DULCOMETER DCM510[®] Aquatic Water Quality Controller

ProMinen

Use your Tablet or Smartphone. I'm WiFi ready!



Please carefully read these operating instructions before use! - Do not discard this manual! The operator shall be responsible for any damage caused by installation or operating errors! Technical changes reserved

Contents

1	Day-t	o-Day Browsing	4
	1.1	The WiFi Connection	4
	1.1.1	Using a PC:	4
	1.1.2	Using a Tablet	5
	1.1.3	Using a Smartphone	6
	1.1.4	Opening the Browser page using WiFi	8
	1.2	The LAN Connection to a Windows PC or Building Network	9
	1.2.1	Connecting to a PC	9
	1.2.2	Connecting to the building network	12
	13	The Home Screen 1 of 2	14
	14	Home Page Services	15
	141	I og-In	15
	1 / 2	Home Page Detail	15
	1.4.2	Home Page System Icons	10
	1.4.5	Create a Report 1 of 3	18
	1.7.7	View & Adjust Setpoints 1 of 2	10
	1.5	Priming Testing Dumps Feeders & Solenoids	21
2	1.0 Charr	ical Feed Controls: Oxidant Acid	23
2	2.1	Sensor Controlled Foods 1 of 2	24
	2.1	Time Modulation	24 26
	2.2		20
	2.3	DID Controls (Polarize Controls Controls)	27
	2.4	PID Controls (Relays 6 through 9 only)	28
	2.5	Control During Events	29
	2.6	Limiting Feed & Alarms	30
	2.7	Interlocks - No Feed on No Flow	31
	2.8	Blocking-Delaying a Feed	32
	2.9	Feed Diagnostics 1 of 2	33
3	Event	s: Feeding by Time & Date	35
	3.1	Setting & Viewing Events 1 of 2	35
	3.2	Alarm Relay	37
4	Senso	ors: Amperometric, pH, ORP, Corrosion, Conductivity	38
	4.1	Sensor Setup 1 of 2	38
	4.2	Sensor Compensation	40
	4.3	Sensor Calibration	41
	4.3.1	DPD: Oxidant Sensors	41
	4.3.2	pH Dual Buffer Calibration 1 of 2	42
	4.3.3	4-20mA Input Loop Calibration 1 of 3	44
	4.3.4	Inventory Calibration	47
	4.4	Sensor Alarms	48
	4.5	Sensor Diagnostics 1 of 3	49
	4.6	Using Sensor Attributes for Phantoms 1 of 2	52
	4.6.1	Combined Chlorine	52
	4.6.2	Langeliers Saturation Index LSI	53
	4.7	Inventory: Using feed meters & pumped volumes	54
5	Wate	r Meters	55
	5.1	Configuring a New Meter	55
	5.2	Flow Rate Alarm	
	5.3	Pulse to Analog Output	
	5.3.1	Configuration of a VFD control output 1 of 3	
	Confi	guration of a VFD control output 2 of 3	
	Confi	guration of a VFD control output 3 of 3	
	54	Meter Diagnostics	
	5.5	Meter Alarms	00 61
6	Flow	witches System Interlocks & Contact Sets	וט רא
U	6 1	Switching Meters & Contact Sets	ב0 הא
	6.2	Contact Sat Alarms	02 62
	0.2		03

6.3 Inverting a Contact Set	
7 Frequency Controlled Pumps	
7.1 Adjusting mL/stroke	
8 4-20mA Outputs	
8.1 Configure: Manual-Auto Switch	
8.2 Calibrate 4-20mA Outputs	
8.3 Diagnostic – 4-20mA Outputs	
9 System Settings	
9.1 Home & Diagnostic pages	
9.2 Activity Log:	
9.2.1 User ID, time stamp	
9.3 Communications: 1 of 2	
9.3.1 LAN IP, Netmask, MAC, Gateway, Wifi IP	
9.3.2 Com card setup	
9.4 Time & Date:	
9.4.1 Sync to Device	
9.5 E-Mail Setup – Test	
9.6 Enable I/O:	
9.6.1 Enable IO, Assign to System#	
9.7 System Setup:	
9.7.1 Naming, Sunday=Day1, Metric Units, Restart Options	
9.8 User Setup:	77
9.8.1 View-Set Access Level and Passwords	77
10 Using the USB Port	
10.1 Capturing Data	
10.2 Save or Load the Program Configuration	
10.2.1 Saving to the USB	
10.2.2 Loading from the USB	
10.2.3 Saving to/from Flash Memory	
10.3 Firmware Upgrade	
10.4 E-mail Reports and Alarms	
10.4.1 E-mail Types:	
11 Appendices:	

Sidebars: Are used to relate helpful tips and default settings as well as explain typical uses for feed and control functions.

1 Day-to-Day Browsing

The purpose of this manual is the show the user how to connect to the DCM5 controller using an Ethernet connection, or wirelessly via WiFi from a PC, tablet or smart phone. Secondly, to give examples of how to program the outputs, calibrate sensors and/or view the process.

The Installation and Operation manual has detailed sensor information, keypad instruction and controller details and specification.

The following sections detail connecting your smart device or PC to the controller. WiFi has the advantage of not requiring a physical cable. LAN setup follows this chapter, then the Home screen is explained as it is common to either connection method.

1.1 The WiFi Connection

A WiFi connection eliminates cables and the need to change your IP address.

There are two steps needed to fully connect to the controller. **Step 1**: Connect your device to the wireless network that includes your controller. **Step 2**, Enter the IP address of the controller in a browser app. There could be multiple devices on this network.

Step 1 is provided in three parts, **1.1.1 Using a PC**, **1.1.2 Using a Tablet** and **1.1.3 Using a Smartphone**

1.1.1 Using a PC:



Click on the **WiFi** icon on your desktop.

Click on the _DCM5_123 choice and press the Connect button.

The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to

differentiate between controllers if more than one is within **WiFi** range.

Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3** Communications

Your computer is now connected to the DCM5 **WiFi** network.

Continue with section 1.1.4 Opening the Browser page



Sidebar:

Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits. See section **9.3 Communications** to make this change.

DCM510_Browser.doc

1.1.2 Using a Tablet

Open the settings page on your Tablet. Select the Wi-Fi icon. Select the DCM network.

	Wi-Fi	
Settings		
	Wi-Fi	
Robert	PERSONAL HOTSPOTS	
Apple ID, iCloud, iTunes & App Store	Bob's iPhone	HI LTE
E Airplane Mode	CHOOSE A NETWORK	
S Wi-Fi Not Connected	MVC_GUEST	? (j)
Bluetooth On	_DCM5_123	? (j)
۲۷ Cellular Data	Other	

The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.

Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

Your computer is now connected to the DCM5 **WiFi** network. Continue with section **1.1.4 Opening the Browser page**

Sidebar:

Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits. See section **9.3 Communications** to make this change.

1.1.3 Using a Smartphone

Here are Smartphone examples using Android and IPhone;

1.1.3.1 Setting up WiFi using an Android phone

From your home page, press the settings button then choose Wi-Fi.



There may be more than one controller nearby. Choose your controller by comparing the serial numbers last 3 digits with the options on the phone. Select your controller. The status should change for that choice. See example picture below; DCM5_123 is 'Connected, no Internet'.



The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.

Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

Your computer is now connected to the DCM5 **WiFi** network. Continue with section **1.1.4 Opening the Browser page using WiFi**

Sidebar:

Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits. See section **9.3 Communications** to make this change.

1.1.3.2 Setting up WiFi using an iPhone

To connect your IPhone to an DCM5 controller, make a **WiFi** connection; Select the Settings button from your desktop.





The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.

Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

Your computer is now connected to the DCM5 **WiFi** network. Continue with section **1.1.4 Opening the Browser page**

Sidebar:

Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.

See section 9.3 Communications to make this change.

1.1.4 Opening the Browser page using WiFi

Once a WiFi connection is established, continue here with step 2. To connect to the controller and see the screen, open a browser and enter the controller's **WiFi** IP address. (Not the LAN IP). The default address is 192.168.1.1. This address cannot be changed. . Find the controller **WiFi** IP address using the controller keypad.

1) Press the Menu key

2) Press the up arrow (scroll up) until you see System. Press OK

3) You should be at the Communications menu. Press OK.

4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address. This is the address you need to use in the browser URL box. No need to add the WWW or Http. Just enter as shown here. 192.168.1.1 and press your return key.

Once connected, you can see values and status of many I/O point but you will not be able to edit or make programming changes without logging in. This is the **HOME** screen. See section **1.3 The Home Screen**



192.168.1.1

NEXT



DCM510_Browser.doc

1.2 The LAN Connection to a Windows PC or Building Network

Set up the Local Area Network (LAN) connection to facilitate connecting a PC or to ready the controller for connection to the building network. This requires an Ethernet CAT5 cable.

1.2.1 Connecting to a PC

If connecting to your PC, you will need to set up your computer's Ethernet port to match the address of the controller.

The Ethernet cable no longer needs to be a 'crossover' type unless you are running a Windows version earlier than VISTA. WIN7 onward will determine which wires need to be transmit and receive and adjust to match the signals on the cable.

Attach the cable to the LAN port on your PC and to the LAN port inside the controller. (Lower left-hand corner). A green light should be seen on both ports. The amber light will blink with each packet that passes by in either direction.

1.2.1.1 Determine the LAN IP address of the controller

The controller's default LAN IP address is 10.10.6.106 and the LAN Netmask is 255.255.255.0. Verify these numbers;

Press the menu key on the controller Use the up arrow to System and press Enter Press Enter for Communication The LAN IP address is shown

Once you have determined the IP address of the controller, you need to set a static IP address on your PC that is compatible with the controller address.



1.2.1.2 Setup the Local Area Connection on your PC

Depending on which version of Windows you are using, these instructions will vary. The idea is to set a compatible static IP address on your PC for the Ethernet port you will use to physically connect to the controller.

Use the following instructions for VISTA, WIN7, WIN8 and WIN10.

Hold down the Windows key

while you press the letter 'r '.

Enter 'ncpa.cpl' in the **Open** box. Press **OK**.



Double click on Local Area Connection and select Properties



Connect using:			
Intel(R) 82566M	MM Gigabit Network Cor	nection	
		Configure	
This connection uses	the following items:		
Client for Mic	rosoft Networks		
Deterministic	Network Enhancer		
	Calageria		
Gos Facket	Scheduler		
File and Print	er Sharing for Microsoft	Networks	
File and Print	er Sharing for Microsoft bcol Version 6 (TCP/IPv	Networks 6)	
Gos Packet Gos Packet Gos Packet Gos Packet Internet Proto Internet Internet	er Sharing for Microsoft bool Version 6 (TCP/IPv bool Version 4 (TCP/IPv	Networks 6) 4)	
Gos Packet Gos Packe	er Sharing for Microsoft bool Version 6 (TCP/IPv bool Version 4 (TCP/IPv opology Discovery Mapp popology Discovery Mapp	Networks 6) 4) ber I/O Driver	
Gos Packet Gos Packe	er Sharing for Microsoft ocol Version 6 (TCP/IPv ocol Version 4 (TCP/IPv opology Discovery Mapj opology Discovery Resp	Networks 6) 4) ber I/O Driver bonder	
Gos Packet Gos Packe	Contraction of the second seco	Networks (6) (4) Deer I/O Driver bonder Properties	2
	Criteduler Screduler Screduler Scol Version 6 (TCP/IPv Scol Version 4 (TCP/IPv Scol Version 5 (TCP/IPv Scol Version 5 (TCP/IPv Scol Version 6 (TCP/IPv Scol Version 7 (TCP/IPv Scol Version	Networks (6) (4) ber I/O Driver bonder Properties	2
	er Sharing for Microsoft bool Version 6 (TCP/IPv bool Version 4 (TCP/IPv bool y Discovery Mapp opology Discovery Resp Uninstall of Protocol/Internet Prot protocol that provides c reconnected networks.	Networks (6) (4) per I/O Driver ponder Properties ocol. The default ommunication	2
	Control Contro	Networks (6) (4) ber I/O Driver bonder Properties ocol. The default ommunication	2
	Control Contro	Networks (4) (4) Der I/O Driver bonder Properties ocol. The default ommunication	2

(2)Select Properties

Select the 'Use the following IP address': circle (1)	General You can get IP settings assigned automatically if y work supports
Enter the first three numbers of the controller's IP address (2)	this capability. Otherwise, you need to ask your net the appropriate IP settings. Obtain an IP address automatically Suse the following IP address:
Example: 010.010.006	IP address: 010.010.006.101 3 Subnet mask: 255.255.255.0 0
Then enter a number between 000 and 255 that is different from the controller address	Default gateway:
In this example, since the controller IP is 010.010.006.106, we used 010.010.006.101 (3)	Atemate DNS server:
Press the Tab key and enter the Su	ubnet mask of 255.255.255.0
Select OK here and on the Local A	rea Connection window

DCM510_Browser.doc

Sidebar:

If you change the port number from the default address of 80, the WiFi port address will be changed automatically as well.

When the port number is 80, it is implied, therefore, you do not include it in the addressing. However, if it is other than 80, you need to include it when you try to connect to the controller. For example: if you change the address to 100, the default LAN IP address will now be entered as such:

10.10.6.106:100

The WiFi default address is now:

192.168.1.1:100

1.2.2 Connecting to the building network

Using the Local Area Network (LAN) port to connect to the building network, you will need to acquire an IP address from the customer which will allow the controller to be compatible with this network. The address you receive must be unique on this network.

Use the keypad to change the address; (See flowchart on next page)

- 1 Press Menu
- 2 Scroll up to System. Press OK
- 3 Scroll down to Communications. Press OK
- 4 Scroll down to LAN IP Address. Press F1 Adjust

5 Use the up/down and left/right arrows to change the numbers until they show the new address. Press F1 Save.

6 If the LAN Netmask is different from the building network, change that as well, then Save.



DCM510_Browser.doc

1.3 The Home Screen 1 of 2



OUTPUTS - ANALOG AND DIGITAL: Analog 4-20mA output signals to pumps, chart recorders, etc. Digital relays # 1 to 5 for pump and solenoid control. Digital Relays 6 to 9 as pulse or On/Off output for low voltage pump speed output or On/Off control.

The Home Screen 2 of 2



View from Smartphone. Scroll in any direction to access all I/O as shown in the PC/Tablet screen.

1.4 Home Page Services

From the home page, you can see all the enabled inputs and outputs (I/O). Log-in to gain access to three levels of programing privileges. Operator has the least benefit, while Admin has full access.

1.4.1 Log-In

Once you are connected, log in by selecting a username and enter a password.

Usernames with Default Passwords:
Operator1 = 1 Operator2 = 2 Operator3 = 3 Operator4 = 4.
Configure5 = 5 Configure6 = 6 Configure7 = 7 Administrator = AAAA
Login Page: Operators can view all controller pages. No access to most System pages. Configure users can edit the program. No access to most System pages.
Modify Passwords:
If the controller is accessible on the site LAN, you should modify all 8 default passwords.
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.

See section 9.8 User Setup to learn how to change passwords.

1.4.2 Home Page Detail

Now that you are logged in, you can edit the controller configuration as well as monitor the action. The following pages break the Home page into sections to enhance identification.

1.4.2.1 Analog Input Display



1.4.2.2 Digital I/O Display



1.4.3 Home Page System Icons

The home page has a variety of services unrelated to the program. These services are accessed via the icons in the upper left corner of the page. ?

The User Manuals icon ? gives you access to the two DCM510 manuals; Operating and Browser (this manual). The Operating manual explains the keypad usage, wiring and specifications. The Browser manual shows you how to connect to and program a DCM510 controller using a PC, tablet or Smartphone.



Create a Report 2 of 3

The row of icons at the top of the page have the following functionality;

The Trend page uses a different set of Icons. See explanation below.

? 🛦 🗉 🗟 🗗 📣

- ? Access the controller manuals. Download them to your PC from the controller.
- Exit from the report menu back to the Home page
- Show/hide this report menu
- Manage the report database
- □ Show/hide the controller header
- Show/acknowledge current alarms

? 🔺 🗊 🔜 🗗 📣	
	Local Storage Manager
Coom 1 Mour & Hour 12 Mour 1 Day 1 Week Al <<	Select an option below to delete historical data from your browser, then click the Delete button. This will not delete historical data that is saved in the actual controller.
O ^{10.2}	Delete all data 👻
H 10.15	Delete all data
<u>e</u> 10.1	Delete data older than a week
V V	Delete data older than 2 weeks
E 10.05	Delete data older than 4 weeks
5	Delete data older than 8 weeks

Create a Report 3 of 3



1.5 View & Adjust Setpoints 1 of 2



Sidebar:

Relays controlled by sensors power Pumps and Solenoids ON and OFF. (Relays are outputs **1** to **5** & outputs **6** to **9** set to 'ON/OFF') Frequency controlled Pumps feed chemicals at varying rates. (Frequency controlled pumps are outputs **6** to **9** set to 'Pulse Output')

ON-OFF Acid pumps use setpoints 0.05 pH apart so that the re-circulation delay between feeding acid and measuring its pH does not cause wide pH swings. If pH swings continue, consider using Special Control programs like Timed Cycling or Time Modulation to delay the controller response to applications that have a long lag time.

View & Adjust Setpoints 2 of 2

The Setpoint page varies with the configuration and type of control output; ON/OFF or variable frequency (pulse).



Sidebar:

Controls may be configured to prevent one chemical feeding while another feeds (See 'Blocking') into a common injection header.

Pumps, feeders, solenoid or valve controls may be turned OFF when the flowswitch shows no sensor header flow (See Interlocks)

Pay attention to the number **1** to **9** that precedes the pump, valve or solenoid name. It's the physical location on the controller circuit board of the wiring that connects to the pump, valve or solenoid. This is how the program relates to physical devices.

You may modify the name of the pump, feeder, valve or solenoid but you'll need to know which output is controlling so you can check that controller hood indicating light is ON when the pump, feeder, valve or solenoid is ON. (Relays 1-5 on the Left Hand Side & Pulse 6-9 on the Right Hand Side)

1.6 Priming-Testing Pumps, Feeders & Solenoids



Sidebar:

Priming may also be used to slug feed on system start-up in addition to testing pumps, feeders, valves or solenoids. Run Time Limit alarms (minutes per actuation or volume at maximum strokes per minute) may stop priming. See also Blocks and Interlocks. See also section 8 4-20mA Outputs.

2 Chemical Feed Controls: Oxidant, Acid

2.1 Sensor Controlled Feeds 1 of 2



Sensor Controlled Feeds 2 of 2

7:Acid Feeder	×	Outputs 6 to 9 may be Mode configured as either Pulse Output		
	Setup ~	or ON/OFF Output . Use Pulse for frequency controlled pumps & ON/OFF for Run/Stop controlled pumps.		
Control Type	Feed	In this example, we've configured output 7 for frequency controlled feed		
Mode	Pulse Output 🕨 🗸			
0.5		Edit for ye	our site, up to 16 characters	
Set Feed Mode	Sensor Control ×	7:Acid Feede	er 📧	
Control by:	E:pH Sensor ~		Configure 🗸 🗸	
Refresh	Submit	Descriptor	Acid Feeder	
Frequency outputs do not have a minimum on time setting.		Decimal digits	2 ~	
The default Centr	rol Action for an acid foodor whore fo	Disable	Yes 🗸 No	
decreases pH se	nsor reading. Can be changed for cau	Istic. Control Action	ON decreases sensor	
See the Special Control section		Special Control	None ~	

7:Acid Feeder		In this event is the numer will turn on at		
	Adjust Setpoint	7.55pH and off at 7.5pH in On/Off mode.		
Setpoint	7.50 pH	In pulse output mode, the pulses will increase in speed from 0		
Deadband	0.05 pH	pulses at 7.5pH to the maximum pulses at 7.55pH		
Refresh	Submit			

Sidebar: Sensors controlling 4-20mA outputs are detailed in section 8

2.2 Time Modulation

Time Modulation allows an ON/OFF pump to operate proportionally, similar to a frequency or 4-20mA controlled pump. Properly sized ON-OFF pumps are typically set to maximum stroke and rate in **Time Modulation** mode.

Sidebar:

Time Modulate Special Control is selectable on Relays 1-5 and 6-9 only when they are set to **Mode = ON/OFF Output**.

Sidebar: Time Modulate Special Control proportions the pump on time with respect to the setpoint/deadband. At the beginning of each period, the controller compares the actual sensor value within the setpoint/deadband range and determines how long the relay will be on during that period.



Sidebar:

Widen the difference between the setpoint and deadband to dampen oscillations. A smaller difference will control similar to On/Off control.

2.3 Timed Cycling

Timed Cycling allows time for the controlling sensor to measure the effect of chemical before feeding more chemical. **Timed Cycling** is used where a chemical is fed occasionally into a system with a large volume.

It may be several minutes before the chemical travels from the injection point through the piping and then back to the controlling sensor.

Based on the setpoint, the relay will be on for the ON time in each period and off for the remainder of the period. Once the setpoint is reached, the relay will not turn on again until the setpoint calls for chemical. It is either on for the ON Time each period, or off for the complete period if beyond the setpoint.



Sidebar:

Often there is a long time delay between adding a chemical and measuring its effect at a sensor, which causes setpoint overshoot and poor control. Timed Cycling and Time Modulation are great tools for improving chemistry control.

2.4 PID Controls (Relays 6 through 9 only)

If long delays (>60 seconds) exist in your control loop, or you are not experienced in PID control with long delays, we advise that you use a different proportional control method like Time Modulation or Timed Cycling. See **Special Control. (Sections 2.2 and 2.3)**

his example uses t ant feeder control	he Configure page for an led by Relay 7 in pulse mode	Select of from the	Configure e pull-down	Setup a sensor based control as shown Section 2.1 Sensor Controlled Feeds then change Special Control from None to		
7:Oxidant Fee	der					
	Configure	~	7:Oxidar	nt Feeder		
Status	Reconfigured			Adjust Setpoint		
Descriptor	Oxidant Feeder		PID Contro	I 740 mV		
Decimal digits	0	~	Refresh PID	Submit		
Disable	Yes Vo		This example u	uses a variable frequency control pulse pump		
Control Assist	D:Total Chlorine		The relay Cont	rol Assist, pH Lockout and Lockout mode ar		
pH Lockout	E:pH Sensor	Ý		discussed earlier. See Section 2.1 Sensor Controlled Feeds		
Lockout mode	high pH only	v	Select S	pecial Control = PID Control		
Special Control	PID Control		When tuning or troubleshooting, never cha more parameters at the same time. This in pump output.			
Pump Type	Other	Pro	portional is the from the setp	e range of control. 100.0mV (in this example) point, the output will be at 100% on and		
mL/stroke	0.100	proportionally diminish until at the setpoint, where the out will be off.				
Other Pump	240 Rated SPM	The to t less	e Integral rate o he process and s effect. 300 se	controls how frequently the output responds a setpoint difference. A larger value will have conds means that the controller will update		
Xp Proportnl	100.000	the response every 5 m Rule of thumb; set equal 1		bonse every 5 minutes. Zero is off. umb; set equal to 1.5x or 2x lag time.		
Integral Rate	300 seconds	La	<mark>ag Time</mark> : The ti effect	me needed for the sensor to reflect the full of an increase in chemical feed.		
Diffrnce Rate	0 seconds	The out s	e difference rat put has an osci tart to increase	te fine tunes the Integral. Set for O and if the illation that cannot be stopped using P and I e D slowly. A little goes a long way. 99% of		

2.5 Control During Events



2.6 Limiting Feed & Alarms

Run Time Limits are used detect and alert operators of problems with chemical feeders.



Sidebar:

If you are experiencing limit alarms, what has changed? Are you out of chemical? Was there a change in demand for chemical? Is the sensor working/calibrated? Is the chemical injector clogged?

2.7 Interlocks - No Feed on No Flow

An Interlock is a dry contact digital input to the controller (O through V) that can be used to indicate the status of other equipment. This status can then be used to start or stop output relays and/or 4-20mA signals.

Select the 1 to 9 icon o relays from	n the home page. Any digital input, energizing. When the Interlock is or	O through Z, can be an Interlo n, (input closed), the relay is en	ck. Interlocks stop nabled.	
1:Acid Pump		Select Interlocked from the pull-down		
Inte	erlocked ~	In this example, whe	n the contact set @ input	
O:Sample Flow Interlock ~		Is enabled to turn on. It will feed based on the pH setpoint		
S:Return Line Flow	unused ~	4.Chlorine numn	ſ	
Refresh	Submit	Inte	erlocked	
In this example relay outp	ut 4 controls a chlorine pump.	Status	Interlock edit	
If both Sample Flow (O) an we want the chl	d Return Line Flow (S) are ON , orine to be enabled,	O:Sample Flow	Interlock ~	
so we select both to 'OR' would mean that if eit would be enabled. OR'	Interlock & 'AND' them. ther interlock is on, the output s are rarely used in Aquatic	S:Return Line Flow	Interlock ~	
applications as that tenc	ls to be an unsafe condition.	Contact set	'AND'ed ~	
		Refresh	'OR'ed	

2.8 Blocking-Delaying a Feed

Interlocks are inputs that can pause outputs. Blocks are outputs that can pause other outputs.



Sidebar:

Warning: A poorly conceived block may prevent a control from maintaining setpoint.

2.9 Feed Diagnostics 1 of 2



Feed Diagnostics 2 of 2

This page shows exa	amples of Diagnostic information for re	elays.			
An Event diagnostic allows you to terminate an active event. This does not change the schedule.			If an Ox overri	kidant relay is set up for pH de, the status will alert an override action	
1:Events			4:Chlorine pu	mp	
	Diagnostic	·]		Diagnostic	~
Status	ON	5	Status	pH override,OFF	
End Event?	Ves No	3	3.6m ON today	0.0m ON, actuation	
1.1m ON today	1.1m ON, actuation	T	Time Modulate Period:120	OFF Countdown: 28 seconds	
Time Owed	10.9 min		Refresh		
Refresh	Submit				

3 Events: Feeding by Time & Date

3.1 Setting & Viewing Events 1 of 2



Sidebar: Relay 1-5 and controls 6-9 in the ON-OFF mode have timed events. The pump starts at a particular time and runs for a certain number of minutes. Pulse-frequency controls 6-9 have volume feed events. The feed is based on a volume

Setting & Viewing Events 2 of 2



Sidebar:

Limit Alarms, Interlocking & Blocking also are used with Events. They are set identically to those for **Chemical Feed Controls**. Refer to Sections 3.5 to 3.7 for setup & state pages.

Timed & Volume events can also be used to wash sensors, activate solenoids, block other controls during event times or activate alternate chemical or energy saver setpoints.
3.2 Alarm Relay

Any relay can be configured as an alarm output relay. Once a relay is designated as the alarm relay, all other I/O points have the choice to activate the alarm relay when they themselves are in alarm. They can choose to activate the alarm relay or not. Any System alarm will activate the alarm relay.

5:Alarm Relay	•		Select the control # i	con from the right s	ide o	f the home page
	Setup	~	Select the Setup menu	ı from the pulldown		
Control Type	Events-Other	~	Verify Control Type is Events-Other	7:Acid Pump		
Refresh	Subr	nit			ļ	Narms 🗸 🗸
5:Alarm Relay		/	Select the Configure menu from the pulldown	vol.@ MAX spm	3.8	G
	Configure	~		OFF on Alarm	~	Yes No
Descriptor	Alarm Relay	Se Ala	et Special Control = Irm Output & Submit	Alarm Relay	√	Yes No
Disable	Yes Vo	/		C:CLE3 Chlor	rine	When this acid pump on relay 7 is in alarm, the Alarm Relay will be activated
Special Control	Alarm Output	~	J			Alarms
Refresh	Sub	mit		Status	Ala	when this CLE3 sensor is in alarm, the Alarm Relay will not be affected.
				HiAlarm	5	.00 ppm
				LoAlarm	0	.50 ppm
				Alarm Relay		Yes 🗸 No
				Delay on Alarm	5	.0 minutes

Sidebar:

Use an alarm relay to turn on an Alarm Light or Klaxon horn. Use relays 6 - 9 to send an alarm signal to a control system.

Relays 6 through 9 can be used with a maximum of 24VDC/250mA power. Wire them in either direction. They are not polarity sensitive. They can only be configured in ON/OFF mode.

4 Sensors: Amperometric, pH, ORP, Corrosion, Conductivity

4.1 Sensor Setup 1 of 2



Sidebar:

Disabled sensors do not appear on either the local or browser HMIs or any pull-down option. Sensors cannot be disabled while in use for control, interlock or compensation. Disabled sensors can be re-enabled on the **System** / **Enable I/O** page of the Home screen.

Sensor Setup 2 of 2



Sidebar: Selecting a Sensor Type installs the correct 4-20 mA to sensor value conversion & sets calibration limits.

4.2 Sensor Compensation



Sidebar:

If you are re-purposing a controller or adding additional sensors & controls then you may be changing-modifying the default compensation.

4.3 Sensor Calibration

4.3.1 DPD: Oxidant Sensors



Sidebar: Amperometric Sensors

The DPD calibration applies to CLO, CTE, CGE & CLE3 Chlorine & CBR Bromine sensors. All of these sensors connect to 4-20mA input driver cards. The G input does not have the necessary voltage to power a loop for the ProMinent amperometric sensors.

4.3.2 pH Dual Buffer Calibration 1 of 2



pH Dual Buffer Calibration 2 of 2



4.3.3 4-20mA Input Loop Calibration 1 of 3

4-20mA inputs may be single or two-point calibrated. This is an example of a single point calibration.

(This example does not include ProMinent amperometric sensors.)

	Select the A to N i This example	con on the home pag calibrates the 4-20m/	e or the <mark>CAL</mark> icc A Mag-meter co	on below the A-N ic nnected to input G	cons.
G:Mag Meter		×			
	Setup 🗲	~	If using the	A to N icon, select Calibra	Setup from the pulldown & check te = 1 Point
Descriptor	Mag Meter				
Display Units(UOM)	GPM		Fill	in as desired	
Decimal digits				Select 1 or 2	point calibration
Calibrate	1 P	oint ~	In this exa	mple we're going t	o single point
Disable	Yes 🗸 M	lo	Cum		
Sensor Type	Ot	her ~		G:Mag Meter	
20mA Value	240 GPM				Calibrate
4mA Value	0 GPM			Enter value	240 GPM
Reset		Submit		Factory Reset	Yes No
	G:Mag Meter		a		
		Calibrate	~	Edit th	e sensor value & press Calibrate
	Status	Calibrated	Stat	tus = Calibrated &	displays new value
	Enter value	245 GPM			
	Factory Reset	Yes 🗸 No			
		Submit	Calibrate		

4-20mA Input Loop Calibration 2 of 3

On this page we are 2 point calibrating a 4-20mA temperature sensor. Verify the **Setup** page **Calibrate = 2 Point** & select **Calibrate** from the pull down.



4-20mA Input Loop Calibration 3 of 3

Use this method if you cannot induce the sensor to output known values. (If you do not know how much water if flowing through a watermeter, you cannot calibrate!)



DCM510_Browser.doc

4.3.4 Inventory Calibration

K:CI2 Invento	ory 🔹	Р	hantom inputs do not physic	cally exist; you can't wire to	them.
	Setup	&	They are of two types: Anal Digital values; volumes and o	og values in the 'K' to 'N' sp contact sets in the 'W' to 'Z'	ace space.
Descriptor	Cl2 Inventory	In	The inventory level is a calc chen	level without a tank level s ulation based on the amoun nical fed.	sensor. It of
Display Units(UOM)	G		Input 'K' ha	s Compensation set to Inve	ntory
Decimal digits	0 ~		K:Inventory		×
Disable	Ves Vo			Configure	~
Reset	Submit	\ \	Compensation	Inventory	~
Inve pulse	Inventory subtracts the volume pumped by pulse controls and/or the volume measured by displacement metering on the pump head from the user set volume		O:MU Meter	unused	~
disp			P:Bleed Meter	unused	~
			R:Turbine meter	unused	~
			U:Water meter	unused	~
Phantoms an In this exan	re logged, alarmed & can be used for contr nple, likely only a low tank level alarm is us	ols. ed	6:Oxidant Pump	Target Output	~
K:Cl2 Invento	ry 📧		7:PPM Test	unused	~
	Calibrate Y		8:P8 PID	unused	~
Sensor Monitor	Elapsed		Reset	Sut	omit
Enter value	100.0 G	w	/hen the tank is refilled. edit	Enter Value	
Factory Reset	Ves 🗸 No	8	press submit to set the curre	ent tank level	
	Submit				

4.4 Sensor Alarms



Sidebar:

Every sensor, water meter, flowswitch & each control has alarms.

Typically alarms are used to detect changes in operating conditions, mechanical faults, feed issues & sensor faults

Setting alarms too tight so that they trip frequently under normal operating variances, may result in a critical alarm getting a slow or no response.

Understandably, alarms are set to reflect site practice, chemistry, plumbing & time of year. Periodically review each control loop settings including, its sensor, interlock, pump or actuator.

4.5 Sensor Diagnostics 1 of 3

Select the A to N icon on the home page & the **Diagnostic** page will display

Sensor inputs 'C-D', 'E-F' and 'I-J' are used for driver cards so the installed sensor will vary with the type of installed card: pH-ORP, conductivity, 4-20mA input, serial sensor or pH-Temperature



Sidebar:

Diagnostic is a summary of the sensor state. Contents vary widely with sensor type.

Sensor Diagnostics 2 of 3

Select the A to N icon on the home page & the Diagnostic page will display		Sensor inputs 'G' (4-20mA input)			
		& 'H' (10mV/C thermal sensor input) are fixed in controller hardware unlike the sensor driver slots @ C-D, E-F & I-J			
	Diagnostic	In this eventual of 4,20m A CLE2 Chloring concers is connect to input (C)			
Sensor Type	CLE3 Chlorine	In this example, a 4-20mA CLES Chlorine sensor is connect to input 'C			
Variance this hour	5.80 to 5.84 ppm	The user selected 0.00 to 10.00 ppm CLE3 sensor type converts the 4-20m			
Sensor Range	0.00 to 10.00 ppm	signal (10.99mA or 58.3% of span) from the sensor to a ppm value.			
Raw sensor	10.99mA 58.3%				
Gain Multiply	0.8330	the current sensor value.			
Offset Adjust	-3.3330ppm	(ppm = mA x Gain + Offset)			
Alarmed High	14:52:34 2016-Aug-30				
Input Firmware Driver	built-in				
Configure: 003C	Status: 0003				
Device: 000C3B40	Product: 0E120712				
Rev.#: 00000001	S/N:: 15082008				
A.ID#: 31032004	A.Part#: -1				
A.rev#: 0	Firmware:00.00.00.14				
Refresh					



Sensor Diagnostics 3 of 3



Sidebar:

Diagnostic is a summary of the sensor state. Contents vary widely with sensor type.

4.6 Using Sensor Attributes for Phantoms 1 of 2 4.6.1 Combined Chlorine

Analog phantom sensors are inputs 'K' through 'N' and digital phantom sensors are inputs 'W' through 'Z'. They can be enabled from the **System Enable I/O** page. They are phantom in the sense that they do not have wiring locations.

Once enabled, phantoms will automatically appear on the home page. Phantoms can be assigned attributes from sensors, used to accept manual entries, calculate LSI or combined chlorine.



Sidebar:

Phantom Sensors '**K**' to '**N**' and phantom meters-contact sets '**W**' to '**Z**' are logged, alarmed & can be used for compensation & controls.

Using Sensor Attributes for Phantoms 2 of 2

4.6.2 Langeliers Saturation Index LSI



4.7 Inventory: Using feed meters & pumped volumes

Calculate chemical tank inventory by subtracting one or more pump volumes from the tank. Must use frequency pumps and re-calibrate the tank level when filled.



Sidebar:

Metric or U.S. units are set on the **System / System Setup** page. The pump setup will be in mL/stroke. The controller converts the pumped mL/stroke volume to either Liters or Gallons depending on the **System Setup Metric Units = Yes - No** setting.

Volume meters are assumed to measure either Gallons (U.S. units) or Liters (Metric) when calculating Inventory for tank levels or ppm concentrations. Scale all of the volume meters according to the System units setting.

5 Water Meters5.1 Configuring a New Meter



5.2 Flow Rate Alarm

A turbine meter can be used as a flow rate alarm and interlock. This process requires two phantoms, an analog 'Flow Rate' phantom to calculate a rate from a pulse, and a digital phantom to provide other outputs with an Interlock or switch.

Enable and set up a turbine meter as described on the previous page. Enable one digital phantom and one analog phantom. See section **9.6 Enable I/O** to enable the phantoms. Analog phantoms range from K to N and digital phantoms W, X, Y and Z. We are using N and Z in the following example below.



5.3 Pulse to Analog Output

5.3.1 Configuration of a VFD control output 1 of 3

In addition to remotely controlling a Variable Frequency Drive (VFD) manually, the DCM510 now has the ability to control a VFD to a flow rate setpoint, and even use an alternate setpoint to control to an energy saving lower flow rate during off hours. The most common configuration will use a square wave pulse flowmeter (Signet 2536 Blue Cap) and a 4-20mA output. One of each of these will need to be enabled and configured for this purpose. The DCM510 uses its Output Events programming routines to control a VFD to a flow rate input, so a dedicated relay output will also be used.

The steps in the example below will walk you through enabling and configuring the I/O's needed to control a VFD to a flow rate setpoint in Gallons per Minute (GPM).



DCM510_Browser.doc

Configuration of a VFD control output 2 of 3



Configuration of a VFD control output 3 of 3

J:Recirc Out	put	Open the 4-2	Step 4: OmA output from the	e home screen.
	Setup			
Descriptor	Recirc Output		J:Recirc Outpu	ıt 🛛
Disable	Yes 🗸 No			Configure 🗸
Reset	Submit		Control by:	Flow rate Y
	In the Control by dropdown, ch we set up in step 2 above.	noose the phantom Press Submit	Manual mode	None Unassigned Corrosion
			20mA Value	Conductivity pH Sensor
			4mA Value	Generic 4-20mA Temperature
			Interlocked	CLE3 Chlorine 4-20mA Input Flow rate
J:Recirc Ou	tput	a.	Open Loop alarm	Calculate ppm Acid pump PPM Feed 2
	Configure	~	Controls a Pump	P8 unused Acid pump
Control by:	Flow rate ~		Reset	Submit
Manual mode	Vas No	Set the 20mA	Value for the VFD ma	Eximum, the same as on the relay in
20mA Value	100.0 gpm		step 5	
4mA Value	0.0 gpm	Use the Interlock a be advisable in thi stop if someone s	and open loop feature s example since we d huts off the flow to th	es if desired. The Interlock would not o not want the recirculation pump to ne sensors for calibration or cleaning.
Interlocked	none	Open Loop mean correctly, the	s if a wire comes loos mA signal will drop be	e or the 4-20mA output is not wired elow 3.8mA and set off an alarm.
Open Loop alarm	Ves No	Controls a C	Chemical Pump mean	is the output will drop to 4mA if the
Controls a Chemical Pump	Yes 🗸 No 🗲	keypad is acti button on th output will b	ve. When Controls a e keypad will have no e affected by the inte	Pump is not selected, the Start/Stop affect on the 4-20mA output, but he prock, so do not use an interlock on a
Reset	Submit		recirculation p	pump application.

5.4 Meter Diagnostics

	ect the P to V icon from t to view the [he right side) Diagnostic pa	of the home page ge			
: Turbine mete	r			from r	display the volume measured midnight on the home page.	
	Diagnostic	or select	Diagnostic from the	pulldown		
ensor Type	Water meter					
ol. this year	181221.59 G					
9 Days Online	Vol/Day,9537.98 G					
olume Total	181221.59 G	Total sir	ice meter enabled			
ol. last year	0.00 G			/		
ate	6.0gpm					
o alarm logged		Rate as of t	he moment the diag	nostic page was Refresh to uno	opened. This is not a date.	
iput Firmware river	built-in					
onfigure: 0000	Status: 0000		Volume resolution (digits after the decimal) is			
evice: 000C4E31	Product: 0E12519A		set	set by Decimal Digits on the Setup page		
ev.#: 00000001	S/N:: 15082008					
.ID#: 31032004	A.Part#: -1					
.rev#: 0	Firmware:01.01.02.00		Q:I	Nater meter		
Refresh				l l	Diagnostic	
Kerresh			Senso	r Type	Diagnostic Turbine meter	
Ketresh			Senso Vol. th	r Type is year	Diagnostic Turbine meter 76927.01 G	
Kerresn			Senso Vol. th 20 Day	r Type is year /s Online	Turbine meter 76927.01 G Vol/Day,3846.35 G	
Turbine t	ype meters calculate Rat e	e every secon	Senso Vol. th 20 Day d Volum	r Type is year /s Online e Total	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G	
Turbine t as r Therefore Rat	ype meters calculate Rate neter pulse counts are me te is more representative	e every secon easured. than contact	d Vol. th 20 Day Volum head	r Type is year /s Online e Total st year	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate neter pulse counts are me te is more representative because counting occurs	e every secon easured. than contact more frequer	d head htly.	r Type is year /s Online e Total st year	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm	
Turbine to as r Therefore Rat meter rates	ype meters calculate Rate neter pulse counts are me te is more representative because counting occurs	e every secon easured. than contact more frequer	d head htly.	r Type is year /s Online e Total st year rm logged	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate neter pulse counts are mo te is more representative because counting occurs	e every secon easured. than contact more frequei	d head htly.	r Type is year /s Online e Total st year rm logged Firmware Driver	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm built-in	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate neter pulse counts are mo t e is more representative because counting occurs	e every secon easured. than contact more frequer	d head htly. Senso Vol. th 20 Day Volum Vol. la Rate No ala Input	r Type is year /s Online e Total st year rm logged Firmware Driver jure: 0001	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm built-in Status: 0000	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate meter pulse counts are me te is more representative because counting occurs	e every secon easured. than contact more frequer	d head htly. Senso Vol. th 20 Day Volum No ala Input Config Device	r Type is year /s Online e Total st year rm logged Firmware Driver jure: 0001 e: 000C4E31	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm built-in Status: 0000 Product: 0E12519A	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate neter pulse counts are me te is more representative because counting occurs DI (Digital Input) dr Shared by all inputs	e every secon easured. than contact more frequen river detail ; 'O' thru 'V'	d head htly. Senso Vol. th 20 Day Vol. la No ala Input I Config Device Rev.#:	r Type is year /s Online e Total st year rm logged Firmware Driver jure: 0001 e: 000C4E31 00000001	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm built-in Status: 0000 Product: 0E12519A S/N:: 15082008	
Turbine t as r Therefore Rat meter rates	ype meters calculate Rate meter pulse counts are me te is more representative because counting occurs DI (Digital Input) dr Shared by all inputs	e every secon easured. than contact more frequer river detail 'O' thru 'V'	d head htly.	r Type is year /s Online e Total st year rm logged Firmware Driver jure: 0001 e: 000C4E31 00000001 31032004	Diagnostic Turbine meter 76927.01 G Vol/Day,3846.35 G 798929.50 G 0.00 G 19.7gpm built-in Status: 0000 Product: 0E12519A S/N:: 15082008 A.Part#; -1	

5.5 Meter Alarms

Se	lect the P to V icon from t to view the D	ne right side of the ho Viagnostic page	ome page	
P:Feedwater		or se	elect Diagnostic from	the pulldown
	Alarms	HiAla	r m is the volume mea	sured from midnight. Edit & Submit
HiAlarm	50000 G	Lo/	Alarm is set on the da	ily volume.
LoAlarm	100 G	It's checke	ed only once @ midni	ght. Edit & Submit
Alarm Relay	Yes 🗸 No 🤸	Alarm Relay =	• Yes & Submit will tu if one has been conf	irn ON the alarm relay rigured.
Disable Alarms	Ves Ves Ves Ves No Image: State of the state of t			tops new alarms this example.
Reset	•	Submit		
If alarmed, a Clear a If you clear a Hi / re-alarm if todays v	alarms option will be inclu Narm & the day has not cl olume increases more tha midnight.	ded on this page. nanged, it may n HiAlarm before	P:Feedwater	
)		Alarms
			Status	Adjusted Alarm
n this example, we wa But don't want an	nt an alarm on any any W alarm if there is no Water	ater make-up make-up	HiAlarm	10.00 G
(so Lo /	(so LoAlarm is less than zero)		LoAlarm	-100.00 G
In this example, we' outputs as a dedicated	re also using one of the re d alarm relay, perhaps to t	elays or pulse he site DCS. By	Alarm Relay	Vos No
choosing Alarm Relay alarn	= Yes , when this I/O point n relay will be activated.	is in alarm, the	Disable Alarms	Yes 🗸 No
			Reset	Submit

6 Flowswitches, System Interlocks & Contact Sets

6.1 Switching Meters & Contact Sets

Volume meters and contact set inputs are connected in the '**O**' to '**V**' digital inputs. They are also in the '**W**' to '**Z**' phantom inputs.

If the meter or contact set input is not being used for control, it can be re-purposed, making a contact set a meter or the inverse.

When an input in the 'O' to 'Z' phantom input is enabled, it's initially configured as a contact set. Any contact set designated as a system flow switch cannot be changed by the user. See Sidebar below.

Contact sets are ON when the contact set is closed. With the exception of the system flow switch(es), the logical sense of the input may be inverted so that ON = contact set open. (Refer to Section 6.3 Inverting a Contact Set).



Sidebar: System Interlocks.

From the factory, each system will have at least one System Interlock. This input cannot be disabled by the user. This ensures that the safety flow switch cannot be accidentally ignored. Contact the factory if this needs to be changed.

6.2 Contact Set Alarms

S	elect the O to V icon from the right	side of the home page		
O:Pool flowsw	vitch	Select Alarms from the	pulldown	
Alarms	1441.0 minutes	With the On Time Alar 1440, the total number this alarm is	m set for more than of minutes in a day, disabled.	
OFF Time Alarm	5.0 minutes	Utes The No Flow Alarm is set to 5 minutes to reduce the likelihood of a nuisance alarm. The switch must be off for 5 contiguous minutes to create an alarm condition		
Alarm Relay	Yes Vo	A system flow switch, as in this example, will ignore the OFF Time Alarm minutes and alarm immediately to maximize safety.		
Reset	Subm	it Alarms use the tim which is reset to	e ON or OFF today 0.0 @ midnight.	
Di It is not	sable Alarm = Yes & Submit recommended that you disable the	e S:Flowswitch		
diarrito			Alarms	
In this example, w	re using the alarm to alert us if th	ON Time Alarm	1500.0 minutes	
recirculation wate set this value to a	er is offline for more than an hour. C few minutes to know immediately	or if No Flow Alarm	60.0 minutes	
Ed	it & Submit to modify	Alarm Relay	Yes 🗸 No	
		Disable Alarms	Yes 🗸 No	
		Reset	Submit	

Sidebar:

Contact set alarms are frequently used to flag unusual operating conditions or outages.

If you are alarming on an event that bridges midnight, bear in mind that the ON or OFF time that trips the alarm is reset @ midnight.

6.3 Inverting a Contact Set

Contact sets are digital inputs that can be 'ON' when they sense a closed contact. The controller can just as easily consider the closed contact to be an 'OFF' signal. This is the inverted sense. In this way, the controller can adjust the input from a digital device to be considered an 'ON' signal from a normally open (NO) contact or a normally closed (NC) contact.

Q:Contact set		
	Configure	~
Compensation	None	~
Invert sense	Yes 🗸 No	To invert the input, select 'Yes' and press Submit .
Reset		Submit

Sidebar: The controller will not allow you to invert the input signal from a system flow switch.

7 Frequency Controlled Pumps

7.1 Adjusting mL/stroke

	Select the '6' to '9' icon	from the right side of th	ne home page		
6:Acid pump		Select Configure fr			
	Configure 🗸 🗸				
Descriptor	Acid pump				
Decimal digits	2 ~	Configure the output	ut relay so the co	ntroller knows	
Disable	Ves 🗸 No	how much chemica enables the control	l is being fed ove ler to calculate a	r time. This tank level.	
Control Action	ON decreases sensor		9:Acid pump		X
Special Control	None			Configure	~
Pump Type	ProMinent 1602		Status	Reconfigured	
ml /stroke	0.130		Descriptor	Acid pump	
Refresh	Submit		Decimal digits	2	~
If the stroke l	knob is set for anything less than 100%, re	calculate	Disable	Ves No	
the mL/strok rate. For exar to 50%, tl	e value or the controller will assume the n mple, if the rate is 0.130 and you reduce th he mL/stroke will need to be changed to 0	naximum ne stroke .065.	Control Action	ON decreases sensor	~
			Special Control	None	~
			Ритр Туре	Other	~
If you are not Type, edit m	using a ProMinent pump, select Other for I/stroke & Rated SPM for the installed pu Submit	Pump mp &	mL/stroke	0.100	
	Pumps are limited to 25 mL/stroke . No minimum limit.		Other Pump	240 Rated SPM	
			Refresh	Subm	it

Sidebar:

Be aware that the output rate of most pumps will vary with changes in backpressure from the process. ProMinent recommends a backpressure valve to ensure the pump output pressure remains constant.

8 4-20mA Outputs 8.1 Configure: Manual-Auto Switch



Sidebar: Manual Mode Use **Manual mode** to A) verify the pump is 100% ON=20mA, completely OFF=4mA, and B) to verify the loop span on the monitoring DCS that is using the current loop value to represent a controller pH, ORP, corrosion rate sensor or ppm calculation.

8.2 Calibrate 4-20mA Outputs

	Select the letter	con from the home	page		
I:4-20mAOut	put			Calibrate overrides the Manual setting or sensor control to set the	
	Calibrate	Select Calibrate fro	om the pulldown	output to 4mA & then 20mA	
Sensor Monitor	Elapsed	Select S	tart to start the two p	point	
4-20mA = 4mA	✓ START				
Factory Reset	Yes 🗸 No		1:4-20mAOu	tput Calibrate	~
	Submit	Calibrate	Sensor Monito	r Elapsed	
			Output @ 4mA	4.01	
I:4-20mAOut	put			Calibrate	
	Calibrate	∼ U	se the mA current val he DCS or milliammet the contro	ue displayed on the pump, measured er to determine the actual output fro oller. Enter this value here	l by om
Sensor Monitor	Elapsed				
Output @ 20mA	20.00 mA measured	Calibrate	Edit Output @ 20 & select Cali	OmA level brate	
			I:4-20mAO	utput	x
	Calik	pration ends.		Calibrate	~
			Status	Calibrated	
	Factory Reset = Yes &	Submit	4-20mA = 4mA	✓ START	
	Returns the 4-20mA outpu factory calibratio	ts to default	Factory Reset	Yes Vo	
				Submit Start	

8.3 Diagnostic – 4-20mA Outputs



9 System Settings 9.1 Home & Diagnostic pages



9.2 Activity Log:

9.2.1 User ID, time stamp



9.3 Communications: 1 of 2 9.3.1 LAN IP, Netmask, MAC, Gateway, Wifi IP

You'll need to be logged in as the admin user to modify **Communications**. The top of the page will prompt you with the required login if you are not allowed to modify the current page.

The controller includes a **DHCP client** which means when you connect to the site LAN you can assign a static IP valid for the LAN or select DHCP and let the network assign a compatible IP address to the controller.

System: Communications		Select Communications from the System pulldown
Communications		Current IP LAN address of the controller
LAN IP Address	10.10.6.116	If you edit & Submit to modify, you'll lose the current browser connection. Re-connect using the new IP address
DHCP	Vies Vo	Select DHCP if you wish the system to choose the IP address. This ensures the controller is visible from and compliant with the customers network
LAN Netmask	255.255.255.0	Set LAN Netmask to desired netmask & Submit
LAN MAC Address	00:1e:c0:ef:8d:f4	If you are using the E-mail functionality (alarms & auto-reporting),
LAN Gateway	192.168.100.1	then the LAN Gateway should match other devices on this LAN
LAN Primary DNS	10.10.6.1	
LAN Secondary DNS	0.0.0.0	Controller WiFi is limited to HTTP browser services for mobile devices & notebook WiFi & therefore uses a fixed IP address. With the SSID set on the System Setup page
WiFi IP Address	192.168.1.1	In address. With the SSIB Set on the System Setup page
WiFi Netmask	255.255.255.0	The WiFi SSID defaults to Aegical xxx where $xxx = 1$ as t 3 numbers
WiFi SSID	AegisII_123	of the controller serial number. Edit to modify & Submit
HTTP Port	80	The HTTP port is defaulted to 80, the standard browser port

Sidebar:

If you modify the IP or Netmask & can no longer connect, the current IP & Netmask can be viewed on the local HMI (keypad & display).

Key Menu / Up / System / OK / Communication / OK & Up - Down to scroll through the settings.

LAN (Local Area Network) refers to the Ethernet port connection. WiFi refers to the wireless connection. See section 1.1 for connection information.

Communications: 2 of 2 9.3.2 Com card setup

The communication card adds the option of communicating with a wide range of standard equipment protocol. This card includes a serial slave port for connection with a plant serial MODBUS, or a variety of Gateways for access to MODBUS TCPIP, serial or IP BACnet or most any protocol with the proper Gateway.

The communication card includes two 4-20mA outputs while allowing a dual 4-20mA input card to be piggy-backed on the com card.

The Pyxis fluorometer is compatible with the MODBUS Master serial port while a serial Master can attach to the serial Slave port. The second slave port can be used to pass along the Master communication.

Consult the Addendum: Aegis II Communication Driver manual for complete instructions.

Note: The below picture is the lower part of the System: Communications menu from the previous page.


9.4 Time & Date:

9.4.1 Sync to Device

System: Tim	ie & Date	Select Time & Date from the System pulldown
Set fields to match my co	Time & Date	This is usually the easiest way to match the controller date and time to your device. Click on the link & Submit .
Date DD/MM/YY Time HH:MM:88 Weekday	01/12/17	-OR- Edit the Date, Time & Weekday fields & Submit Follow the formatting for the Date (DD/MM/YY) and Time (HH:MM:SS) fields to avoid an error message
Accor	djusting the time & date ntrols that use time, data	affects feed events, logging, alarming

9.5 E-Mail Setup – Test



9.6 Enable I/O:

9.6.1 Enable IO, Assign to System#

All I/O points can be enabled and used by the controller. Enabled points are displayed on the main screen. If a point is disabled, it is removed from the main screen and has no programmable function.

If you select two systems, (See System Setup menu, section **9.7 System Setup**) you will see the menu on the left. This menu page will allow you to select which system each I/O is a part of. A single system user will see a different menu, shown in the lower right corner of this page.



9.7 System Setup:

9.7.1 Naming, Sunday=Day1 ,Metric Units, Restart Options

You'll need to be logged in as the admin user to modify **System Setup**. The top of the page will prompt you with the required login if you are not allowed to modify the current page.

System Setu	р	Select System Setup from the System pulldown
	System Setup	Site Name & System-Names will tag your reports & E-mail alarms to differentiate controllers. Sixteen characters maximum. Edit & Submit
Site name	PFC DCM510	Select Keypad Password = Yes & Submit
System-Name	Pool1	Require keypad users to logon.
2nd Bystem-Name	Pool2	Requires the user ID to be typed. Not available from the dropdown.
Keypad Password	Ves Vo	Metric Units = Yes & Submit displays temperatures in 'C' & measures volumes in Liters. Metric Units = No & Submit displays
Login requires userid	Yes Vo	temperatures in 'F' & measures volumes in Gallons
Metrio Units	Yes 🗸 No 🗖	Select Sunday=Day 1 = Yes & Submit Resets the 28 day event clock to the
8unday=Day 1	Yes 🗸 No ┥	Note: This option only displays if not already week #1.
System Type	Pool1 & Pool2	System Type: Select Single, Pool 1 & 2 or Pool & Spa
Flow ON delay	45 seconds	Outputs remain off after flow restoration based on this setting.
Pool1 Flowswitch	O:Sample Flow	
Pool2 Flowswitch	none	System flow switches cannot be removed. This prevents accidental chemical feed during no sample flow condition.
Alarm on STOPs	Ves Not	
8ystem restart	Yes 🗸 No	Select Alarm on STOPs = Yes & Submit t o alarm when user presses the STOP button on controller keypad or if any output is forced off.
Factory Reset	Yes 🗸 No	Select System restart = Yes & Submit
Enable Alarm Chime	Yes No	Same effect as cycling the power OFF-ON; reboots CPU, then restarts controls & actuation times
Reset	larm Chime = Yes & Submit	CAUTION: Make sure to have a valid configuration file to use as this function will erase almost all setup parameters except user ID's and Passwords. See section 10.2.1 USB – Save or Load the Program Configuration
for auc	lible tone on alarm	calibration Load a default or previously saved configuration after Factory Reset to avoid enabling and reconfiguring each I/O.

9.8 User Setup:

9.8.1 View-Set Access Level and Passwords



10 Using the USB Port

10.1 Capturing Data

The DCM510 logs all sensors, flow switches, meter values, relay ON times, fed volumes and status every 5 minutes. This data is easily captured from the USB port located behind the communication light cover.

1- Insert a USB flash drive into the USB port shown. The OLED screen will acknowledge the drive



Phillips head screw

2- Choose F1, LOG to set up the download.





Figure 65 USB Access Door Closed [Top] and Open [Bottom]

Select upload size

AL123_17_101.csv

2288 Log records Remove USB drive

ESC to previous Log#38 of 288

3- Choose the amount of history, DAY [F1], WEEK [F2], or MONTH [F3]. When you choose the period, the download starts.

During the download, the keypad and browser connection are locked.

- 4- The display will show the progress of the download
- 5- Once complete, the display will show the file name uploaded to the USB flash

drive (ending in "csv"), the size of the file in number of records or time stamps, and instructs you to remove the drive to return the controller to normal operation.

6- Don't forget to close and re-secure the access door to assure the interior of the controller is not subjected to moisture or corrosive fumes from the environment.

No special conversion program or Excel add-in is needed to import the CSV formatted data into Microsoft Excel® or similar spreadsheet programs. Refer to your spreadsheet or graphing software product to learn how to import CSV data. (CSV = Comma Seperated Value). The I/O data is stored in 5 minute intervals. (Not adjustable). Values shown are as taken, not averaged over the 5 minute period. Relays show ON time in seconds if on/off. Frequency outputs in volume (mL).

	А	В	С	D	E	F	G	Н	1	J	К	Γ
1	DCM5											Γ.
2	Serial nun	Site name	Controller	name	Firmware							
3												
4	123	W P Stein	Hot Tub		17.06.05.0	0						
5	Log record	s										
6	I/O	Location	Α	В	С	D	E	F	G	Н	I	J
7	I/O	Units	uS	mpy	ppm	ppm	рН	mV	mA	F	mA	r
8	Date	Time	Conductiv	Corrosion	CLE3 Chlor	CTE Chlori	pH Sensor	ORP Sense	4-20mA in	Temperat	4-20mAO	۷,
9	20/06/17	10:45:00	0.85	0.002	0	0	6.73	-4	0.017	68.242	20	
10	20/06/17	10:40:00	0.85	0.002	0	0	6.73	-4	0.015	68.109	20	
11	20/06/17	10:35:00	0.85	0.002	0	0	6.75	-4	0.017	67.693	20	
12	20/06/17	10:30:00	0.85	0.002	0	0	6.74	-4	0.017	68.319	20	
13	20/06/17	10:25:00	0.85	0.002	0	0	6.74	-4	0.017	67.822	20	
14	20/06/17	10:20:00	0.85	0.002	0	0	6.75	-4	0.017	68.071	20	
15	20/06/17	10:15:00	0.85	0.002	0	0	6.78	-4	0.015	68.093	20	

Table 20 Partial example of captured data

10.2 Save or Load the Program Configuration

THIS IS NOT THE FIRMWARE INSTRUCTIONS. See 10.3 Firmware Upgrade

A program configuration is a list of instructions that the user can edit. Set-points, calibrations, names of I/O are all saved in the program configuration. You can save the configuration via a USB drive for backup purposes or to clone another controller. (Save from one controller and Load the configuration onto another.) To see how to access the USB port, see section 10.1 Capturing Data.

10.2.1 Saving to the USB

- 1- To **save** a copy of your current program onto a USB drive, insert a USB into the USB port located behind the Communication panel.
- 2- Press F3 Config





NEXT

T

Configure file AC123_16_292.cfg SAVE=capture config:

SAVE

3-

f you have not previously saved a program on this USB you can only F1 SAVE a copy to the USB.

4-

f you have a previously saved program, you have the choice of saving F1 or loading F3.

In either case, press F1 SAVE to copy the current configuration to the USB drive. When the save is complete, the display will notify you to remove the USB drive.

10.2.2 Loading from the USB

- 1- To load a previously saved program from the USB to your controller, insert a USB into the USB port located behind the Communication panel.
- 2- Press F3 Config.
- 3- Press F3 Load.
- 4- The controller loads the program from your USB and notifies you to remove it.

Sometimes referred to as "Cloning", a saved program file can be loaded onto a different DCM510 controller. They will then have the same configuration. Afterwards, you can edit either program via the keypad or with a PC, etc.

10.2.3 Saving to/from Flash Memory

AC123_16_292.cfg complete Remove USB drive USB drive active Offline, All STOP UPDATE CONFIG LOG F3 Re-configure file Writing 6 SAVE=capture config: SAVE NEXT LOAD AC123_16_292.cfg Complete restarts Remove USB drive

Save a copy of your program settings in flash memory using the keypad. Use the

System/Configure menu.

10.3 Firmware Upgrade

If necessary, your controller can have the firmware upgraded. Firmware is a set of instructions which tell the controller CPU how to operate. Firmware is not your 'program configuration' which determines which relay operates when and how. The program configuration can be saved and if needed, re-loaded, or copied to another controller. See section, **10.2 Save or Load the Program Configuration**

1 File Please To avoid accidents and confusion with this important process, please remove all files from the USB drive prior to adding the .hex file. The controller will only allow you to view one file. Be sure you copy the correct file to the USB. If you have more than one, you may load the wrong file.

- 1- Obtain the hex file from ProMinent and insert thumb drive with the new file into the USB port located behind the Communication panel. See section **10.1 Capturing Data**.
- 2- Press F2, UPDATE
- 3- The display shows the one file from the USB drive; APQ17060500.hex and the current hex file in use; Running:16.10.13.00. NOTE: These numbers are date codes, year, month and day. '00' indicates they come from the USB drive.





NEXT

BACK

Program file AP17051300.hex Running:16.10.13.00

Program file

OK. Ready to program Remove USB drive

LOAD

F2 "OLDPGM" is a list of hex programs on the controller. If OLDPGM is not a choice, there are no other backup hex files in the controller memory. You can load a previous program from this list.

- 4- If the file on line 2 is the new firmware file, press F1 NEWPGM to select the new hex file. Press F1, Load to install the new hex file.
- 5- Remove the USB drive when prompted.

NOTE: OLDER FIRMWARE VERSIONS USE STEP 6.

- 6- The firmware is copied to the controller. When complete, the controller will notify you to remove the USB drive.
- 7- After you remove the drive, the controller will erase the existing firmware and install the new one.
- 8- Once the new firmware is installed, the controller will restart.



10.4 E-mail Reports and Alarms

The E-mail function is explained in the DCM510 Browser manual. You cannot access this feature through the keypad. The following explanation is for informational purposes only.

The E-mail tool can send three types on information; Alarms, Status and Daily data. Setup is via a PC or smart phone browser.

During controller power up or reset, E-mail initializes as disabled.

10.4.1 E-mail Types:

10.4.1.1 ALARM: Sent once when an alarm first occurs.

Lists all active alarms.

Includes enabled sensor, meter & contact values for alarm context User Enabled/Disabled.

10.4.1.2 STATUS: Sent @ noon every day (12:00). Verifies that the controller is running & on the LAN.

Includes enabled sensor, meter & contact values.

Sent @ midday so that commercial systems will have some run time and some day is left to respond to operating issues.

10.4.1.3 DAILY: Sent @ midnight (23:59) every day. Verifies that the controller is running & on the LAN.

Includes enabled output run times or volumes and sensor, meter & contact values. User Enabled/Disabled.

All types send comma delimited values(CSV); one line per I/O or Alarm so that the both the subject & body can be easily parsed into a logging app, a typical use for the DAILY type.

Will make text-to-speech entertaining (bit encoded value-states are therefore intentionally excluded).

11 Appendices: a. IO Namespace: Letters & Numbers

The controller uses the letters 'A' to 'Z' to refer to sensors, meters, contact sets & 4-20mA outputs.

The numbers '1' to '9' refer to digital output controls. These can be AC relays, dry contact relays or digital solid state DC outputs for pulsed or on/off control.

Users can assign site specific names to all of the I/O, A-Z & 1-9. The I/O letters & numbers are a convenient, compact way to describe both the physical location of the I/O within the controller enclosure & the capabilities of each I/O.

Some letters are 'phantom', meaning they don't have physical wiring location within the enclosure. 'Phantoms' are used to represent calculated & derived values that are logged, alarmed & may be used for control.

I/O	Туре	Notes			
A-B	Serial sensors	3 wire Conductivity-Flowswitch-Temperature or Corrosion Rate			
		or Differential pressure sensors			
C-D	Dual sensor driver cards	pH-ORP: configurable as dual pH or dual ORP or pH-ORP			
E-F		4-20mA input			
I-J	6 types in any	4-20mA output			
	combination	Conductivity			
		pH & 4-20mA input			
		Dual serial sensor			
G	Built-in 4-20mA input				
Н	Built-in 10mV/C	Used with legacy DCM5 'SGT' temperature sensor			
	temperature sensor input				
K-N Phantom sensors		Calculated (Inventory, Manual, Combined Chlorine,			
		LSI/Ryznar, Flow Rate) or derived from other sensors &			
		meters			
O-V	Volume meter & contact	Each of 7 inputs configurable as Turbine, Contact Head			
	set inputs	meter or Contact Set. A second System flowswitch will			
		reduce this to 6 inputs.			
W-Z Phantom volume meter & Der		Derived from other sensors & meters			
	contact set inputs				
1-2	Line powered control	Form C, powers pumps, solenoids & motorized valves			
	relays				
3-5	Dry or line powered	Form C, may be used dry or powered.			
	control relays				
6-9	Pulse or ON/OFF	Dry contact sets used to pulse or enable pumps, alarm			
	controls	24V 250mA max.			

b. Input Attributes & Phantoms

Many of the sensors connected to the controller have attributes other than the default value. For example, the serial conductivity sensor measures conductivity, temperature & includes a flowswitch. The conductivity is the default value of the sensor connect to input 'A' (attribute A0) & the Temperature (attribute A1) & the flowswitch (attribute A2).

Notice that the A1 attribute is of the same type as the A0 attribute, both are analog sensor values but the A2 attribute is a contact set attribute (ON/OFF).

Attributes can be assigned to phantom inputs where they are logged, alarmed & used for control. A phantom input cannot be assigned to another phantom. (prevents circular references). Phantoms in the **K-N** space are analog sensors. Those in the **W-Z** space are volumes & contact sets.

I/O	Туре	Attribute $x = I/O$	Phantom
A-B	Serial Conductivity	x0 Conductivity x1 Temperature x2 Flowswitch	K-N K-N W-Z
	Serial Corrosion Rate	x0 Corrosion Rate x1 Pitting Rate (Imbalance)	K-N K-N
	Serial Differential Pressure	x0 Differential Pressure x1 Inlet Pressure x2 Outlet Pressure	K-N K-N K-N
C-D E-F	pH-ORP driver card	x0 ORP or pH x1 Temperature if pH	K-N K-N
I-J	Conductivity card	x0 Conductivity x1 Temperature if 'Conductivity' or 'Condensate'	K-N K-N K-N
	pH- 4-20mA input card	x0 pH x1 Temperature-pH side	K-N K-N
	Serial Sensor card	Identical sensors & attributes To A-B	
Н	Temperature	x0 Temperature x1 Rate	K-N K-N
O-V	Volume meters	x0 Volume Today x1 Rate x2 Volume this Year x3 Volume total	W-Z K-N W-Z W-Z

Use the x0 attribute if you wish to have one sensor display two values.

For example, using a conductivity sensor to measure conductivity & salt concentration or to have additional levels of alarms.

DCM510_Browser.doc

c. 4-20mA Input Selectable Types

Knowing the sensor type connected to a 4-20mA input allows the controller to:

- A. Scale the input correctly for the selected sensor type
- B. Provide calibration & calibration limits appropriate to selected type
- C. Clamp the measured sensor values so that an open loop doesn't measure a negative ppm or conductivity

Select **Sensor Type** = Other if A,B or C not applicable

Sensor Type	Span Options	mA	G=Gain, O=Offset
	& units	Span	Span not user
			modifiable
Unassigned	Generic 0-100	4-20	User modifiable span
			G= 6.25, O=-25
CBR Bromine	CBR 0-2ppm	4-16	G=0.167, O=-0.667
	CBR 0-10ppm	4-16	G=0.833, O=-3.333
CGE Chlorine	CGE 0-2ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
CLE3 Chlorine	CLE 0-2ppm	4-16	G=0.167, O=-0.667
	CLE 0-10ppm	4-16	G=.8333, O=-3.333
	CLE 0-20ppm	4-16	G=01.56, O=-06.6
	CLE 0-50ppm	4-16	G=4.125, O=-16.50
	CLE 0-100ppm	4-16	G=8.333, O=-33.33
CLO Chlorine	CLO 0-2ppm	4-16	G=0.167, O=-0.667
	CLO 0-10ppm	4-16	G=0.833, O=-3.333
CTE Chlorine	CTE 0-2ppm	4-16	G=0.167, O=-0.667
	CTE 0-10ppm	4-16	G=0.833, O=-3.333
Diff.Pressure	DeltaP 0-100psi	4-20	G= 6.25, O=-25
pH-transducer	pH 0 to 14	4-20	4mA=-15.45pH
			20mA=-1.45pH
			pH outside of 0-14
			blocked
			G=-1.056, O=19.675
			5.373mA=14pH,
			18.6mA=0pH
ORP-	ORP 0-1000mV	4-20	G= 62.5, O=-250
transducer			
Temperature	Temp. 0-100C	4-20	G= 6.25, O=-25
Turbidity	Turb. 0-	4-20	G= 312.5, O=-1250
	5000NTU		
Ultraviolet	UV 0-100%	4-20	G= 6.25, O=-25
	UV 0-1000wm2	4-20	G= 62.5, O=-250

Notes:

- 1. Gain & Offset return to the table values @ Calibrate = Factory Reset
- 2. The preceding table applies to the ChemFeed version of the DCM510

d. Enabling-Disabling I/O & Adding-Removing Driver Cards

Inputs A-Z cannot be disabled if in use by another I/O for control, compensation, phantom link, etc. The disable option using the browser or keypad is replaced with a message telling you where the target sensor is used, so you can remove the dependency.

Note that the sensor can be used for control, compensation of other sensors & in the case of sensors with more than one attribute; as a source for phantom sensors.

When you disable a sensor, the compensation is removed so that if for example: You disable a thermally compensated conductivity sensor and the thermal sensor is subsequently removed or disabled, there is no conflict when the conductivity sensor is re-enabled, but it's no longer thermally compensated.

When a **C-D**, **E-F** or **I-J** driver card is removed, all of the dependencies are removed on the next power ON. Outputs that use the removed driver sensor(s) for control have the control configuration removed. Other sensors which use the removed driver sensors are modified.

When you install a new driver, the sensor inputs default. For example adding a pH-ORP driver, configures for one pH & one ORP sensor on power ON.

Auto-Removing Phantoms:

<u>Phantoms are auto-removed</u> if they are derived from inputs >= 'C' If the Phantom is in use as an interlock a latching alarm is set.