Q' terminals.
- Volume/contact**: Set **Volume/contact** for your verify meter type in mL. **1.0 ml** is the Tacmina default.
- Inventory input**: Select an optional **Inventory Input** for tracking chemical pumped and calculating ppm.
- Wait-to-Verify**: Set the time between the pump turning ON and the first pulse from the verify meter. **30 seconds** is the default.
- Compensation**: Select **Compensation** to **Feed Verify**.
- Verify Output**: Select the pump where the verify meter is installed. In this example, it's the **Inhibitor** pump connected to relay **1**.

The configuration fields include:

- Digital Type: Volume Meter
- Description: Feed Verify
- Volume/contact: 1.0 mL
- Meter Type: Contact Meter
- Display units: mL
- Decimal digits: 0
- Copy Volume to: none
- Compensation: Feed Verify
- Inventory input: K:Tank Level
- Verify Output: 1:Inhibitor
- Wait-to-Verify: 30 seconds
- Disable Input: ☒ No
- Log Period: 60 minutes

Buttons at the bottom: REFRESH, SUBMIT.

#### Sidebar:

**Feed Verify** uses a feed meter on the pump to ensure chemical is pumped when the pump is turns **ON**. Any water meter input '**O**' to '**Z**' can be used for a **Verify Meter**. **Feed Verify** can be used to check any control or feed with a downstream water meter. Relays '**1**' to '**5**' and frequency controlled Pumps '**6**' to '**9**' can be alarmed on fail to feed with the **Feed Verify Compensation**.

Once you've set up the **Verify Meter**, you'll need to tell it which Pump to verify and if you wish keep track of the chemical pumped, which input to use for **Inventory**.

More than one **Verify Meter** can use the same **Inventory input** since more than one pump may use the same tank or tote.

Feed meters may be built into the pump, installed on the pump feed tubing or on the pump suction tubing for fractional HP boiler feed pumps.

Many pumps can be purchased with a low cost option that provides a contact closure whenever the pump feeds, typically every stroke.

These contact sets can **Feed Verify** that the pump has not lost prime, become unplugged or run out of chemical in applications where the accuracy of a higher cost 1mL/pulse meter is not required.

## DCM500 Browser

### 4.7 Water Meters

#### 4.7.3 Copying Meters

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.

Make-up :O Configure

Digital Type Volume Meter

Description Make-up

Volume/contact 100.0 G

Meter Type Contact Meter

Display units G

Decimal digits 0

Copy Volume to Y:Site Total

Compensation None

Disable Input ☐ Yes ☒ No

Log Period 60 minutes

REFRESH SUBMIT

In this example, the **Make-up** meter connected to input '**O**' is copied to the phantom **Site Total** meter @ input '**Y**'

Copying can sum **Contact Meters** and **Turbine Meters**.

Pull this selector down to view all enabled water meters. Select & **SUBMIT** to **Copy**.

You can **Copy** to both real meters connected to inputs '**O**' to '**V**' and/or to phantom meters connected to '**W**' to '**Z**'

#### Sidebar:

The volume measured by one water meter can be copied to another water meter.

There are several uses for copying meters:

1. More than one meter can be summed control.
2. Several meters volumes may be summed to a single meter for logging or alarming purposes.  
If you enabled a phantom input, '**W**' to '**Z**' you don't need to give up a physical controller input to sum volumes.

#### Operation:

Only the incremental volume measured is copied, not the meter daily total.

Copying starts when you set **Copy Volume to**.

#### Constraint:

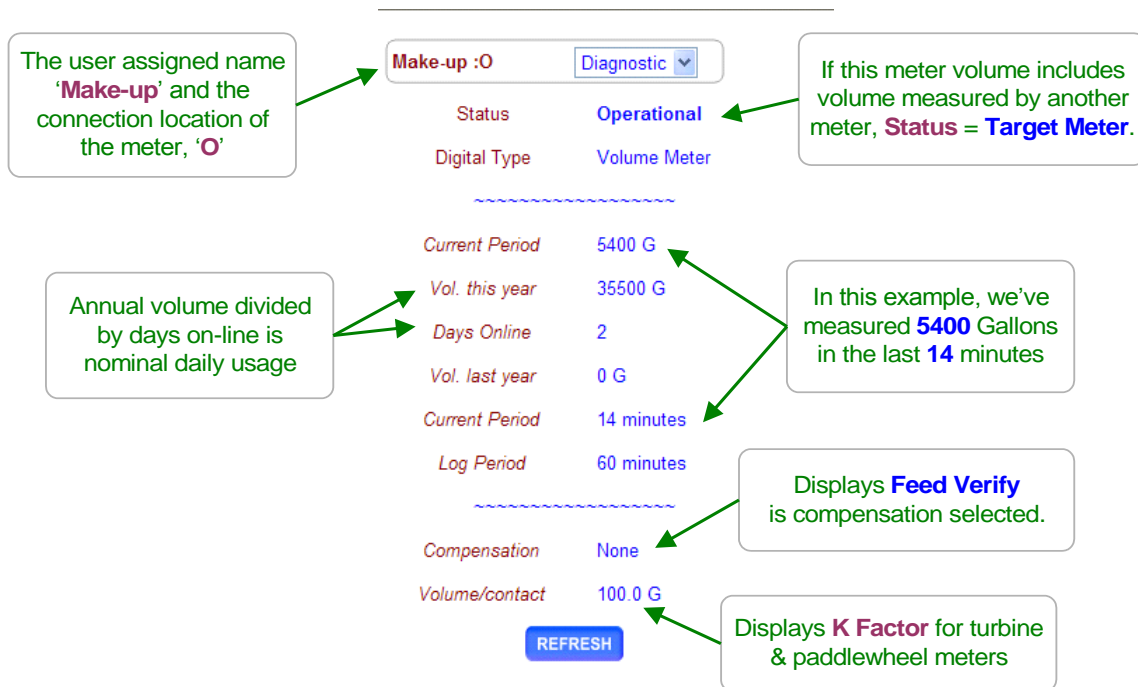
The target meter of a **Copy Volume to** cannot be copied to prevent a run-away circular copy. In this example if you copied meter '**O**' to Meter '**Q**' and then copied '**Q**' to '**O**', you'd quickly get an infinite volume. The controller blocks this type of circular reference.

## DCM500 Browser

### 4.7 Water Meters

#### 4.7.4 Meter Diagnostics

Select the link on the target volume meter to display the **Diagnostic** page.



#### Sidebar:

If **Days Online** = 286 and **Vol. this year** = 1642900 & the site operates 24/7 then we're averaging 5750 Gallons/day

Is this the expected volume for the target usage or load?

If we've been averaging 5750 and today at noon we've measured

**Volume today** = 9860 Gallons, why the increase?

#### Meter Alarms: Low Alarm

The **Low Alarm** for water meters only trips at midnight if the meter has not exceeded to **Low Alarm** volume. Set **Low Alarms** = 0 to prevent alarms @ midnight.

Use **Low Alarm** to flag sites that have not made-up, pools that have had no conductivity control or chemicals that have not fed.

#### Meter Alarms: High Alarm

The **High Alarm** for water meters trips when the meter exceeds the **High Alarm** volume.

Set **High Alarms** higher than the volume expected @ highest load to prevent nuisance alarms OR close to actual usage to flag you on increased load..

Set **High Alarms** on feed verify meters to flag you on increased usage.

Note; Clearing a water meter **High Alarm** without adjusting the **High Alarm** level will immediately trip another alarm on the meter.

### 4.8 Mirroring Sensors

Mirroring is used to display more than one value from a single sensor.

The screenshot shows the configuration interface for a sensor named "TDS_from_A :I". The fields and their values are:

- Description:** TDS_from_A
- Gain Multiply:** 9.5022
- Offset Adjust:** -13.8000 PPM
- Display units:** PPM
- Decimal digits:** 0
- Compensation:** None
- Disable Input:** No (selected)
- Mirror Sensor:** A:Cond - Flow A
- Log Period:** 60 minutes

Callouts and annotations:

- Mirror inputs may be compensated.** (Points to the Compensation field)
- Phantom inputs 'H' to 'N' can Mirror inputs 'A' to 'G'** (Points to the Mirror Sensor dropdown)
- Mirror copies the raw sensor millivolt level from an actual sensor to a phantom** (Points to the Mirror Sensor dropdown)
- This example, would allow the TDS to be thermally compensated differently than the Conductivity sensor.** (Points to the Gain Multiply field)

Buttons: REFRESH, SUBMIT

#### Sidebar:

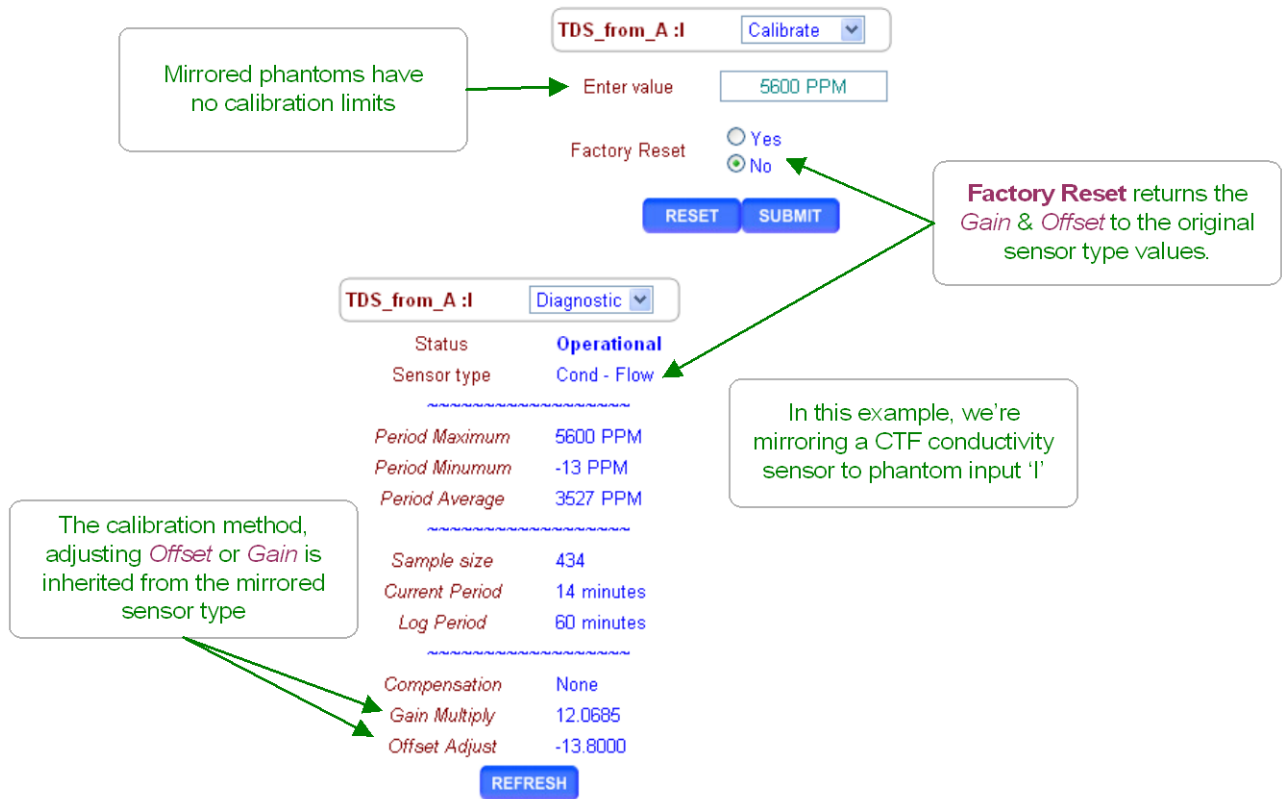
**Mirroring** allows you to display both Conductivity and TDS from one conductivity sensor. Each sensor may be independently calibrated and will likely have different thermal compensation rates.

#### Typical 'Mirror' Uses:

1. **Simplest:** Users may wish to see temperature displayed in both 'F' & 'C'
2. **Brine:** Systems which electrolyze brine for disinfection may measure both TDS & Brine ppm from a single conductivity sensor.
3. **ORP:** Display, control & alarm on both the ORP mV and a value derived from the ORP mV.

### 4.8 Mirroring Sensors

Calibrating a 'mirror' sensor is similar to the method use to calibrate the 'mirrored' sensor.



#### Sidebar:

Single point calibration of a sensor, modifies either the '**Offset**' or '**Gain**' to adjust displayed sensor value to the user calibration value.

Because the controller firmware cannot anticipate all of the uses of 'Mirror' sensors, the limits on calibration need to be removed.

These limits are used to flag users on sensor & wiring faults & make assumptions about sensor values that may be invalid for 'Mirror' sensors.

Mirror sensors use the same calibration method as the 'mirrored' sensor without the limits on the '**Offset**' or '**Gain**' that limit the calibration range of the 'mirrored' sensor.

### 5.0 Flowswitches & Contact Sets

#### 5.1 Switching Meters & Contact Sets

Select the link on the target water meter or contact and pull down the top, right menu, selecting **Configure**.

If you need another contact set, flowswitch or meter, enable an unused input.

If you are going to connect a meter or contact set, use an input 'O' through 'V'. If you are going to use for mirroring or volume summing, use a phantom input 'W' through 'Z'.

Pull down this selector to change from the present **Contact Set** to a **Volume Meter**. and **SUBMIT**

Contact sets used for Interlocking or control cannot be switched. Meters used for control or volume tracking volume cannot be switched.

**Flowswitch :S** **Configure**

**Digital Type** **Contact Set**

**Description** Flowswitch

**Invert sense** ☐ Yes ☒ No

**Compensation** None

**Disable Input** ☐ Yes ☒ No

**Log Period** 60 minutes

**REFRESH** **SUBMIT**

#### Sidebar:

##### Volume & Contact Set Inputs:

Controller inputs 'O' through 'V' may be set individually to be a water meter or a contact set. The DCM500 is defaulted to contact at inputs 'O' to 'V'.

##### Phantom Inputs:

Controller inputs 'W' through 'Z' do not have physical terminals but may be enabled individually as either water-volume meters or contact sets.

Phantom meters are used as '**Rate-to-volume**' or '**Copy Volume to**' targets.

Phantom contact sets are used for re-circulating GPM switches.

### 5.2 Contact Set Alarms

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.

**ON Time Alarm** in this **Flowswitch** example is the time the water feature operates in every 24 hours

**Flowswitch:S** **Alarms** ▼

**ON Time Alarm** 1020.0 minutes

**No Flow Alarm** 30.0 minutes

**RESET** **SUBMIT**

The **No Flow Alarm** in this example would alarm **30.0 minutes** after a loss of flow.

This is not a realistic example, since most sites would be concerned about loss or flow or flow being no too long, but not both

Any event or condition that can be indicated by a contact set, can be alarmed... high or low pressure, level or temperature on filters, ROs tanks, sumps...

#### Sidebar:

Default alarm times are set so that contact sets won't alarm unless user configured. It's unlikely that you would set both alarms on any one contact set but the ability to alarm both ON & OFF states gives you a lot of application flexibility.

#### ON Time Alarm:

If the pressure switch on your RO or sidestream filter shows high pressure for more than 30 minutes, you'd like to log an alarm.

If the flowswitch on a water pad which typically is ON between 6:00AM & 8:00PM

Is ON for more than 15 hours, either the flowswitch has faulted OR pad operation has changed.

#### No Flow Alarm:

If you had an aquatics system that runs 24/7 you'd want to alarm on a flowswitch that has no flow since it indicates that the sensor or injection line is blocked or inadvertently valved OFF.

### 5.3 Re-Circulation Rate Switch

Turbine or paddlewheel insertion type water meters installed in the re-circulation line can be used as a flowswitch.

Select the link on the meter that you wish to use for a GPM switch and pull down the top, right menu, selecting **Configure**.

Then enable a phantom contact set to use as a rate switch.

In this example the meter is connected to input 'U' & the rate switch is @ phantom input 'X'.

**RecircRate_U :U** Configure

Digital Type: Volume Meter

Description: RecircRate_U

'K' Factor: 100.00

Meter Type: Turbine Meter

Display units: GPM

Decimal digits: 0

Compensation: Display Rate

Disable Input: ☐ Yes ☒ No

REFRESH SUBMIT

**Turbine** or paddlewheel water meters can display rate instead of volume

Set **Compensation** to **Display Rate**.

Insertion paddlewheel water meters are frequently installed in large diameter re-circulation piping

**Display Rate** water meters can also be used to control an **Interlocked** contact set

**GPMswitch_X :X** Configure

Digital Type: Contact Set

Description: GPMswitch_X

Invert sense: ☐ Yes ☒ No

Compensation: Rate Switch

Rate Sensor: U:RecircRate_U

TurnON setpoint: 50.000 GPM

Disable Input: ☐ Yes ☒ No

REFRESH SUBMIT

Set **Compensation** to **Rate Switch** & select the target **Display Rate** meter and set the **ON** flow rate

In this example, we can now use 'X' to interlock pumps & filter-heater controls. When the **RecircRate_U** falls below **50 GPM**, the controls will turn OFF

#### Sidebar:

If you wish to measure both volume and rate, wire the meter in parallel into two meter inputs. Configure one meter as a **Display Rate** meter & the other as a conventional volume meter.

### 5.4 Mirroring Outputs

Select the link on the contact set that you wish to use for mirroring and pull down the top, right menu, selecting **Configure**.

**ContactSet_T:T** Configure

Digital Type Contact Set

Description ContactSet_T

Invert sense ☒ Yes ☐ No

Compensation Mirror output

Target Output 3:Biocide

Disable Input ☐ Yes ☒ No

Log Period 5 minutes

REFRESH SUBMIT

**Annotations:**

- Compensation:** Pull down the **Compensation** selector. Select **Mirror output** and **SUBMIT**
- Target Output:** Pull down the **Target Output** selector. Select the pump, valve or solenoid you wish to **Mirror** and **SUBMIT**
- Both ON/OFF relays '1' to '5' and frequency controlled pumps '6' to '9' can be mirrored.**
- Example:** In this example, when the **Flocculant** pump connected to relay **3**, turns ON, contact **ContactSet_T** will also display ON, **Mirroring 3**

#### Sidebar:

**Mirroring, Inverting & Contact Set Controls** support varied and complex PLC type applications.

Many sites won't use these extra contact set functions, however for those sites which have applications these controls, they are built into each controller.

#### Example:

Every time we feed flocculant using the pump powered by relay 3, I want to feed extra biocide after the flocculant feed ends.

I'll configure **ContactSet_T** to mirror the **Flocculant** & then use **ContactSet_T** to control the biocide Pump to turn ON for 15 seconds.

To make this work, I'll need to invert **ContactSet_T** and then configure a contact set control. These methods are detailed in the following two sections.

### 5.5 Inverting Contact Sets

Select the link on the contact set you wish to invert and pull down the top, right menu, selecting **Configure**.

The default for all contact sets and flowswitches is **Invert sense = NO**. When a default contact set closes, the controller displays ON

Select **YES** and **SUBMIT** to invert the sense of **ContactSet_T**.

The controller's **Diagnostic** page for a contact set will tell you if a contact set is Open or Closed.

Form fields:

- ContactSet_T:T [Configure]
- Digital Type: Contact Set
- Description: ContactSet_T
- Invert sense: ☒ Yes ☐ No
- Compensation: Mirror output
- Target Output: 3:Biocide
- Disable Input: ☐ Yes ☒ No
- Log Period: 5 minutes

Buttons: REFRESH SUBMIT

#### Sidebar:

##### Inverting Sense:

Contact sets interlock and control when they are **ON**.

For non-inverted contact sets, **ON** is when the contact set is closed.

If you wish to Interlock or control when the contact set is open, set Invert sense to YES.

If your contact sets are open when they are measuring the state you wish to alarm, control using or log, set Invert sense to YES.

##### RUN/STOP an 'Invert sense' Example:

Contact set 'U' is used for a RUN/STOP switch.

The switch contacts are OPEN when the switch is set to RUN.

**Invert sense** is set for 'U' so that RUN displays on the controller as **ON** and so that 'U' can be used as a flowswitch for pumps and solenoids.

##### 1 Contact Set, 2 Jobs Example:

I want to control a solenoid when the contact set is open & control a pump when the contact set is closed.

Wire the contact set to input 'U' and jumper the **U+** terminal to the **V+** terminal.

Use input 'U' for the pump. Invert the 'V' input & use it for the solenoid.

## 5.6 Contact Set Controls

Select the pump, valve or solenoid you wish to control using a contact set or flowswitch and pull down the top, right menu, selecting **Configure**.

When the controlling contact set is **ON**, the relay is **ON** .

In this example when input '**V**' is **ON**, relay **4** is **ON**.

If the contact set is controlling a variable frequency pump output, **6** to **9**, the pump feeds at 100% when the contact set is **ON**.

Contact_4 :4 **Configure**

Control by:

Interlocked:

Blocked by:

**RESET** **SUBMIT**

Set **Control by** to a contact set input. In this example we've selected input '**V**' to control relay **4**

The **Diagnostic** display shows the total time the output has been **ON** today & **ON** time of the controlling contact set this **actuation** .

TestV_4 :4 **Diagnostic**

Status: **Operational,ON**

Mode:

Control by: V 50 seconds

1.3m ON today 0.8m ON, actuation

**REFRESH** **SUBMIT**

Contact_4 :4 **Setup**

Description:

Disable output: ☐ Yes ☒ No

**RESET** **SUBMIT**

Contact set controls are simple. There are no setpoints or special controls. Relays can be renamed. Frequency controls include pump type selection.

If **Invert sense** is set to **Yes**, the controlling contact set in this example will be **ON** when the contact set is **OPEN**.

This setting allows you to turn the relay or pump **ON** when the contact set is **OPEN** or **CLOSED**.

ContactSet_V :V **Configure**

Digital Type:

Description:

Invert sense: ☐ Yes ☒ No

Compensation:

Disable Input: ☐ Yes ☒ No

**REFRESH** **SUBMIT**

### 6.0 4-20mA Outputs

#### 6.1 4-20mA Output Setpoints

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.

**4-20mAOutput E:E** **Configure**

Description: 4-20mAOutput E

Adjust Setpoint: 25.0 %

Return to Auto: ☐ Yes ☒ No

Interlocked: S.Flowswitch

Log Period: 5 minutes

**REFRESH** **SUBMIT**

**4-20mAOutput E:E** **Alarms**

Status: **Alarmed**

High Alarm: 100000.0 %

Low Alarm: 0.0 %

Delay on Alarm: 5.0 minutes

Clear Alarms: ☐ Yes

4-20 loop open: 06:43:40 13/12/07

**RESET** **SUBMIT**

In **Manual** mode the user sets a fixed current level 0-100% = 4 to 20mA

Both **Auto** & **Manual** modes can be **Interlocked**. Current = 4mA when Flowswitch OFF

The current loop level, 0 to 100% is logged. In this example the current log is available at input 'E'

The controller alarms when the current loop is open. Select **Clear Alarms** & **SUBMIT** to reset.

#### Sidebar:

##### Manual Mode:

Use **Manual mode** to verify the 100% ON=20mA, OFF=4mA & that modulated operation of the proportional pump or valve is operating correctly.

Use **Manual mode** to verify the monitoring input that is using the current loop value to represent a controller conductivity, pH, ORP or corrosion rate sensor or ppm calculation.

##### Load Powered 4-20mA Loop:

4-20mA current outputs are powered by the loop load or by the controller 15VDC power supply. Building automation system typically supply 24VDC to power current loops. Current loop controlled pumps and valves usually use the controller 15VDC supply to power the loop.

##### Open Loop Alarm:

The DC isolated 4-20mA output alarms on an open loop or a loss of loop power.

**Log Period:** DCM500 controllers set the logging rate @ system configure & not @ each I/O.

## 6.1 4-20mA Output Setpoints

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.

**Setpoints** may be reversed to change feed mode. Adjust & **SUBMIT**.

**Return to Manual** by selecting **Yes** & **SUBMIT**.

Pull down the **Control Sensor** selector to view available sensors. In this example, the 4-20mA current is controlled by **Conductivity**.

**Diagnostic** displays the **Auto - Manual - Alarmed Status** & variation is loop current within the log period

**Span & Zero** may be adjusted by keypad users to calibrate the current loop

### Sidebar:

**Setpoints:** Setpoints may be positive or negative numbers.

The 4mA Setpoint may be greater or less than the 20mA setpoint so that the loop current may either increase or decrease as the controlling sensor increases.

A pH sensor can control an acid pump on one 4-20mA output and a caustic pump on another 4-20mA output.

### Calculating Loop Current:

$$4\text{-}20\text{mA Output current (mA)} = 4 + 16 \times \left( \frac{\text{Sensor Value} - 4\text{mA Setpoint}}{20\text{mA Setpoint} - 4\text{mA Setpoint}} \right)$$

Use the absolute value of the setpoint difference for **20mA Setpoint < 4mA Setpoint**.

For this page's example, if the conductivity connected to input 'A' is 1500uS:

$$8.0\text{mA} = 4 + 16 \times \left( \frac{1500\text{uS} - 1000\text{uS}}{3000\text{uS} - 1000\text{uS}} \right)$$

### Manual-Auto Switching:

Setpoints are retained when you switch between Auto & Manual.

You can use one mode to verify the other if you are checking the level at a monitoring DCS or the operation of a proportional pump or valve.

## 6.2 4-20mA Configuration

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.

The screenshot shows the '4-20mAOutput E:E' configuration page. The top right menu is set to 'Configure'. The page is divided into two main sections: configuration on the left and status/alarms on the right.

**Configuration Section (Left):**

- Description:** 4-20mAOutput E
- Adjust Setpoint:** 25.0 %
- Return to Auto:** Radio buttons for Yes and No (No is selected).
- Interlocked:** Dropdown menu showing 'S.Flowswitch'.
- Log Period:** 5 minutes
- Buttons:** REFRESH and SUBMIT.

**Status/Alarms Section (Right):**

- Top Menu:** 4-20mAOutput E:E, Alarms (dropdown)
- Status:** Alarmed
- High Alarm:** 100.000.0 %
- Low Alarm:** 0.0 %
- Delay on Alarm:** 5.0 minutes
- Clear Alarms:** ☐ Yes
- 4-20 loop open:** 06:43:40 13/12/07
- Buttons:** RESET and SUBMIT.

**Callouts:**

- Top Left:** In **Manual** mode the user sets a fixed current level 0-100% = 4 to 20mA. (Points to the 'Return to Auto' section)
- Bottom Left:** Both **Auto & Manual** modes can be **Interlocked**. Current = 4mA when Flowswitch OFF. (Points to the 'Interlocked' dropdown)
- Bottom Center:** The current loop level, 0 to 100% is logged. In this example the current log is available at input 'E'. (Points to the 'Log Period' field)
- Bottom Right:** The controller alarms when the current loop is open. Select **Clear Alarms & SUBMIT** to reset. (Points to the 'Clear Alarms' checkbox and the 'SUBMIT' button)

### Sidebar:

**Control by:** Any enabled sensor of any type, 'A' to 'N' may be used to control the 4-20mA loop current.

Once you've selected a controlling sensor, adjust the **4mA Setpoint** and **20mA Setpoint** to reflect the range for either control of a pump or valve or for a remote DCS monitoring input.

**Example:** You are controlling the 4-20mA output current using a pH sensor.

If the 4-20mA current is controlling a pump feeding acid you could set 4mA= 7.0pH and 20mA = 8.0pH.

The pump would be OFF at 7.0pH and at 100% at 8.0pH.

If the 4-20mA current is monitored by a building automation system or distributed control system, you could set 4mA= 6.0pH and 20mA = 10.0pH. since this span represents the likely range of measured pH.

**Auto Mode:** The **Control Sensor** option only appears in **Auto** mode.

**Open Loop Alarms:** Both disconnected wiring and loss of loop power cause an open loop alarm. In either case, the current loop cannot control a pump or valve.

## 7.0 Frequency Controlled Pumps

### 7.1 Selecting a Pump

Select the link on the target pump and pull down the top, right menu, selecting **Setup**.

**Left Screenshot (ProMinent 1001):**

- Oxidant: 7 (Setup)
- Description: Oxidant
- Log Period: 5 minutes
- Event Cycle: 24 Hours (selected), 7 Days, 28 Days
- Disable output: ☐ Yes, ☒ No
- Pump Type: ProMinent 1001
- ml/stroke: 0.10
- Rated SPM: 180
- Buttons: RESET, SUBMIT

**Right Screenshot (Other):**

- Oxidant : 7 (Setup)
- Status: Feed adjusted
- Description: Oxidant
- Log Period: 5 minutes
- Event Cycle: 24 Hours (selected), 7 Days, 28 Days
- Disable output: ☐ Yes, ☒ No
- Pump Type: Other
- ml/stroke: 0.20
- Rated SPM: 100
- Buttons: RESET, SUBMIT

**Annotations:**

- Left:** Pull down the **Pump Type** selector and select one of the 6 built-in pumps. The controller sets the **Rated SPM** for the selected pump and the **ml/stroke** for a 40 psi injection head.
- Right:** Pull down the **Pump Type** selector and select **Other** if your pump isn't one of the 6 built into the controller. Set the **ml/stroke** and **Rated SPM** for your pump & **SUBMIT**.

#### Built-in Pump types

Pump Type	ml/stroke	Liters/hr	Gallons/hr
1601	0.13	1.404	0.371
1602	0.24	2.592	0.685
1001	0.10	1.080	0.285
1002	0.24	2.592	0.685
0704	0.42	4.536	1.198
0705	0.50	5.400	1.427

#### Sidebar:

##### Pump Type:

If you select one of the 6 built-in ProMinent pumps, the feed volume mL/stroke and maximum frequency are set correctly and automatically assuming a nominal 40 psi feed line pressure. If you select '**Other**' as a pump type, you'll need to provide both the nominal mL/stroke and maximum stroke rate. Pumps with maximum stroke rates from 50 SPM to 400 SPM are supported by the controller.

##### Relay Controls:

Frequency controlled pumps may be switched ON/OFF by one of the controller's relays '1' to '5'. Disconnect and remove the frequency control cable and plug the pump power cord into the controller.

This is not the best use for a frequency controlled pump but if you need more than the controller's four frequency controls, its an option.

### 7.2 Copying a Pump Volume

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.

**InhibitorB:7** Configure

Control by:

Measure volume

then Feed

Copy Volume to

Interlocked

Blocked by

RESET SUBMIT

**Oxidant:7** Configure

Control by:

Copy Volume to

Interlocked

Blocked by

Special Control

Feed

RESET SUBMIT

In this example, we're copying the pumped volume to a phantom water meter. Pumped volume is **added** to **Y:Tot.Inhib.**

In this example, we're copying the pumped volume to tank level. Pumped volume is **subtracted** from the **K:Tank Level**

Pull down the **Copy Volume to** selector to display all possible copy targets. Select & **SUBMIT**.

#### Sidebar:

##### Copying Volumes:

Pumped volumes are summed to volume meter inputs 'O' to 'Z' and subtracted from sensor inventory inputs 'H' to 'N'.

##### Inventory Applications: Summing to Sensor

If more than one frequency controlled pump is feeding from the same tank, both pumps can be set to Copy Volume to the same tank to display and alarm on a calculated tank volume. A Feed Verify meter can also share the same calculated volume.

##### Proportional Feed Application: Summing to Meter

If you wish to feed 100mL of chemical 'B' after every 1000mL of chemical 'A', copy the pump 'A' volume to a water meter. Then use the water meter to feed 100ml of 'B' every time we measure 1000mL from 'A'. The meter doesn't need to physically exist, so you could enable and use one of the phantom inputs 'W' to 'Z' to avoid using one of the meter-contact set inputs 'O' to 'V' which have physical terminal blocks.

### 7.3 Adjusting mL/stroke

Select the link on the target frequency controlled pump and pull down the top, right menu, selecting **Setup**.

Select the **Setup** option to modify a frequency controlled pump's mL/stroke

The default mL stroke setting for the 6 built-in pump types assume a 40psi injection head.

Verify that you are using a **1001** type pump cable to frequency control '7'.

If you require more mL/stroke accuracy, modify the default setting & **SUBMIT**

**InhibitorB:7** Setup

Description: InhibitorB

Log Period: 5 minutes

Event Cycle: 24 Hours, 7 Days, 28 Days

Disable output: ☐ Yes, ☒ No

Pump Type: ProMinent 1001

ml/stroke: 0.12

Rated SPM: 180

RESET SUBMIT

#### Sidebar:

##### Product Concentration Error Sources

ppm level errors can be caused by: Product formulation inaccuracy, loss of active product due to extended storage, settling-separation or temperature, reaction of the product with other fed chemicals, errors in the ppm test method or its reagent, inaccuracy or incorrect scaling of the make-up or feedwater meter **and** errors in the mL/stroke setting of the feed pump.

##### Calibrating Stroke Volume:

When your chemical ppm tests don't match the feed ppm setpoints or the calculated inventory doesn't match the actual tank volume, then consider calibrating the pump ml/stroke. If you find you're correcting the mL/stroke value frequently, then its very likely that the error source is not the mL/stroke setting since the feed head hasn't changed.

##### Calculated Adjust:

If you test 5% higher than the ppm feed setpoint, then adjust the mL/stroke x 1.05.

This method is minimum effort but it may mask other contributors to concentration error.

##### Pump from a Graduated Cylinder:

Pump 100 to 250mL from a graduated cylinder and note the change in inventory or fed volume. Correct the mL/stroke accordingly.

##### Calibration Limits:

The controller limits the range of **mL/stroke** calibration for the built-in ProMinent pumps.

### 7.4 Setting the SPM Rating

Select the link on the target frequency controlled pump and pull down the top, right menu, selecting **Setup**.

**InhibitorB :7** Setup

Status: **Feed @ MIN!**

Description: InhibitorB

Log Period: 5 minutes

Event Cycle: 24 Hours, 7 Days, 28 Days

Disable output: ☐ Yes, ☒ No

Pump Type: Other

ml/stroke: 0.20

Rated SPM: 100

RESET SUBMIT

The controller checks the user set feed rate & mode to verify that the pump can deliver. If you exceed the pump's capacity, the controller will provide a message and set the pump to its MAX feed rate.

**Other Pump Types** can set the Rated SPM. Adjust & **SUBMIT**.

#### Sidebar:

##### Strokes per Minute:

Only **Other** type pumps can adjust the Rated SPM from 50 to 400 strokes per minute. The built-in ProMinent pumps have preset SPM ratings.

The controller uses the **Rated SPM** and **mL/stroke** to verify that feed **mL/minute** setpoints can be delivered.

#### Warning:

Don't set the **Rated SPM** for the pump higher than its nameplate rating since the action of the pump on overspeed may not be defined and in the worst case the pump may stall. This potential operating fault is not an issue for the built-in ProMinent pumps.

## DCM500 Browser

### 8.0 System Settings

#### 8.1 Site Specifics

Select the system or home link. Pull down the top, right menu, selecting **SYS Configure**.

The screenshot shows the 'SYS Configure' page with various settings and callouts explaining their functions:

- System:** SYS Configure (dropdown)
- Status:** (label)
- Site name:** DCM500 Site (text field)
- Controller name:** Pool-Spa (text field)
- Metric Units:** ☐ Yes ☒ No (radio buttons)
- LCD Display:** Pool (dropdown menu)
- Keypad Password:** (text field)
- Load config.:** ☐ Yes ☒ No (radio buttons)
- Save config.:** ☐ Yes ☒ No (radio buttons)
- Flow ON delay:** 45 seconds (text field)
- Flowswitches:** O+P (text field)
- Wash END delay:** 30 seconds (text field)
- Alarm on STOPs:** ☐ Yes ☒ No (radio buttons)
- Log Period:** 60 minutes (text field)
- System restart:** ☐ Yes ☒ No (radio buttons)
- Buttons:** RESET, SUBMIT

**Callouts:**

- Metric Units** displays temperatures in 'C'entigrade and volume in 'L'itres
- Selecting **Yes** will require a password to modify the controller configuration.
- Flow ON delay** allows time for a representative sample of water to reach the sensors
- Flowswitches** tell the controller which digital inputs initiate a **Flow delay**
- Select **Yes** to alarm on all pumps or solenoids user set to **STOP**
- Saving to flash** Edit these fields to uniquely identify your DCM500
- LCD Display** auto-configures the power ON LCD display of mV, pH & ppm.
- Once configured for your site, select **Save config.** Then you'll have a '**last known good**' for **Load config**
- Wash END delay** holds sensor values past the end of a wash event to allow rinsing.
- Sensor minimum, maximum & average values, Contact set ON times, Meter volumes, Pump ON time or pumped volume are logged at this frequency

#### Sidebar:

**Commissioning:** *Select U.S. or Metric Units when you commission or install.*

Data logging uses the Units setting for the units on logged volumes and temperatures. Changing units does not change data already logged.

#### Metric Inputs:

Non 4-20mA temperature inputs are converted to Centigrade using the default offset and gain for each of the thermal input type.

If you switch back to U.S. units, temperatures are converted to Fahrenheit using the default offset & gain, removing the effect of any user calibration.

Inventory volumes are calculated in Liters but units are not changed.

ppm calculations now assume metered volumes in Liters and not gallons.

#### Metric Outputs:

Pumped volumes are reported in mL & Liters.

Event feed volumes are in Liters and not Gallons.

The controller uses the units of the controlling sensor for setpoints.

If a water meter was set to measure Gallons prior to switching the **Metric Units**, it will still display Gallons on the meter and wherever it's used for control.

### 8.2 Passwords

Select the system or home link. Pull down the top, right menu, selecting **Passwords**.

The screenshot displays two side-by-side forms for managing passwords. The left form is titled 'Login @ configure' and the right form is titled 'Login @ Admin'. Both forms have a 'System:' dropdown menu set to 'Passwords'. The left form includes fields for 'User ID' (with 'Configure5' in the dropdown), 'New Password' (with '5' in the input field), and 'Confirm Password' (with '5' in the input field). The right form includes fields for 'New Password' (with 'AAAA' in the input field), 'Confirm Password' (with 'AAAA' in the input field), 'Select User' (with 'O:Operator1' in the dropdown), and 'Access Level' (with 'Operate' in the dropdown). Both forms have 'RESET' and 'SUBMIT' buttons. Annotations with arrows point to various elements: 'Displays your access level, **configure**, **operate** or **Admin**' points to the 'System:' dropdown; 'Modify your **User ID** & **SUBMIT**' points to the 'User ID' dropdown; 'Modify both **New** & **Confirm Passwords** & **SUBMIT**' points to the password input fields; 'You can only view & modify the **User ID** & **Password** of the present current login.' points to the 'User ID' and 'New Password' fields; 'The **Admin** login user can set the access level for other userids' points to the 'Access Level' dropdown; and 'Select the User ID, select the **Access Level** and then **SUBMIT** to change a user's access.' points to the 'Select User' and 'Access Level' dropdowns.

#### Default Passwords:

Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.  
Configure5 = **5** Configure6 = **6** Configure7 = **7** Administrator = **AAAA**  
There are 3 password access levels, Operate, Configure and Administrator.

The eight User IDs are used in the controller's keypress log.

**Login Page:** Operators can view all controller pages.

When you modify a page & **SUBMIT** the Status message will display **Login @ configure** OR **Login @ Admin** is a higher access level is required.

Go to the home page or select the system link and **Logout** & **SUBMIT**, then login at the required access level.

#### Modify Passwords:

If the controller is accessible on the site LAN, you should modify all 8 passwords. Passwords are limited to 8 letters and numbers. Keypad passwords are capitals only. Any space in a password ends the password on both editing and **Login** password entry

Two users cannot share the same password because only the password is used to identify keypad users. The controller displays **Password Fail** on a duplicate password.

**Reset Passwords:** If you forget your password, a **Reset Password**, available from ProMinent & specific to your controller's serial number, setting all passwords to default.

### 8.3 Time & Date

Select the system or home link. Pull down the top, right menu, selecting **Time & Date**.

The screenshot shows the 'Time & Date' configuration page. At the top, a 'System:' dropdown menu is set to 'Time & Date'. Below it, the 'Date DD/MM/YY' field shows '12/12/07' and the 'Time HH:MM:SS' field shows '19:52:01'. At the bottom are 'RESET' and 'SUBMIT' buttons. Two callout boxes provide additional information: one points to the 'SUBMIT' button with the text 'Modify the date and/or time & **SUBMIT**', and another points to the time field with the text 'The controller uses a 24 hour clock. **19:52:01** is 7:52 P.M.'

#### Sidebar:

##### Time & Date:

The controller uses a 24 hour clock where 14:30 is 2:30 PM.

When you set the Date, the controller automatically sets the correct day of the week.

##### Controller Response to a new Time&Date:

When you change the time & date, the controller:

1. Turns all outputs OFF, resets all control timing and restarts the logging period on each I/O
2. Zeroes time and volume owed which ends all timed & volume events.
3. Does a midnight reset which will may set volume-meter Low Alarms.
4. Sets the events Day 1 to the most recent Sunday.

Example: If you are at Day 19, Thursday of week 3, on a 28 day event cycle.

After a **Time&Date** change you are now at, Day 5, Thursday of week 1

## DCM500 Browser

### 8.4 Keypress-Alarm Log

Select the system or home link. Pull down the top, right menu, selecting **Activity Log**.

The screenshot shows the 'Activity Log' interface. At the top, there is a 'System:' dropdown menu currently set to 'Activity Log'. Below this, a list of activities is displayed in a table-like format. Each entry consists of a system name, a user ID, and a timestamp. The activities listed are:

System	User	Activity
System		Alarms cleared
admin	09:53:14 06/11/07	
Biocide		Edit Biotiming
admin	09:40:17 06/11/07	
Biocide		Reconfigured
admin	09:40:10 06/11/07	
Biocide		Interlock modify
admin	09:40:10 06/11/07	
Biocide		Control changed
admin	09:40:10 06/11/07	
Inhibitor		Reconfigured
admin	09:39:31 06/11/07	
Inhibitor		Interlock modify
admin	09:39:31 06/11/07	
Tower Bleed		Reconfigured
admin	09:38:44 06/11/07	
Tower Bleed		Interlock modify
admin	09:38:44 06/11/07	

Annotations with arrows pointing to specific entries:

- A box pointing to the 'Alarms cleared' entry: 'The last 25 user activities, 2 lines for each activity'
- A box pointing to the 'Edit Biotiming' entry: '1st line displays the name of the sensor, meter, pump or valve and the activity'
- A box pointing to the 'Reconfigured' entry (under Biocide): '2nd line displays the user id and the time and date of activity'
- A box pointing to the 'Reconfigured' entry (under Inhibitor): 'These activity log entries flag a **Inhibitor** pump feed adjustment by the **admin** user'

#### Sidebar:

#### Keypress-Alarm Log:

The log contains the last 25 activities that effect the operation of the controller. Most recent activities first. Both keypad and browser user activities are logged.

#### User IDs:

**Keypad Password ON:** Logs the User IDs listed in **Section 9.1 Default Passwords**.

**Keypad Password OFF:** Logs all User IDs as **Keypad**.

Browser user IDs are always logged because login is required to browse.

Actions taken by the controller, like configuring a new driver card on power ON, use the **System** user ID.

### 8.5 Enabling Inputs & Outputs

Select the link on the target ‘unused’ input or output in either the **Diagnostic** or **Site** views.

WaterMeter_Q:Q

System: Home

Frequency_7 :7

Enable I/O ☐ Yes

18/12/07 S/N: U000X0005

Status Logged in

Current User admin

Logout ☐ Yes

New View ☒ Diagnostic

Alarms, Events and Timers ☐ Reset All

Alarms none

RESET SUBMIT

Enable I/O ☐ Yes

Enable by selecting Yes & SUBMIT

In this example, we're enabling a frequency control connected to output '7'.

If the input or output does not appear in the Site view, select Diagnostic & SUBMIT. All I/O displays in Diagnostic.

#### Disabling I/O:

Select Input link and then the **Configure** top menu option, then **Disable & SUBMIT**.  
 Select Output link then the **Setup** top menu option, then **Disable & SUBMIT**.  
 I/O in use by the controller for control or sensor compensation cannot be disabled.  
 Disabled I/O is grayed out, displaying the ‘unused’ gray disc icon.  
 Disabled I/O is not logged and does not appear in the selections used to compensate and configure other enabled I/O

#### Enabling Inputs:

Sensor inputs **A**:Conductivity, **B**:Temperature and **G**:4-20mA Input are fixed.  
**A, B & G** may be enabled or disabled but their function is fixed.  
 The function of Sensor inputs **C-D** and **E-F** is set by the installed sensor-driver card to be another conductivity or a pH, ORP, ppm, corrosion rate...  
 Phantom Sensor inputs ‘**H**’ to ‘**N**’ are enabled as need or used by the optional I/O expansion card.

Meter-Volume and Contact Set Inputs ‘**O**’ to ‘**V**’ are enabled and configured for either water-volume meters OR flowswitches, boiler ON line contact sets, level-pressure switches ...  
 Phantom Meter-Volume or Contact Set inputs ‘**W**’ to ‘**Z**’ are enabled as needed as ‘**Rate-to-Volume**’ and ‘**Copy Volume to**’ target or as ‘**Mirror Output**’ targets.

#### Enabling Outputs:

Outputs **1** to **5** are AC power switching relays that are enabled to power pumps, solenoids or motorized valves.  
 Outputs **6** to **9** are frequency controlled outputs or dry contact digital outputs (DO) that are enabled to proportionally control pumps or enable external equipment, send alarms ....

### 8.5 Enabling Inputs & Outputs

Select the link on the target **'unused'** input or output in either the **Diagnostic** or **Site** views.

The diagram illustrates the process of enabling I/O for two inputs. On the left, there is a form for 'ContactSet_X:X' with an 'Enable I/O' checkbox (currently unchecked) and a 'SUBMIT' button. A green arrow points from a text box below to the 'SUBMIT' button. On the right, there is a form for 'WaterMeter_Q:Q' with an 'Enable I/O' checkbox (currently unchecked) and a 'SUBMIT' button. A green arrow points from a text box below to the 'SUBMIT' button.

**ContactSet_X:X**

Enable I/O ☐ Yes

SUBMIT

In this example, we're enabling phantom contact set input 'X'. We may change 'X' to a meter-volume input after enabling to sum other, real meters.

**WaterMeter_Q:Q**

Enable I/O ☐ Yes

SUBMIT

In this example, we're enabling a real meter-volume input with wiring terminals at location 'Q'.

#### Sidebar:

##### Enabling Inputs:

In each controller there are 26 inputs; 14 Sensors 'A' to 'N' and 12 Meter-Volume or Contact Sets 'O' to 'Z'.

Of the 14 sensors, 7, **A-G**, have terminal blocks where you can connect actual sensors and 7, **H-N**, are 'Phantom' and are used for manual and calculated values unless the I/O expansion is installed which uses sensor **H**, **I** & **K** to **N**.

Of the 12 Meter-Volume or Contact Sets, 8, **O-V** have terminal blocks where you can connect actual meters or contact sets and 4, **W-Z** are 'Phantom' and are used for copy targets and mirroring.

##### Enabling Outputs:

Outputs are enabled in the same way as inputs. Each controller has 9 outputs.

Outputs **1-5** are relays which switch controller AC power to turn ON and OFF pumps, valves and solenoids.

Outputs **6-9** are frequency controls which are connected to frequency controlled pumps by a 2 wire control cable. The pumps are plugged into the AC power and the controller modifies the feed rate by changing the pump stroke frequency.

Outputs **6-9** may also be configured a digital outs, thermally fused @ 24VDC & 250mA

## DCM500 Browser

### 8.6 Configurations

Select the system or home link. Pull down the top, right menu, selecting **View-Config**.

Note: **View-Config** selection is only available when the **Diagnostic** View displays.

The screenshot shows the 'View-Config' interface. At the top, there is a 'System:' dropdown menu set to 'View-Config'. Below it, the text '4 View-Config' is displayed. To the right, a list of View-Config sets is shown: 'AVCset_DCM500_1', 'None', 'AQ_poolspa_1', 'AQ_1pool_htr', 'AQ_2pool_1', and 'AQ_1pool_1'. The 'AQ_2pool_1' option is selected. Below the list, there are radio buttons for 'Yes' and 'No', with 'No' being selected. At the bottom, there are 'RESET' and 'SUBMIT' buttons. A 'Load config.' button is also visible. Annotations include: a box stating 'View-Config sets are loaded when the DCM500 is manufactured. This controller has a set of 4.' pointing to the 'System:' dropdown; a box stating 'DCM500s may have up to 15 View-Configurations loaded. This controller is currently running the AQ_2pool_1 View-Config' pointing to the selected option; a box stating 'Load a new View-Config by selecting a View-Config, setting Load config. to Yes & SUBMIT' pointing to the 'Load config.' button; and a 'WARNING' box stating 'Save your existing configuration using Save config prior to loading a new one'.

#### System: **View-Config**

Up to 15 view-configurations may be included with the controller.

Each **View-config** may have its own graphics, controls, alarms, setpoints, interlocks, pump types & name... everything in DCM500 is defined in a **View-config**.

The configurations shipped with the controller make it easy to modify the DCM500 for each site or to add functionality to an existing controller.

You'll need to be connected at the '**admin**' password level to **Load Config**.

### 8.6 Configurations

Display the **Site View** then select the system or home link.  
Pull down the top, right menu, selecting **View-Config**.

The screenshot shows the 'View-Config' interface. At the top, there is a 'System:' dropdown menu set to 'View-Config'. Below it, there are two 'Replace Icon' dropdown menus, both currently set to 'none'. A 'RESET' button is located between these two dropdowns. At the bottom, there are 'RESET' and 'SUBMIT' buttons. A large dropdown menu is open, showing a list of icons including: B:Temperature_B, C:ORP Sensor C, E:Conductivity E, F:Temperature F, G:4-20mA Input G, H:SensorInput_H, I:SensorInput_I, J:SensorInput_J, K:SensorInput_K, L:SensorInput_L, M:SensorInput_M, N:SensorInput_N, P:Feedwater2_P, Q:WaterMeter_Q, R:Softened_R, T:ContactSet_T, U:ContactSet_U, V:ContactSet_V, W:ContactSet_W, X:ContactSet_X, Y:ContactSet_Y, Z:ContactSet_Z, 3:PowerRelay_3, 6:Frequency_6, 7:Frequency_7, 8:Frequency_8, 9:Frequency_9, and none. Three green callout boxes provide instructions: 1. 'Replace icon only displays when the Site View displays' points to the 'Replace Icon' dropdowns. 2. 'Select the icon you wish to replace & icon you wish to replace it with & SUBMIT.' points to the open icon list. 3. A 'RESET' button is also visible between the two 'Replace Icon' dropdowns.

#### Sidebar:

**Replace icon** allows you to modify the **Site View** to match your installed sensor-meter-pump-solenoid set.

Any icon can be replaced with any other icon.

A water meter can be replaced with a frequency-controlled pump.

A pump can be replaced with a pH sensor or a calculated tank level.

All enabled and disabled inputs display in both icon selectors

**Note:** Replacing & switching icons has no effect on the operation of any controls, alarms or data logging. It's a visual change only.

When you remove an icon from the **Site View**, you can still see and access the icon in the **Diagnostic** view.

## DCM500 Browser

### 8.7 Communications

Select the system or home link. Pull down the top, right menu, selecting **COM Configure**. If connecting to a site Ethernet LAN, the DCM500 **IP address** will be auto-assigned.

The diagram illustrates the DCM500 COM Configure interface for Ethernet settings, divided into two states: DHCP Disabled and DHCP Enabled.

**Top Interface (DHCP Disabled):**

- System:** COM Configure
- IP Address:** 192.168.0.90
- Netmask:** 255.255.255.0
- DHCP:** ☐ Enable
- HTTP Port:** 80
- MAC Address:** 0090:c200:0000
- Gateway:** 192.168.0.1
- Buttons:** RESET, SUBMIT

**Annotations for Top Interface:**

- If your DCM500 is not connected to a site LAN, DHCP should remain disabled so can assign a static IP** (points to DHCP field).
- DHCP Disabled allows the Admin user to modify the IP Address & Netmask** (points to IP Address and Netmask fields).
- The default IP Address is 10.10.6.106. In this example, we've changed it to 192.168.0.90. The IP Address becomes the fallback address if DHCP is enabled but not available** (points to IP Address field).
- DHCP gets an IP Address from your LAN. On smaller Ethernet LANs, the DHCP service is provided by your router** (points to DHCP field).

**Bottom Interface (DHCP Enabled):**

- System:** COM Configure
- IP Address:** 192.168.0.106
- Netmask:** 255.255.255.0
- DHCP:** ☐ Disable
- HTTP Port:** 80
- MAC Address:** 0090:c200:0000
- Gateway:** 192.168.0.1
- Buttons:** RESET, SUBMIT

**Annotations for Bottom Interface:**

- DHCP Enabled displays the automatically assigned IP Address & Netmask** (points to IP Address and Netmask fields).
- DHCP runs on power ON & then every 2 minutes. If you connected to the site LAN after power up, wait the 2 minutes OR cycle the power.** (points to DHCP field).

**Additional Notes:**

- Using the keypad, navigate to System / Communicate & ENTER. If you can edit the IP Address, DHCP is not enabled or available. If you can't edit, it's a DHCP assigned IP. DHCP may be turned ON or OFF using the keypad.**
- Note:** When you modify any Ethernet parameter, the DCM500 resets the browser connection.
- Warning:** If you remotely Enable or Disable DHCP, you may not know the new IP Address & will require an on-site user to read the new IP from the DCM500 keypad display.

**Connection Reset Message:**

**The connection was reset**

The connection to the server was reset while the page was loading.

- The site could be temporarily unavailable or too busy. Try again in a few moments.
- If you are unable to connect to the server, please contact your network administrator.

#### Sidebar:

**Warning:** Do not connect the DCM500 Ethernet connection into a site LAN without approval from site IT staff .

Browser passwords are the same as the default keypad passwords listed in the manual Section 8.2 Passwords.

You'll need to configure your notebook to connect.

Refer to Section 9 for Ethernet TCP-IP setup.

## DCM500 Browser

### 8.8 E-Mail Out

DCM500's connected to the site LAN can E-mail alarms & system operating parameters thru Prominent's app which redistributes and re-packages for end users.

The screenshot shows the 'E-mail Setup' configuration page in the DCM500 Browser. The 'System' dropdown is set to 'E-mail Setup'. The 'Status' is 'ON :Mail sent'. The 'E-mail Out' checkbox is checked. The 'Frequency' is set to '6 hours'. The 'Account' is 'DCM500@prominent.us', 'Mail To' is 'datastream@prominent.us', and 'SMTP Server' is '174.36.23.134'. The 'Test E-mail' checkbox is checked, and the 'Next mail' is scheduled for '19 minutes'. The 'RESET' and 'SUBMIT' buttons are visible at the bottom.

**Scheduled DCM500 E-mails include sensor & pump values & system diagnostics.**

**Status** in this example, shows that the last scheduled E-mail or Alarm E-mail was sent successfully

Select **System: E-mail Setup** to configure E-mail out.

**E-mail Out** in this example is turned **ON**. Select **Disable**, **SUBMIT** to stop E-mailing

**Frequency** selectable from 1 to 24 hours.

Prominent's server app takes care of distributing E-mails, building summary reports ...

Check **Yes** & **SUBMIT** to send an E-mail now. Press **REFRESH** to update the status during send.

E-mails are sent on the hour & synched with midnight. The next one is sent in **19 minutes**

#### Status: messages

**OFF:** = E-mail out Disabled by user

**ON :** = E-mails out Enabled by user

**Testing:** = User selects Test E-mail

**:Mail Sent** = last test, alarm or scheduled E-mail successfully sent.

**:No router** = not connected to site LAN or DHCP not yet run or not supported by LAN

**:Timed Out** = last test, alarm or scheduled E-mail not sent.

**:none sent** = Power-on state, prior to 1st E-mail.

#### DCM500 Mail Server Messages

**:Can't Send** = E-mails blocked externally

**:fails, no socket** = Ethernet resources not available

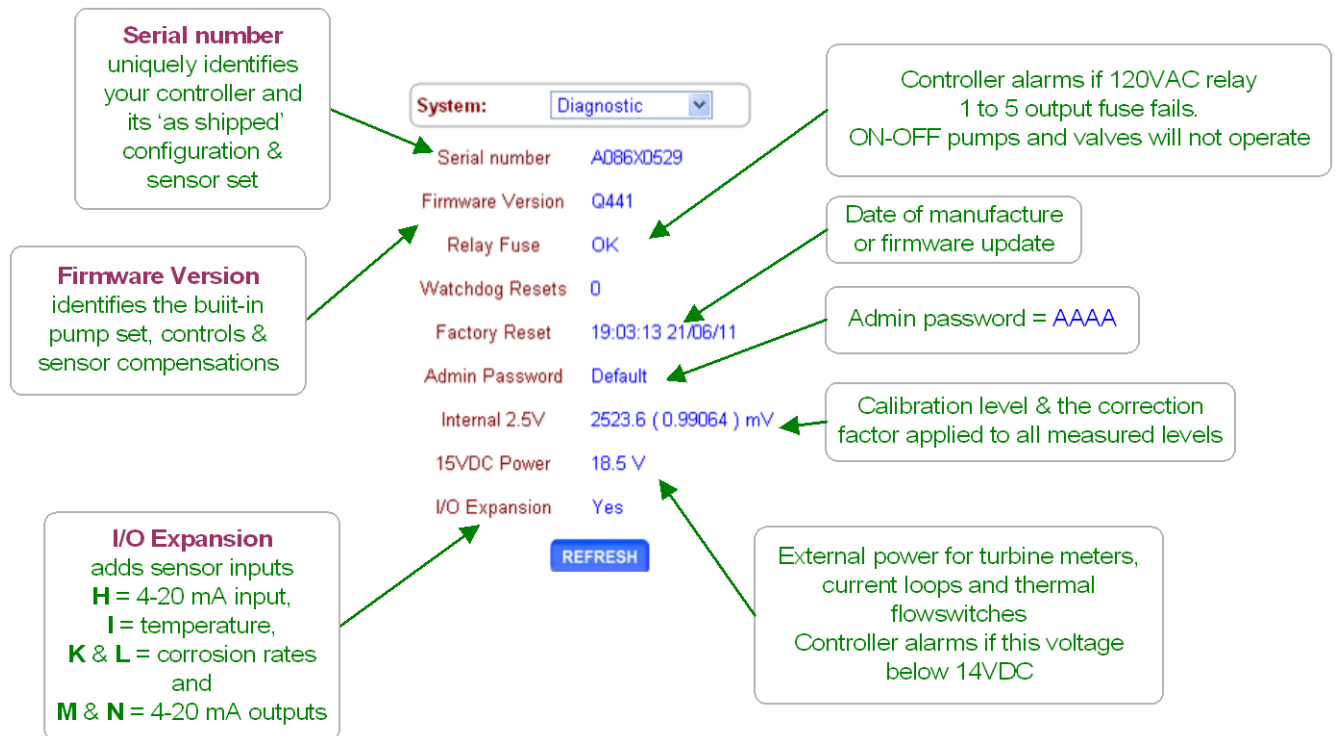
**:fails, no DNS** = cannot connect to SMTP server

**:authorize fails** = password or user name incorrect



### 8.9 System Diagnostic

Select the link below the view Day & Date to get to the log in page then select **Diagnostic** at the top on the right side page.



#### Sidebar:

If the **System Diagnostic** Admin Password is not Default, then you will not be able to use the default 'AAAA' administrator password to log onto the controller.

Watchdog Resets should always be zero.

If you have discharged static onto one of the controller circuit boards or one of the meter, sensor or contact set cables is in the same conduit as AC power switching transients, you may see the Watchdog Resets count up as the controller times-out & recovers.

Touch the grounded controller internal aluminum frame before handling controller sensor cards or re-wiring controller terminals. Static discharge is not typically a problem on-site since few controllers are installed in carpeted areas.

Correct wiring to remove instrument cabling from AC power conduits.

### 9.0 Notebook & PC Ethernet Set-up

#### 9.1 Ethernet Overview

##### 9.1.1 DCM500 Not Connected to the Site LAN

If you are going to occasionally browse the DCM500 using an Ethernet crossover cable, leave the controller IP address @ the default 10.10.6.106 & setup a connection to this IP in your notebook-netbook..

If you do it this way then you can easily connect to multiple, non LAN connected DCM500s without having to modify your notebook or netbook TCP-IP connection for each DCM500

#### 9.2 View-Modify the DCM500 IP Address

**Warning:** Do not connect to a site LAN without permission from the site IT staff.

If you connect the DCM500 into the site LAN, use the keypad to view the DCM500 IP address.

To view or adjust the controller Ethernet setting  
press **ENTER** and **DOWN** to **Communicate**  
at the power up or day-time display.

Key **ENTER** @ **Communicate**

Displays the current LAN **IP address**.  
In this example, it's the factory default.

If you are connected into the site LAN,  
**IP address** is assigned by DHCP & cannot be modified.

Key **ENTER** to modify.  
**ENTER** option not available on LAN connected DCM500s.

**Netmask** is usually this value for most sites.  
Key **ENTER** to modify.

This is the default **HTML Port** for browsing.  
It can be modified only via the browser.

The site IT staff may require the controller **MAC Address** to  
register-allow the controller on the site network.

The **MAC address** is six 2 digit hexadecimal  
numbers, separated by colons into  
3 groups of 4 to fit the LCD screen.

In this example, the **MAC address** is **00 90 C2 00 00 00**

**Communicate**

Pool	679.4mV	↕
7.5pH	2.1ppm	↕

⬅ then ⬇

Communicate	↕
Configure	↕

⬅

IP Address	↕
10.10.6.106	↕

⬇ ⬆ or ⬅

Netmask	↕
255.255.255.0	↕

⬇ ⬆ or ⬅

HTML Port	↕
80	↕

⬇ ⬆

MAC Address	↕
0090:c200:0000	↕

⬇ ⬆

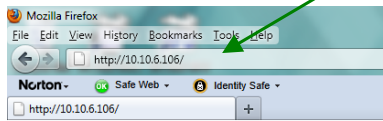
IP Address	↕
10.10.6.106	↕

## DCM500 Browser

### 9.3 Browser Connect

If the DCM 500 is on the site's LAN, you're ready to Ethernet connect & browse.

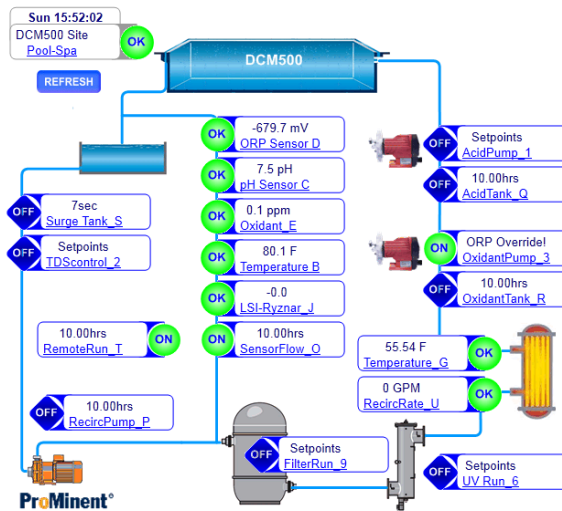
If you are not on the site LAN & are going to use a Cross-over cable, see one of the following sections for your operating system (Windows 7, Vista, or XP) TCP-IP connection set-up.



Connect a 'cross-over' cable between your notebook's Ethernet jack & the controller's Ethernet jack.

Start your browser, Internet Explorer or Mozilla's Firefox.  
If you have wireless internet access, you'll connect to your ISP, Earthlink in this example.  
If no wireless access, you'll get the the not found page.

Then key the controller's IP address into the browser's address line,  
**10.10.6.106** in this example & **ENTER**.  
Your browser will convert to **http://10.10.6.106/**



System:

02/01/11 S/N: A086X0529

Status: Waiting for Login

Select User: Public

Password: .....

New View: ☐ Diagnostic

Alarms: none

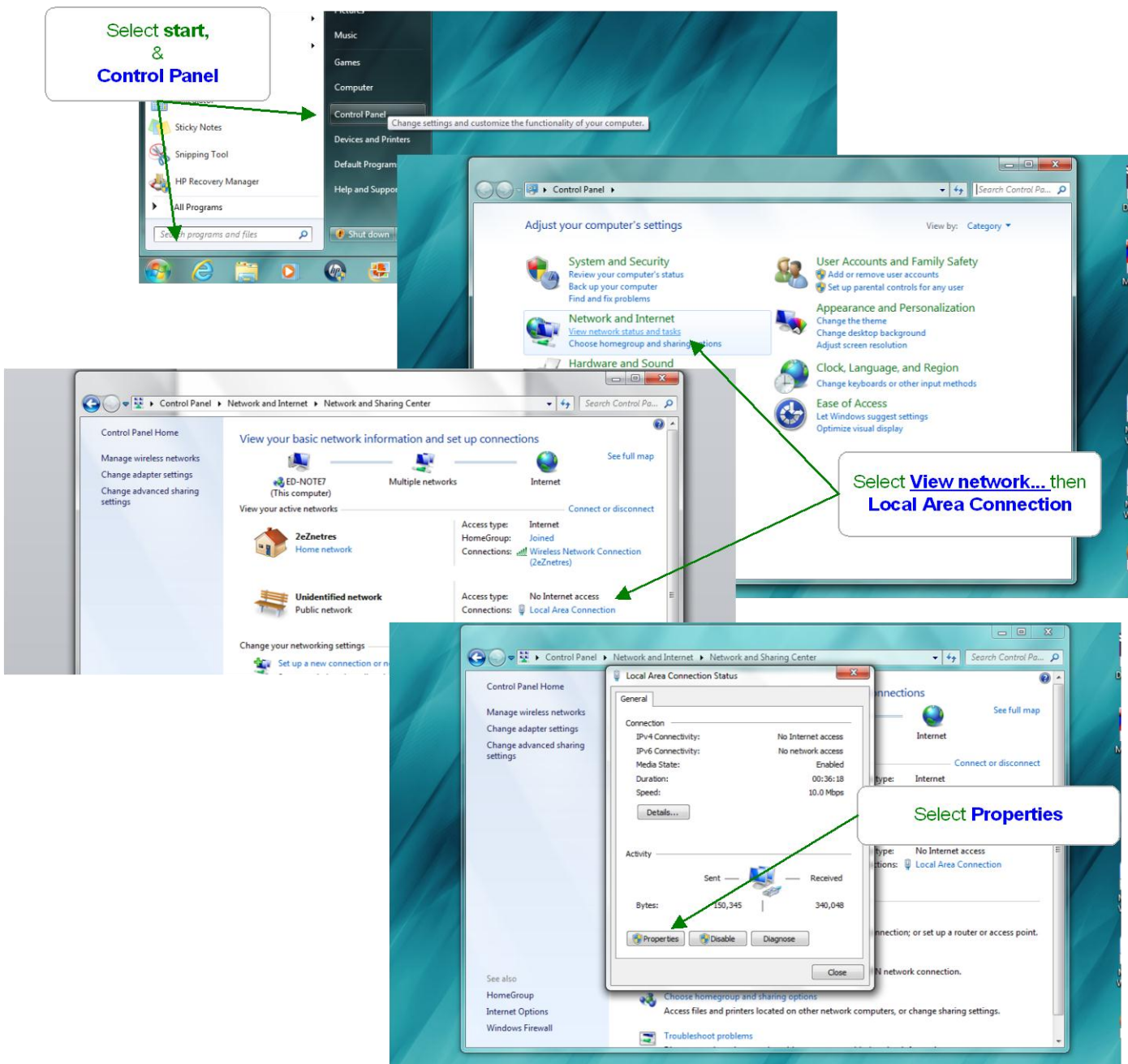
RESET SUBMIT

You'll see a real time view of your DCM500, updated automatically every 2 seconds.

You can select **Diagnostic** & **SUBMIT** to view all of the controller's inputs & outputs.

To do anything else, you'll have to **Login** to the controller

9.4 Windows 7 Cross-Over Set-up



## 9.4 Windows 7 Cross-Over Set-up cont.

The screenshot shows the Windows 7 Network and Sharing Center. The 'Local Area Connection Properties' window is open, showing the 'Networking' tab. The 'Connect using:' section shows 'Atheros AR8151 PCI-E Gigabit Ethernet Controller (NDIS 6.00.00)'. The 'This connection uses the following items:' list includes 'Client for Microsoft Networks', 'QoS Packet Scheduler', 'File and Printer Sharing for Microsoft Networks', 'Internet Protocol Version 6 (TCP/IPv6)', 'Internet Protocol Version 4 (TCP/IPv4)', 'Link-Layer Topology Discovery Mapper I/O Driver', and 'Link-Layer Topology Discovery Responder'. The 'Internet Protocol Version 4 (TCP/IPv4) Properties' window is also open, showing the 'General' tab. The 'Use the following IP address' option is selected, with the IP address set to '10 . 10 . 6 . 200', Subnet mask set to '255 . 255 . 255 . 0', and Default gateway set to '. . . .'. The 'Use the following DNS server addresses' option is also selected, with Preferred DNS server and Alternate DNS server both set to '. . . .'. The 'Validate settings upon exit' checkbox is unchecked. The 'Advanced...' button is visible at the bottom right of the 'Internet Protocol Version 4 (TCP/IPv4) Properties' window.

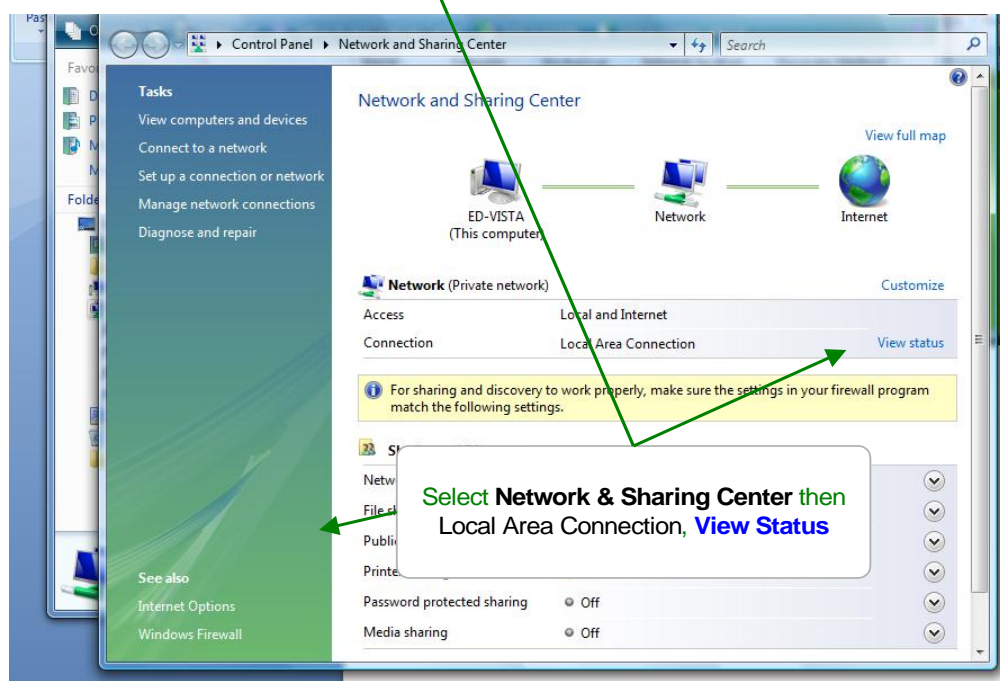
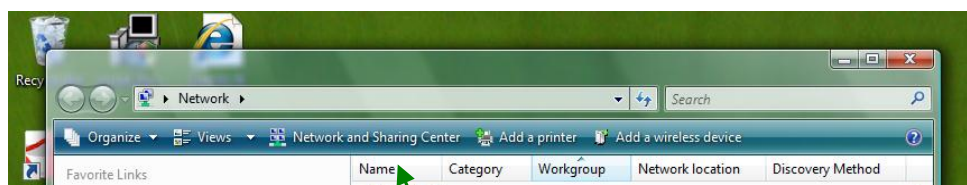
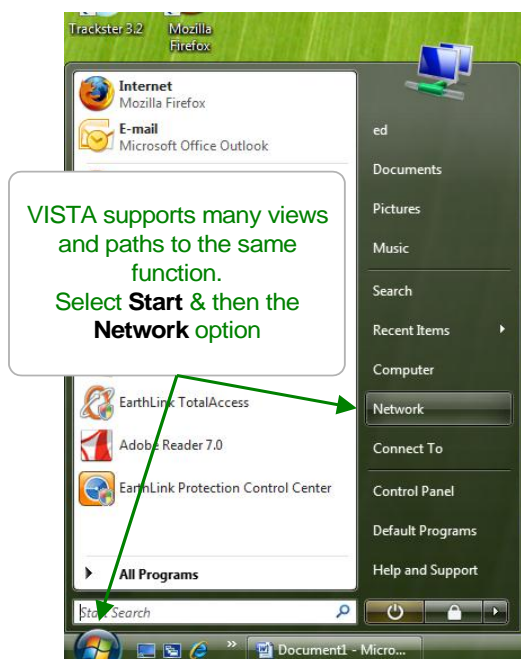
Select **TCP/IPv4** then select  
Use the following...

**Note** the present IP Address and gateway,  
server settings before you modify.  
You'll need to restore them after browsing the  
controller **if** you use the local Ethernet jack to  
connect to other devices or services

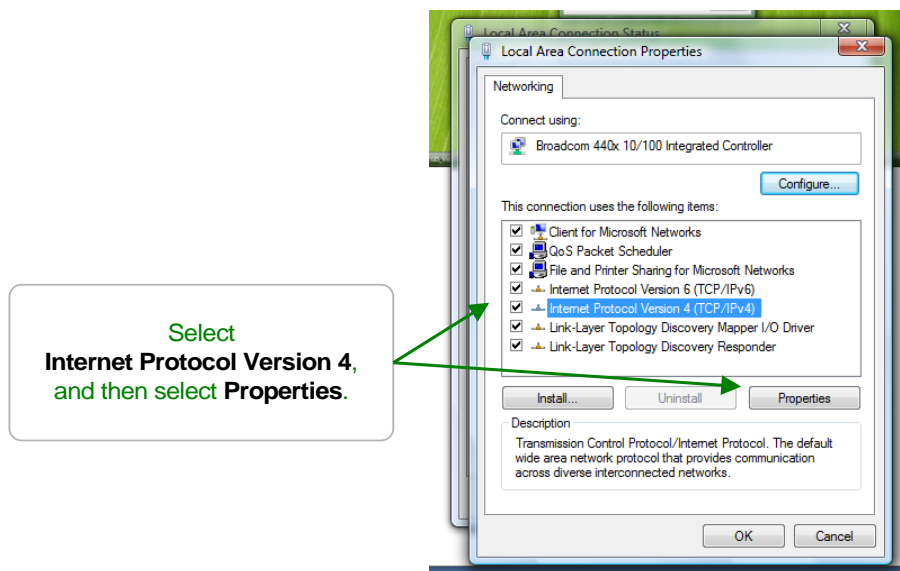
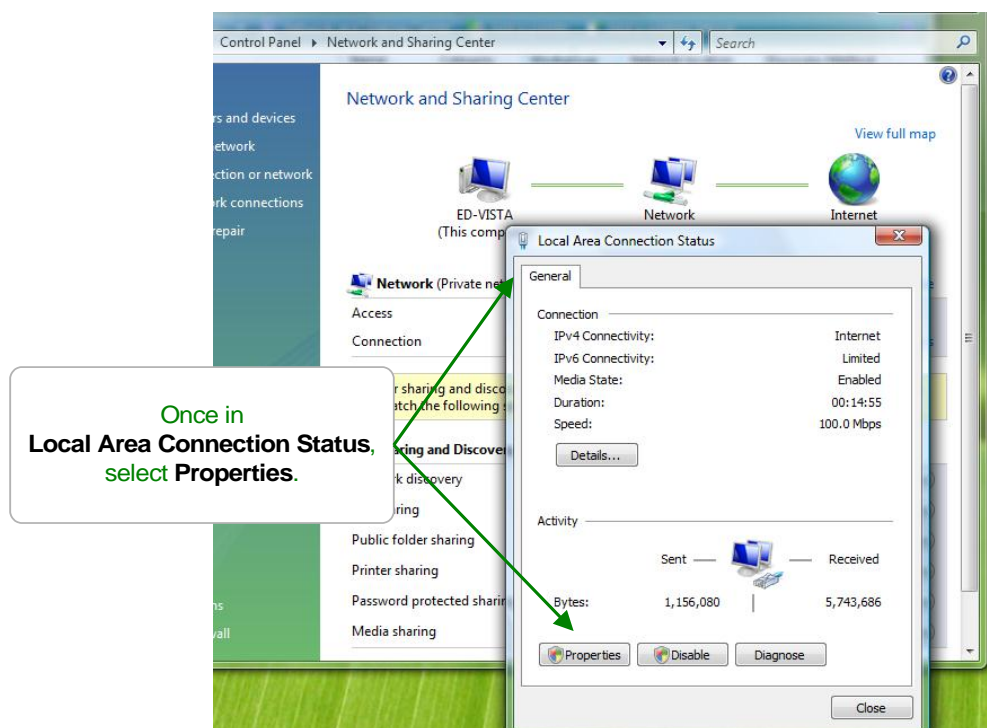
Edit the IP address,  
10.10.6.200 in this example  
& **OK**

We've put our notebook PC  
on the same LAN as the  
DCM500. Now we can  
connect using an Ethernet  
cross-over cable

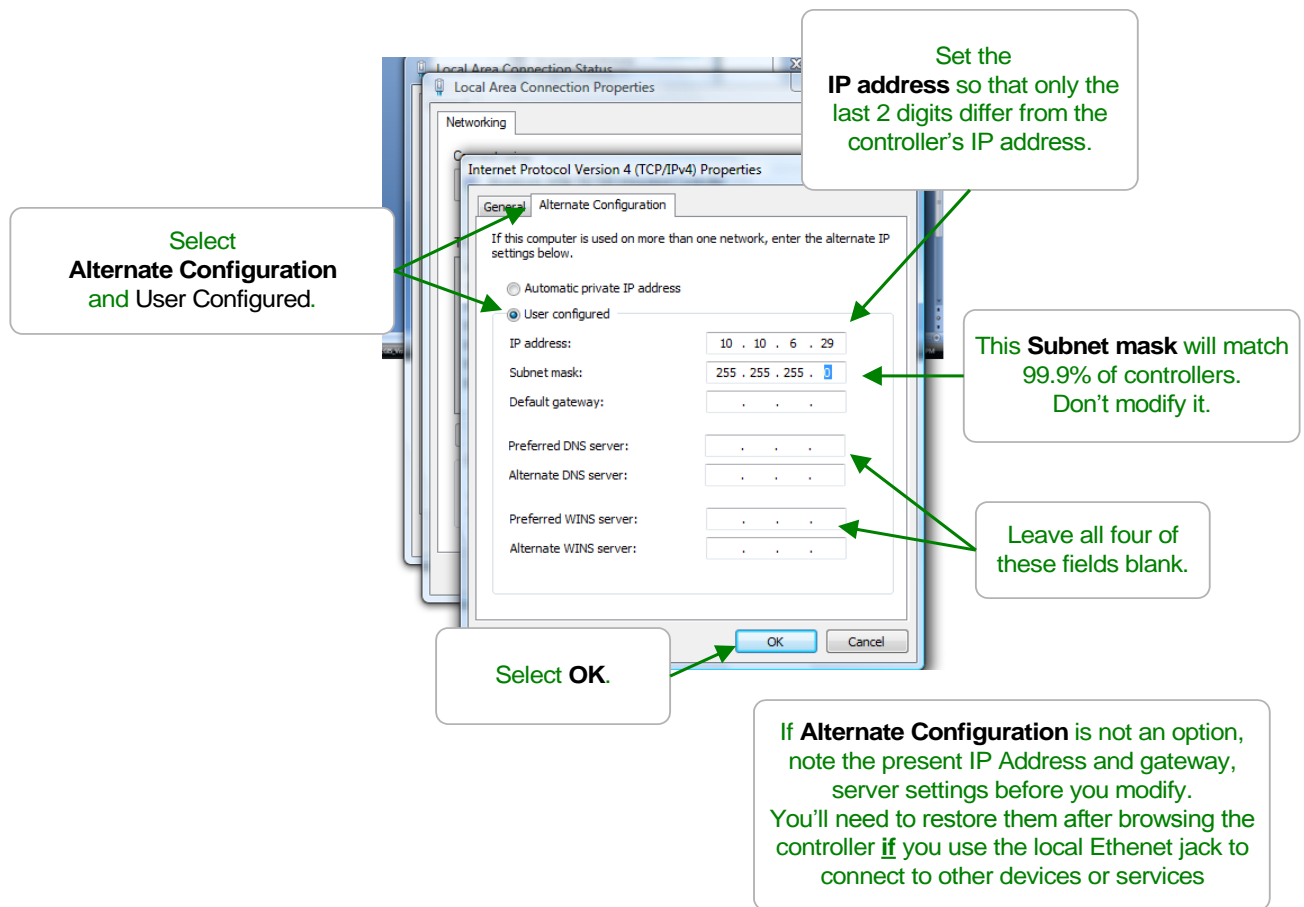
## 9.5 Windows VISTA Cross-Over Set-up



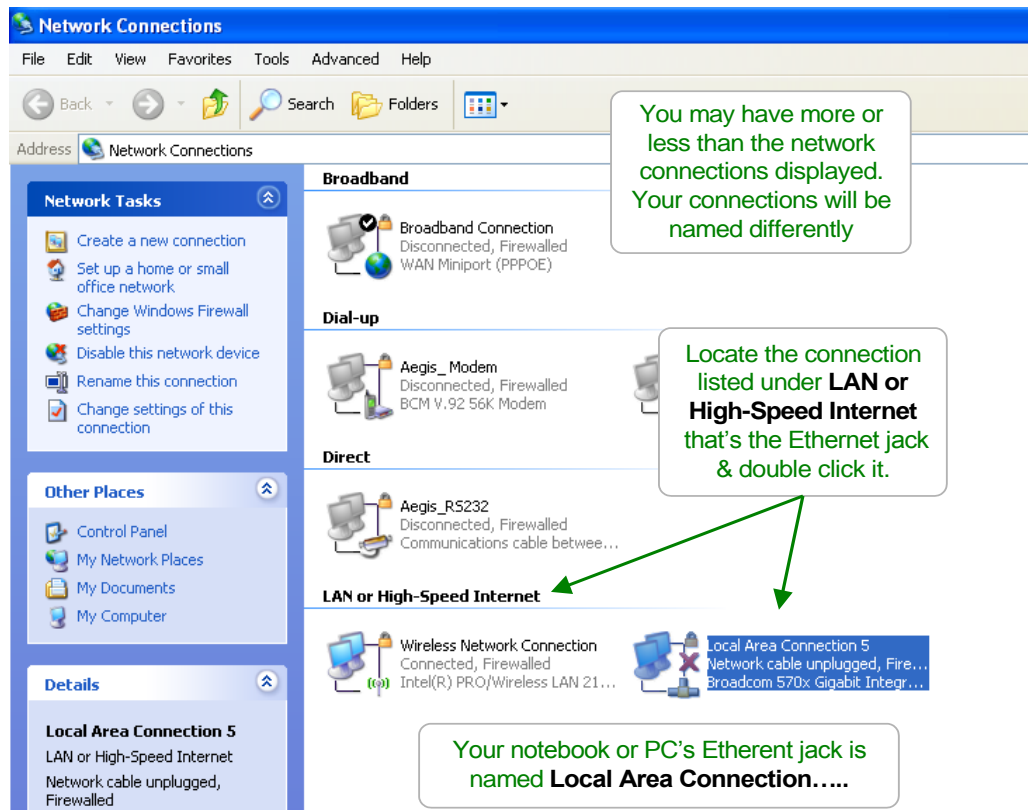
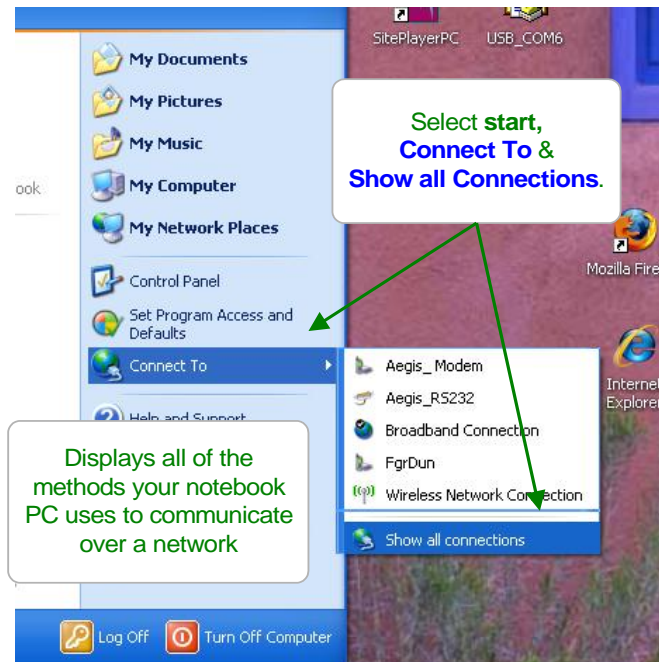
## 9.5 Windows VISTA Cross-Over Set-up cont.



## 9.5 Windows VISTA Cross-Over Set-up cont.



## 9.6 Windows XP Cross-Over Set-up



## 9.6 Windows XP Cross-Over Set-up cont.

