

DULCOMETER® DCM 3 series Aquatic Water Quality Controller

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



Certified to
NSF/ANSI Standard 50

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.

Introduction

This installation and operation manual is for the use of the installer, owner, and operator of the system. Due to space restraints, single examples of most frequent aquatic configurations are shown. These examples are provided to demonstrate how additional, similar configurations can be programmed.

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General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Read the following supplementary information in its entirety!

The following are highlighted separately in the document:

Safety Information

Safety information is provided with descriptions of the hazardous situation.

Refer to Section [4 Safety and Responsibility](#).



Information

This type of box provides important information either relating to the correct operation of the system, or is intended to make your work easier.

1 Operating Concept

There are two manuals associated with the DCM3 controller, this Installation and Operating manual and a Browser manual. The Browser manual covers all Ethernet and WiFi communications and how to program the unit via a PC, tablet or Smartphone. Most programming operations, especially multiple changes are more easily performed using the browser interface.



1.1 The Front Panel



Status LED

In the event of an alarm, the controller's status LED at the upper right corner of the keypad changes from 'blue' to 'flashing red'. If one of the feeders is set to manual STOP, the status LED will be 'steady red'.



Figure 2 Status LED

The DCM3 uses a yellow OLED (Organic LED) text display to indicate real time values of 6 static, or more scrolling sensor inputs or outputs on the main display. One multicolored Status LED indicates alarms and unusual conditions and 5 multicolored LEDs to indicate individual output contact status (relays).

The communication indication panel is located at the bottom center of the controller face. A green light indicates the function is available. If the port is in use, the green light blinks.



Figure 3 Communication Status LEDs

1.2 Functions of the keys










Key	Function
	Confirmation in the menus: Confirms and saves any changes.
	Escape or Back to the HOME display or to the previous menu.
	Enables direct access to all of the controller's menus.
	Enables direct access to the controller's calibration menu from the HOME display.
	Start/Stop all control outputs from any display. (4-20mA = 4mA). Front panel LED is solid red.
	(Up Arrow) Increases a displayed number value or moves upwards in the menus.
	(Right Arrow) Moves the cursor to the right.
	(Down Arrow) Decreases a displayed number value or step down in the menus.
	(Left Arrow) Moves the cursor to the left.

Table 1 Function of the keys

1.3 Operating Language

The operating language is currently offered in English only.

1.4 Keypad Lock

The controller has an available keypad lock. If the keypad lock is enabled, changing of parameters or configurations requires a passcode. Observing most of the parameters is allowed without a password. The keypad password is the same as the password used in the Ethernet or Wi-Fi browser connection. There are 3 three security levels of access in addition to the Public's View Only level. They are Operator, Configure (manager/supervisor), and Admin (Administrator). The keypad lock is OFF by default, and all keypad users have full Admin access to allow for easier start-up commissioning. It is strongly suggested, especially sites with more than one operator, to enable and use the Keypad Password option outlined in section 11.2.2.

See [11.2.2 Keypad Passwords](#) for more details.

2 Navigating the Menu

Name of menu item	Jump to chapter
[Home]	↪ Return to the default display (See below)
[Adjust Set-points]	↪ Section 10.5.1 Feed Based on a Sensor
[Prime, Force ON]	↪ Section 10.13 Prime, or Force a Relay ON
[Adjust Alarms]	↪ Section 9.7.3 Analog Alarm Configuration
[Events]	↪ Section 10.6 Configuring an Event-Other relay
[Water Meter Setup]	↪ Section 9.9.1 Configure a Digital Input as a Water Meter or Status Input
[Set Feed Mode]	↪ Section 10.5 Configuring a Feed Relay
[I/O Setup]	↪ Section 9.1 Analog and Digital Inputs
[I/O Status]	↪ Section 2.1 Input /Output Status
[System]	↪ Section 11 System Menu
[WiFi Status]	↪ Section 12.1 WiFi Menu

Table 2 Main Menu lookup



Figure 4 Typical Home screen
no alarms



Figure 4A Home Screen if any
alarm present

Note that the bottom line of text aligns with the dynamic F1 F2 F3 HOT keys

The default display shows up to six current sensor values simultaneously, and the STATUS, ALARM and SETPNT buttons. The STATUS button (F1) is explained in section [2.1 Input/Output Status](#). The Alarm button (F2) allows the user to view and clear the latest alarms for all I/O points. The SETPNT button (F3) allows the user to jump to the Setpoints menu to see or change any output control setpoint.

Additional sensors can be shown on the main screen, using the Scroll selection in section [2.2 Modifying the 'Home' Screen](#) below. The 4 static sensors shown can be changed and/or rearranged, at owner's preference. See section [2.2 Modifying the 'Home' Screen](#).

See also section [9.7.3 Analog Alarm Configuration](#), for more information on alarms.

2.1 Input/Output Status

2.1.1 F1 Status Button


The Home screen, shown here with 4 input sensor values also shows STATUS over the F1 button. Pressing F1 STATUS will jump to the I/O Status menu.

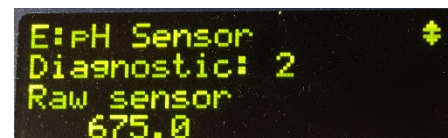
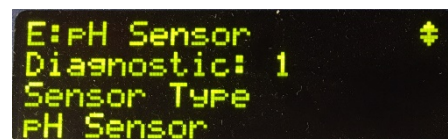


The I/O's are shown in numerical and alphabetical order so the first item shown is usually Relay #1, normally configured for controlling Acid Feed. For this example, we will use the pH sensor, since virtually all of the DCM3's will have a pH sensor installed.

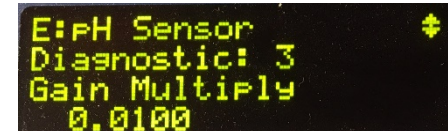
- Push the down arrow several times to find the E;pH sensor status screen. On this screen you can see the current Value of the pH sensor (7.5 pH), the range it has been for the latest 5-minute period (7.4 to 7.8), and some additional options.
- Pressing **F1 CAL** will take you to the Calibration menus Explained in detail in Section 9.5, **F2 ALARMS** will take you to the Alarms menu explained in section 9.7, and **F3 MORE** will show more status and diagnostic information about the pH sensor input.
- The first screen, Diagnostic 1, shows the sensor type.



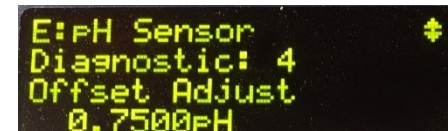
Pressing the down arrow key  will advance through the next available diagnostic screens. Diagnostic 2 shows the raw sensor signal used for diagnostic purposes.



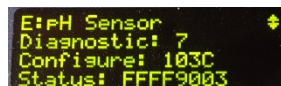
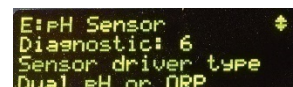
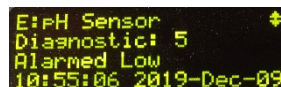
The next screen, Diagnostic 3 shows the calibration gain, again used for diagnostic purposes.



The Diagnostic 4 screen is the calibration offset value, also used for diagnostic purposes.



The rest of the diagnostic screens, Diagnostic 5 through Diagnostic 11, are only needed to aid in troubleshooting in case the information is requested by the factory. They are shown here to demonstrate how to get the information if asked, and what to expect to see when they are displayed.



Input/Output Status

2.1.2 Momentary Status Display


The Home screen, shown here with 6 input signal values, has a momentary display in addition to the three dynamic Function key choices. The momentary display shows the status of the input in the same manner as the status key except that it is only viewed for as long as you hold down the right arrow.

2.1.3 The Home Screen

Shown here with 6 input signal values, has a momentary display in addition to the three dynamic Function key choices. The momentary display shows the status of the input in the same manner as the status key, except that it is only viewed for as long as you hold down the right arrow.






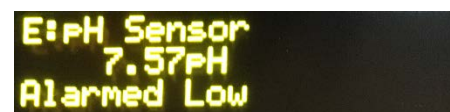
```
7.56pH    749mV  ⚡
78.4F     0.0gpm
+2.3min   +9.8min
STATUS ALARMS SETPNT
```

- 1- From main display press the  Down arrow key to invoke a cursor, then continue with the Down arrow key to select a desired sensor



```
▶7.57pH    749mV  ⚡
77.9F     0.0gpm
+2.46hrs   +2.58hrs
CNTRL STATUS PRIME
```

- 2- Use the  Right arrow key to momentarily see sensor information
- 3- Use the  Left arrow key to momentarily see any output that is tied to the selected input
- 4- Use the  key to Exit



```
E:pH Sensor
7.57pH
Alarmed Low
```




Note: The momentary information will remain on the display only as long as you hold down the arrow key. More detailed status information is available in the I/O Status menu outlined in section 2.1.1 above.



```
1:Acid Feed
ON: 2.7min
by E:pH Sensor
@ 7.57
```

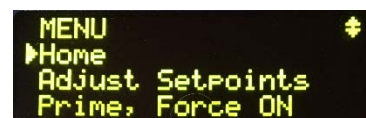
2.2 Modifying the 'Home' Screen

In the Display Setup menu, you can first choose if you want to scroll all the available inputs sequentially, like the screen to the right. Otherwise, you may choose which 6 of the sensors to show statically on the Home screen.

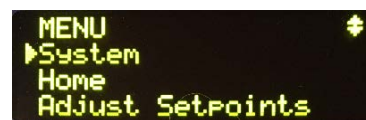
- 1- To configure the Home screen, press the  button.
- 2- Use the Up/Down Arrows to navigate to **System**, then press .
- 3- Scroll to **Display Setup** then press .



```
C:Free Chlor 0.00PPM
E:pH Sensor 6.7pH
G:Flow rate 0.0gpm
STATUS ALARMS SETPNT
```

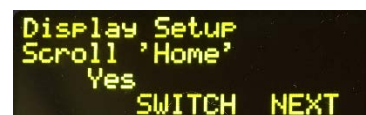


```
MENU ⚡
▶Home
Adjust Setpoints
Prime, Force ON
```



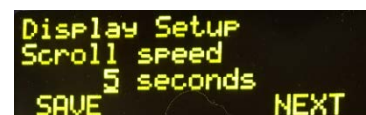
```
MENU ⚡
▶System
Home
Adjust Setpoints
```

You will now have the choice of 'Scrolling' the Home display or not. If you choose 'Scroll 'Home' = Yes', you will see three input values, with their description, scroll up on the screen every few seconds. If you prefer to have the Home screen display up to 6 static values, **skip to step 8** below.



```
Display Setup
Scroll 'Home'
Yes
SWITCH NEXT
```

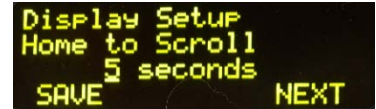
- 4- Choose to scroll the inputs displayed, or not, by pressing **F2 SWITCH**. Press **F1 SAVE** if you change the choice.
- 5- If Scroll is selected, there are 2 more choices for scroll speed and when to begin to scroll.



```
Display Setup
Scroll speed
5 seconds
SAVE NEXT
```

To see and change those choices, press **F3 NEXT** twice to get to the Scroll Speed screen.

- 6- Use the arrow keys to change the number of seconds between line scroll changes. 1-9 seconds are valid choices. If this value is changed, press **F1 SAVE** to save your choice.



```

Display Setup
Home to Scroll
  5 seconds
SAVE          NEXT
  
```

- 7- Press **F3 NEXT** to advance to the Display Setup/Home to Scroll screen where the scroll delay time is chosen. 1-9 seconds are valid choices. Select your preference using the up and down arrows and press **F1 SAVE** to save your choice.
- 8- To select which inputs are shown on the OLED static display, Press **F3 NEXT** to continue to the 'Home' Inputs menu.
- 9- Press **F2 ADJUST** to add or change the OLED static display with Inputs or **ESC** to escape the Display Setup menu to the System menu.



```

Display Setup
'Home' Inputs
          ADJUST  NEXT
  
```

- 10- If you pushed **F2 ADJUST**, use the up/down arrows to find an input point for the top left corner of the display. Press **F1** to **SELECT** it then **F2** to go to the **NEXT** choice.
- 11- Continue choosing I/O points in this manner. At any time, press **ESC** to exit.



```

'Home' Inputs
Top, Left
#E:PH Sensor
SELECT NEXT  BACK
  
```

3 Identification code

The DCM3 product does not normally have an Ident code or configuration code associated with it. Instead, there is a friendlier 7-digit part number located on the data plate at the right side of the controller enclosure. If needed, the DCM3 part number is also available through your authorized ProMinent Distributor, or our national customer service help line 412-787-2484.



4 Safety and Responsibility

4.1 Explanation of the Safety Information

Introduction



CAUTION!

Read all installation and operating instructions completely before installing and operating this equipment.

These operating instructions provide information on the technical data and functions of the product, as well as detailed safety information and are provided as guidance for the installer and operator.

The safety information and notes are categorized according to the following scheme. A number of different symbols are used to denote different situations.

The symbols shown here serve only as examples.



Denotes hints on use and other useful information.

NOTICE

Denotes a possibly damaging situation. If this notice is disregarded, the product or an object near it could be damaged.



CAUTION!

Denotes a possibly hazardous situation. If this is disregarded, it could result in slight or minor injuries. May also be used as a warning about equipment damage.



WARNING!

Denotes a hazardous situation. If this is disregarded, it could result in very serious or fatal injuries.



DANGER!

Denotes an immediate threatening danger. If this is disregarded, it will result in very serious or fatal injuries.



4.2 General Safety Notes

- ❖ **Caution!:** Before opening the enclosure or before carrying out installation work, ensure the devices are voltage-free.
 - ❖ Disconnect damaged, defective, or modified devices from the power supply.



WARNING!

Live parts!

Possible consequence: very serious or fatal injuries

NOTICE

Correct sensor operation

Damage to the product or its surroundings.

- Correct measuring and chemical metering is only possible if the sensors are working correctly.
- Check, clean and calibrate the sensors regularly
- Investigate all alarm conditions.



WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in safety data sheets.

Check safety data sheets regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that up to date safety data sheets are available, as well as for producing an associated hazard assessment for the workstations affected.



WARNING!

Operating faults!

Possible consequence: Fatal or very serious injuries.

The unit should only be operated by adequately qualified and technically trained personnel

Please also observe the operating instructions for sensors and fittings and any other items which may be installed, such as sample water pumps

The operator is responsible for ensuring that personnel are qualified.

CAUTION!



Symbol will be applied beside each MAINs socket outlet identifying that the maximum total output current rating on all relays should not exceed 5A



⚠ DANGER

Hazardous voltages cause severe injury or death.
Disconnect all sources of power before servicing.
(Multiple and/or remote sources of power may be present).



CAUTION!

Read all installation and operating instructions completely before installing and operating this equipment

4.3 Intended Use

The device is intended for measuring and regulating liquid media in pool, spa, water features, splash pads and other aquatic water treatment applications.

Only use the device in accordance with the technical data and specifications outlined in these operating instructions and in the operating instructions for the individual components (such as sensors, fittings, calibration devices, metering pumps, etc.).

Any other uses or modifications may void the ProMinent warranty.



CAUTION!

If the equipment supplied is used in a manner not specified in these instructions, protection provided by the equipment may be impaired.



CAUTION!

Aquatic Water Treatment Controllers operate chemical feeders and other devices that may pump hazardous, corrosive and toxic chemicals.

Fully understand the implications of the control set-points, interlocks and alarms that you select.

Injury and/or damage to equipment may result from improper operation.



CAUTION!

The pertinent accident prevention regulations, as well as all other generally acknowledged safety precautions, must be adhered to!



CAUTION!

READ AND FOLLOW ALL SDS PRECAUTIONS REGARDING CHEMICALS USED

Water disinfection control involves irritating, corrosive, caustic, acidic, and potentially toxic chemicals. Please use extreme caution and comply with all national, state and local regulations and recommendations for the handling and storage of these chemicals.

It is the responsibility of the user of this equipment to obtain and follow the safety precautions of the manufacturer of the hazardous materials, including the proper use of all personal protective equipment.



WARNING!

ALWAYS USE ANTI-SYPHON DEVICES

Uncontrolled feeding of chemicals can result in injury or death. Anti-Syphon devices must be installed on chemical feeders to prevent uncontrolled feed of concentrated chemicals. If a vacuum is created in the water circulation line and no anti-siphon device is installed on the chemical feeders, potentially hazardous concentrations of chemicals can be drawn into pool or spa. Always use injection check valves and anti-siphon valves in the chemical feed lines to prevent this situation.



WARNING!

FLOW INTERLOCKS SHOULD NEVER BE BYPASSED, EVEN TEMPORARILY.

The DCM3 has the capability to assign a low flow interlock from a connected flow meter. The previous flow interlock precaution also pertains to those low flow lockouts. If the interlock is disabled or bypassed, the sensor would not be able to sense a hazardous situation and turn off the chemical feed pumps to prevent uncontrolled chemical feed.



WARNING!

TEST FLOW SWITCH INTERLOCK REGULARLY

Testing of the flow switch regularly is essential to assure the flow switch stops chemical feed, remains stopped, and controller shows "Interlocked" within 20 seconds, whenever circulation flow stops. If the flow switch does not interlock chemical feed, plumbing corrections or the installation of additional flow switches or lockouts will be necessary to avoid uncontrolled chemical feed.



WARNING!

ELECTRICAL SURGES CAN DAMAGE YOUR CONTROLLER

Uncontrolled feeding of chemicals can result in injury or death.

A damaged controller could feed chemicals in an uncontrolled manner.

If you suspect your ProMinent controller is not operating properly, disconnect it from the chemical feeders until the problem has been corrected.



WARNING!

NEVER OVERRIDE A FLOW SWITCH

Uncontrolled feeding of concentrated chemicals can result in personal injury or death. Sample and recirculation flow switches are critical safety devices which prevent uncontrolled chemical feed. Follow suggested flow switch instructions carefully.

A Sample flow switch is provided with all ProMinent pool controllers and is an integral safety device to prevent the uncontrolled feed of chemicals, which could cause personal injury or death. This critical safety device must always be available to protect the swimmers and others near the pool.

An additional return line flow switch should always be installed to prevent chemical feed if return water to the pool is restricted.



WARNING!

Danger of injury to inadequately qualified personnel!

The operator of the system is responsible for ensuring that the personnel qualifications are fulfilled. If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage. All work on the unit should therefore only be conducted by qualified personnel. Unqualified personnel should be kept away from the hazard zone



WARNING!

NEVER CONNECT FEEDER DIRECTLY TO POWER SOURCE

If the chemical feeders are connected solely to a wall outlet, the safety devices integral to your ProMinent controller, and necessary for the safe feeding of chemicals, may be bypassed. It is very important that the chemical feeders be connected to the controller and never solely to a wall outlet as the only way to control the feed of chemicals.



WARNING!

Chemical feed during periods of no water flow, like filter backwash, can pose a serious health threat from potentially high chemical concentrations and hazardous chlorine gas formation.

This product must be installed with interlocks in place to avoid chemical overdose in case of loss of circulation flow in Pools and Spas.

4.4 Warranty Guide

As of the date of this manual, the physical controller is warranted for 5 years from the date of purchase as explained in the complete ProMinent warranty. The complete warranty is found in the ProMinent catalog introduction and is available online at <http://prominent.us/support/Warranty>. Current changes to this warranty may not be shown in this manual.

Residual sensors are typically warranted for 12 months and the Industrial/Aquatic pH and ORP sensors are warranted for 24 months. All other Dulcotest® sensors are warranted for 6 months

including the gold tipped ORP sensor.

The warranty does not apply to goods that become defective for the reason of:

- a) Unsuitable or unreasonable use including sample under vacuum or pressures outside the sensor ratings.
- b) Faulty assembly, installation or servicing by the purchaser or any third party
- c) Faulty or careless handling

4.5 Users' Qualifications

4.5.1 Training

Training	Definition
Instructed personnel	An instructed person is a person who has been instructed and, if required, trained in the tasks assigned to him/ her and possible dangers that could result from improper behavior, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfills the requirements of an instructed person and who has also received additional training specific to the system from ProMinent or another authorized distribution partner.
Trained qualified personnel	A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrician	Electricians are people who are trained and able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorized by ProMinent to work on the system.

Table 4 Training Definitions

5 Functional Description

The DULCOMETER® DCM3 is a Multi-parameter control and analysis platform from ProMinent. In the remainder of this document, the term 'controller' is consistently used for the DULCOMETER® DCM3. The controller has been developed for continuous measurement and control of liquid analysis parameters in aquatic applications. The controller can operate together with conventional analog and digital sensors and actuators. The controller is also equipped to communicate with some sensors using a proprietary serial bus.

The controller's powered AC relays R1 and R2 may be used with solenoids, chemical metering pumps and related water treatment equipment, not to exceed 120Volts and 5 Amperes total. Relays R3, R4, and R5 are Form C mechanical relays that can be powered or unpowered "dry" contacts. If they are powered from the internal AC line power bus, they are fused by the same 5 Ampere fuse and limitation. If they are powered externally, external fusing may be required for safe operation.

Typical applications:

- Swimming Pools
- Spas
- Water Features
- Zero Depth pools
- Splash Pads
- Therapy Pools
- Fountains
- Habitat environments for Mammals and Cetaceans

Standard Features:

- One serial input channel for use with a Conductivity sensor.
- One dedicated digital Sample Flow switch input "O".
- Five multi-purpose digital inputs for square wave pulsing (open-collector) water meters, flow, level and limit switches.
- Temperature input used for compensation of pH signal and other uses.
- Output Relays: On-Off, Time Modulated (Pulse Width Modulation), or Time Cycling, using any/all of the following: line voltage relays (2), or unpowered 'dry' contacts (3).
- Currently, 1 operating language (English)
- Saving the Controller Configuration to internal flash memory
- Cloning of controller configuration by saving and

uploading via USB Flash Drive.

- Upgrading of the firmware using USB Flash Drive
- Data-logging all I/O at a 5-minute rate for 1 year.
- Downloading saved data via USB flash drive for most recent Day Week or Month.
 - USB Data format is CSV (Comma Separated Values) for easy import into spreadsheet and graphing programs.
- Ethernet LAN connection for remote monitor, operation or configuration.
- WiFi Hotspot provided for easy local wireless browser access

Optional accessories:

- Up to 2 sensor input/output driver cards including:
 - Dual mV (pH + ORP)
 - CLB sensor input (Free Chlorine ppm)



I/O Naming Structure

The DCM3 controller inputs are assigned letters and the outputs are assigned numbers as part of the programming scheme. This allows, for example, output Relay 3 to be controlled by input sensor 'C', Free Chlorine. In this example, the Chlorine sensor would be connected to the terminals on the CLB driver card mounted in the C slot and the oxidant feeder would be connected to Relay 3.

6 Mounting and Installation

User qualification, mechanical installation: trained qualified personnel, see ↗ Section [4.5 Users' qualifications](#).

User qualification, electrical installation: Electrical technician, see ↗ Section [4.5 Users' qualifications](#).



CAUTION!

For Safety, the controller must be installed in a manner that the power plug can be pulled out easily or the power disconnect switch can be reached easily.



Mounting position

- Install the DCM3 OLED screen at eye level to make operation easiest.
- The controller is mounted as a system on an acrylic backpanel with the modular in-line probe housing as standard.
- Always install the controller vertically, so that the cable connections are on the bottom of the enclosure.
- If removing the controller from the supplied acrylic panel, leave sufficient free space (~18") between the controller and the modular sensor housing for cables and access to any sensors or sample plumbing.

NOTICE

Mounting position and conditions

The controller is rated for IP 65 liquid protection, and is equivalent to NEMA 4X (indoor) for air, dust and liquid tightness. These standards are only achieved if all seals and threaded connectors are correctly rated and installed.

Electrical installation should be performed only after mechanical installation.

Ensure that there is unimpeded access for operation, within a room that prevents public access.

The installation must be secure, low-vibration

Avoid direct sunlight

Permissible ambient temperature of the controller's electrical enclosure at the installation location: -20 to 60°C (-4 to 120°F) at max. 95% relative air humidity (non-condensing)

Take into consideration the permissible ambient temperature of the connected sensors and other components.

The controller is only suitable for operation in closed rooms. If operated outside, the controller must be protected against the environment by a suitable protective enclosure

All above conditions apply at or below an altitude of 2,000 meters. (6,500 feet)

6.1 Scope of Supply

The following components are included as standard:

Description	Quantity	
Controller DCM3 (AGIb) factory mounted on 18x30" polypropylene wall bracket	1	<div>NOTICE</div> <p>pH and ORP sensors have pre-installed and labeled coaxial cables with SN6 connectors for easy connection to the sensors, but the sensors are shipped separately, not installed in the modular sensor housing.</p>
Factory mounted DGMa sensor housing assembly		
Factory wired sensors and power cords		
All sensors included with the system ordered.		
Ethernet LAN connection provided		
WiFi WLAN Hotspot installed		
Various parts to connect sample and return lines and install supplied sensors	2	
Operating Manuals on USB Flash Drive	1	<div>NOTICE</div> <p>Oxidant residual sensor are pre-wired and pre-connected to the CLB driver module in the controller, but not in the modular sensor housing. The CLB3 sensor comes in it's own protective clear holder immersed in electrolyte, ready for installation in the modular sensor housing as soon as the sample water is ready to flow. Please follow the instructions in the accompanying sensor manuals for commissioning of the CLB sensor.</p>
General safety notes and quick start guide	1	

6.2 Mechanical installation

6.2.1 Wall mounting (of polypropylene bracket)

Mounting materials provided by others

(4) 3/8" Wall mounting holes are as shown in the drawing below

Remote mounting (optional)

Mounting materials (contained in the scope of supply)

- 1 x wall bracket
- 4 x PT screws 5 x 35 mm
- 4 x washers 5.3
- 4 x wall anchors Ø 8 mm, plastic

Wall mounting

1. Remove the wall bracket from the housing (Fig. 7A)
2. Press the two snap hooks (1) outwards
⇒ The wall bracket snaps slightly downwards.
3. Push the wall bracket downwards (2) to clear the housing and tilt it out (3)

Drill the holes

1. Use the wall bracket as a drilling template to mark the positions of 4 drill holes. (Figure 7B)
2. Drill the holes: Ø 8mm (5/16"), depth = 50mm (1.96")
3. Screw the wall bracket into position using the washers provided. If needed, use the wall anchors provided.

6.2.2 Factory Panel Options

Custom panel arrangements are available from the ProMinent facility in Pittsburgh.

The panel mounted DCM3 includes outlet plugs and a configurable probe holder.

Probe holder options include a flow switch, Free Chlorine, pH, ORP and Temperature sensors.

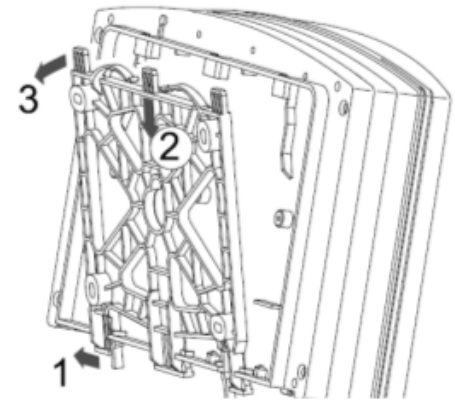


Figure 7A Removing the Wall Bracket

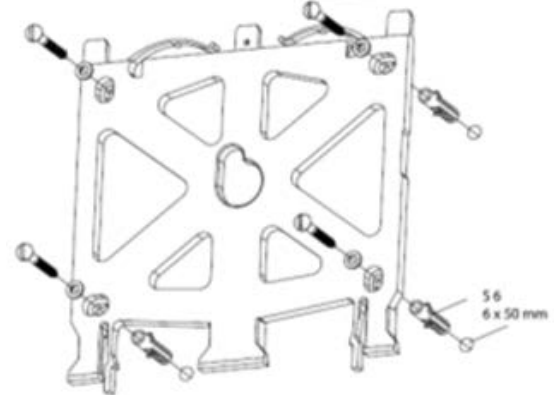


Figure 7B Mounting the Wall Bracket

Re-attach the controller

1. Hook the bottom of the housing (1) into the wall bracket (Figure 7C)
2. Lightly press the housing at the top (2) against the wall bracket
3. Then check that the housing is hooked in at the top and press down (3) until it clicks into place.

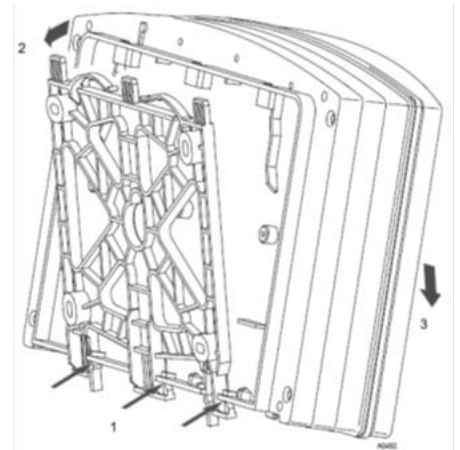


Figure 7C. Attaching the controller

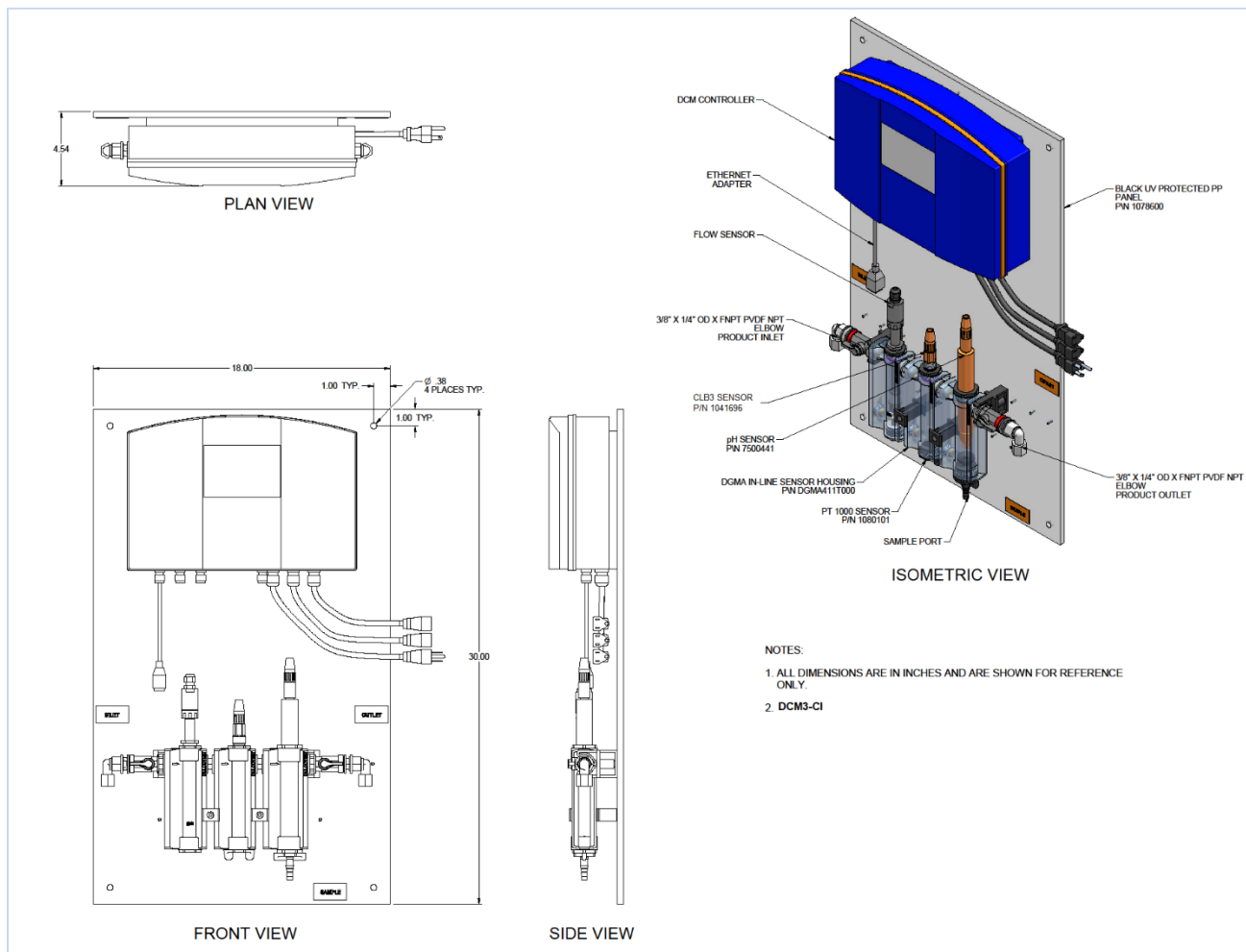


Figure 6 Typical panel drawing

6.2.3 Water Sampling

Best results for controlling the water chemistry in your pool or spa will always depend on the water sample. Water for the sensors must be representative of the water in the pool or spa. For consistent and stable sensor readings, it logically depends on the sample water being stable in flow and pressure at rates that are ideal for sensor performance. *Vacuum or changing sample pressures will pump the reference electrolyte from the sensors and cause premature failure of the sensors.* Entrained air in the sample stream will affect all residual readings and must be avoided or eliminated. pH, ORP and Temperature sensors are not usually affected by entrained air.

6.2.3.1 Sensor Requirements

Free Chlorine residual sensors, like the CLB3 sensor used in the DCM3-CI, are sensitive to pressure and

flow. The ideal pressure is never under vacuum, always slightly positive, and as low as possible to obtain 16-21 gallons per hour (g/h). Pressure should not exceed the 1 bar (15 psig) limit for the modular DGMA sensor holder. If the sample is under vacuum or the flow rate or pressure varies, so too will the residual sensor readings.

Less sensitive to flow are the temperature, pH, ORP sensors. Flow rates for these sensors can be up to 3 GPM, as long as the pressure is under 15 psig and is constant and representative of the pool water. pH and ORP are still affected by pressure changes and vacuum sampling which will cause erratic readings and drastically shorten sensor life.

Temperature and Conductivity sensors are not sensitive to flow or pressure. They only require that the sample be representative of the treated water.

6.2.3.2 Sample Source and Return

Sample water for the sensors should always be filtered water from just downstream of the system filters.

It is important to eliminate any small debris that might damage the glass or membrane sensors or clog the small ports in the sample housing or the flow meter / flow switch. An inline strainer is provided for this purpose, and it is important that it be installed upstream of the DGMA modular sensor holder assembly. The sample rate is ideally a stable flow between 16-21 gallons per hour (60 – 80 l/h) or only 0.27 to 0.35 gallons per minute (1.0 to 1.33 l/m). Creating a differential pressure large enough to cause this small amount of flow should not be difficult and usually does not require any special plumbing. Return the sample to the filtration stream as far downstream as possible, especially after all large flow devices (i.e. Heater, UV system, etc.). This arrangement should assure enough differential pressure.

Some unique installations have high backpressures that exceed the limits of the sensors (like high pressure water features such as high waterslides or high-pressure spray pads). These types of applications will need special consideration for sampling the water. Contact your ProMinent distributor or the ProMinent Help Desk at the phone number located on the back cover of this manual. Please look at the sample diagrams below for suggested sample locations for Pressure or Vacuum filters.

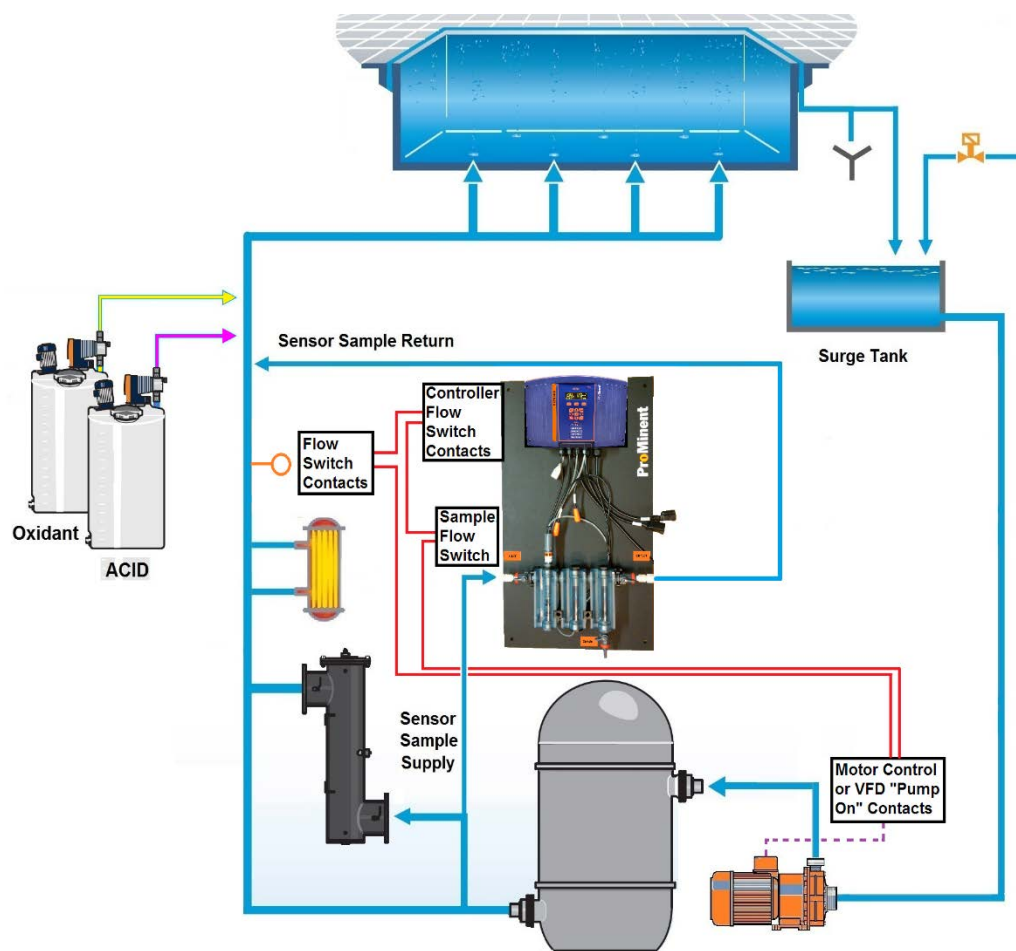


Figure 8A. Recommended Pressure Filter Sample and Return

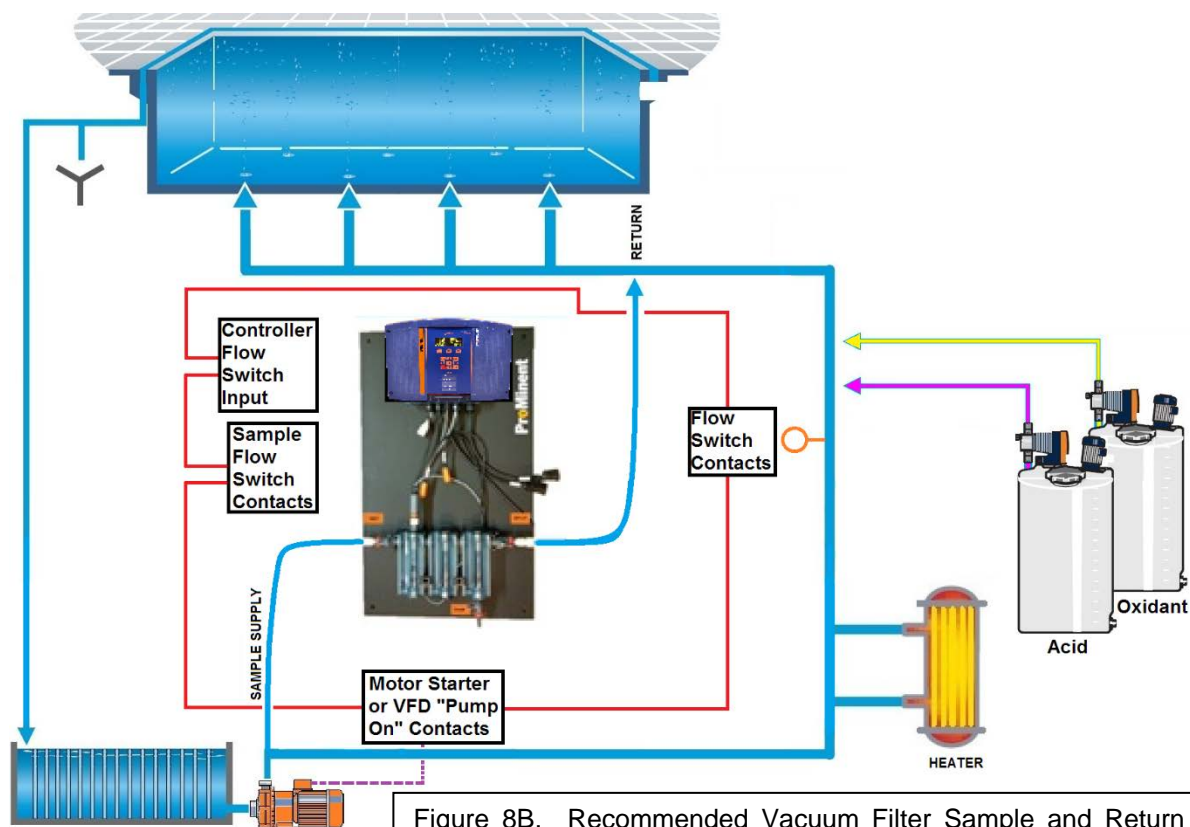


Figure 8B. Recommended Vacuum Filter Sample and Return

6.2.3.3 Optimizing for Accuracy and Repeatability

Accuracy of DPD tests and Chlorine Sensors

Your calibration can only be as accurate as the tool used to calibrate the instrument. The published accuracy of ProMinent CLB residual amperometric sensor is +/- .1 ppm. That means, under perfect conditions, the CLB sensor can be 0.1ppm off and the chlorine test can also be off by its accuracy tolerance. In the case of a non-electronic visual color comparator with an error of 0.2ppm, there could be a discrepancy of as much as 0.3ppm Free chlorine.

Conditions that cause DPD test inaccuracy

- Human eye sensitivity as color comparator
- Inadequate rinsing of sample vial between samples – 4-5 minimum
- Variable chlorine test timing – waiting the full, recommended reaction time?
- Varying sample volumes-top or bottom of meniscus?
- Varying reagent metering – dropper vertical?
- Aging reagents – fresh is always better
- Contaminated reagents – store as recommended, not in direct sunshine (or in the trunk of your car).
- Aging or dirty comparator – Standards must be kept clean and an electronic comparator needs to have its lenses cleaned periodically-read the owner's manual
- Colorimeter calibration/alignment – read the manual for recommendations. If it has been dropped, it may no longer be accurate.

NOTE: Your DPD tester will have instructions for how to properly use and maintain your instrument to obtain optimum results. Read these instructions carefully and follow them to the letter, including the newest sequences of reagent and water sample introduction, vial cleaning, reagent shelf life and storage.

6.2.4 Sensor Installation

Note: If this is a new installation, be sure that circulating sample water is available during and after sensor installation as the sensors must be kept wet and they will take a number of hours to run-in. Additionally, it is advised that the sample water be allowed to flow to drain before being connected to the supplied DGMa sample hardware to eliminate any debris that might clog the small openings in the valves and sensor chambers. If this is not done, the debris from installation of plumbing, filter sand and other trash will be washed into and clog the DGMa. Assuring the supplied sample strainer is installed properly upstream of the DGMa will help prevent sample stream contamination and clogging. Contamination or clogging will necessitate the complete disassembly and cleaning of the modular sensor housing. While this is not difficult, due to the modular design of the individual cells, it is time consuming.

6.2.4.1 Factory Installed Sensors

The conductivity and temperature sensors do not require constant moisture, so they are shipped pre-wired and installed in the DGMa modular sensor assembly. The CLB3 sensor is normally pre-wired to the controller, but the sensor is shipped in its protective housing, immersed in electrolyte until ready for use.

6.2.4.2 Field installed Sensors

The factory wired CLB3 sensor is connected to the controller, but it is shipped “wet” in its own protective holder. When the water sample has been flushed and can be started as soon as the sensors are installed, unscrew the retainer at the top of the CLB3 chlorine sensor, remove it from its holder and insert the sensor into the 13.5mm module. Open the sample petcock to avoid forcing the sensor into the cell against pressure. Be sure it is in water in the DGMa so that it does not dry out during the commissioning of the other sensors. Tighten the retaining nut just enough to prevent leaking. This is an O-ring seal and requires very little force to seal. Do not overtighten.

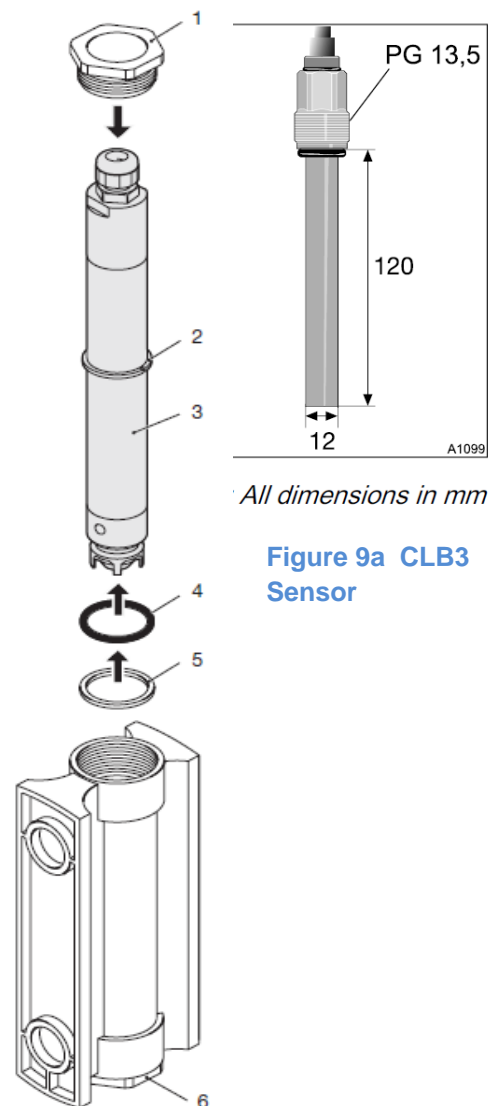
The coaxial cables used to connect the pH and ORP sensors are normally pre-installed at the factory with the sensor type written on a label near the orange SN6 connector. pH and ORP sensors are shipped in individual boxes and their tips are protected by a moisture sealed cap that contains liquid electrolyte. When you are ready to install the pH and ORP sensors, follow the cleaning and rinsing procedure below. While just inserting the pH and ORP sensors into the DGMa modular sensor housing is acceptable, cleaning the sensors prior to first installation will dramatically speed up the sensor equilibration.

Pre-Cleaning pH and ORP sensors:

Remove the protective cap with the tip of the sensor down to avoid spilling the electrolyte. The electrolyte is a non-toxic, potassium chloride silver chloride salt solution. Use a soft bristled toothbrush and a few drops of isopropyl alcohol (no additives like fragrance) to remove the coating of plasticizing chemicals. pH and ORP sensors react faster when recovering from an acidic rinse solution. Rinse the sensors with an acidic solution using the same soft bristled toothbrush. Any acidic solution will work, vinegar, acetic acid, TLC®, Lime Away®, or CLR®, etc.

Installing the pH and ORP sensors:

Be sure the petcock is open so that you are not forcing the sensors against pressure created from a closed housing outlet. Place the O-rings (4) and compression rings (5) as shown in the drawing on both



All dimensions in mm

Figure 9a CLB3 Sensor

Figure 9 pH Sensor and DGMa sensor module

sensors before inserting into the cell. All 25mm sensors (pH and ORP) use the same O-ring arrangement.

Install the pH sensor above the PT1000 Temperature sensor in the same cell. The ORP sensor, if used, is installed in the most downstream cell in the assembly, usually the one with the sample petcock.

On the DCM3-CI system, the CLB3 sensor is located above the sample petcock. Turn on the sample water as soon as the sensors are installed, so the liquid junctions do not dry out. Adjust the sample flow rate to the guidelines below. If there is a delay preventing the sensors from being installed promptly in a flowing sample stream, the sensors must be kept wet. Pool or tap water in a clean disposable cup is adequate for short periods of a few hours. Longer times require the sensors be returned to their protective containers using tap water if the electrolyte is no longer available.

6.2.4.3 Vacuum and Pressure

Caution must be exercised when installing or removing the sensors in or from the DGMa sensor housing. Sensors can be damaged by forcing the sensors into or out of the housing against pressure or vacuum caused by closed valves. Open the sample petcock before removing or installing sensors in the DGMa sensor housing to allow pressure to equalize as the sensor is changed.

6.2.4.4 Sensor Order

Residual sensors function by measuring the current used to reduce the sample presented to them. If the flow of the sample increases, the amount of chlorine presented increases, and so then does the reading shown. That is the reason the residual sensor accuracy is flow dependent, where pH, ORP and temperature sensors are not.

When samples are taken using the sample petcock, flow will increase across the tips of the sensors and so too can the residual readings. Take this into consideration when checking or performing calibrations. Take note of sensor readings on the controller before opening the sample petcock to take a water sample, as the ppm reading will likely change, and so may the pH or ORP reading, but usually not as much as the ppm reading.

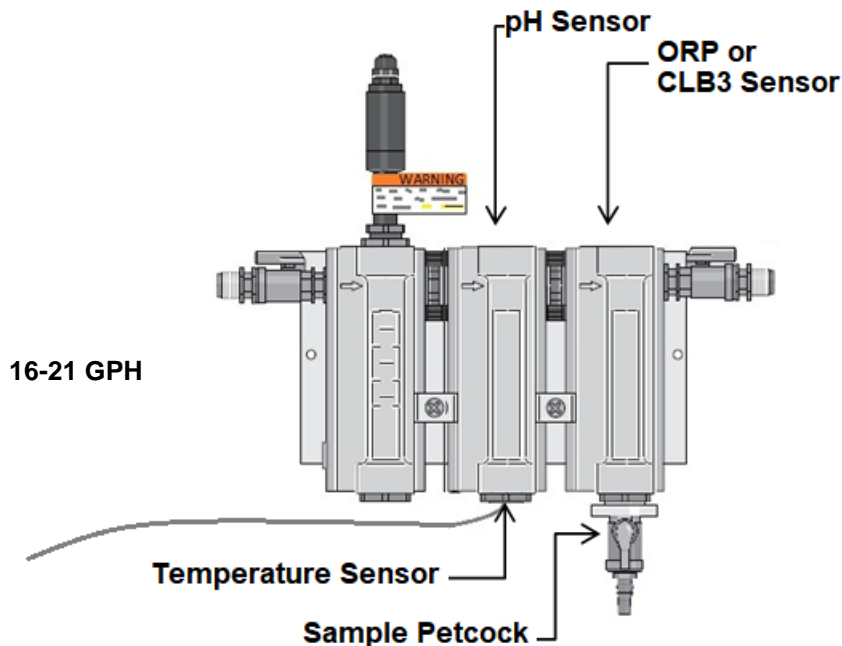


Figure 10 Aquatic Sensor Placement in DGMa Modular Sensor Housing

6.2.5 Maximizing sensor accuracy

As we saw in the sensor installation section, all sensors are adversely affected by excessive pressure, pressure changes and especially negative pressure (vacuum). Since the non-temperature or conductivity sensors all have an internal electrolyte at atmospheric pressure, any negative pressure or frequent pressure changes on the sample stream will effectively pump the electrolyte out of the sensors. Since this electrolyte is critical to sensor function and accuracy, any negative pressure will not only affect the readings, but it will deplete the electrolyte and require frequent sensor replacement. Sensors are not warranted against these conditions.

6.2.5.1 Sensor Compensation

The optional CLB3 Free Chlorine residual sensor uses temperature compensation. Any temperature sensor calibration adjustments will therefore affect the Free Chlorine residual calibration. For this reason, Calibrations of Free chlorine sensors require that the temperature sensor be calibrated, if needed, *before* the free residual sensor, otherwise temperature calibrations performed after the Free Chlorine calibration will shift the Chlorine readings.

6.2.5.2 Sample Flow Rate and Stability

Optimal sample flow rate for CLB residual sensors is 18-19 gallons per hour. Allowed range is 16-21 g/h. The residual sample accuracy is very dependent upon the sample flow rate, so any change in flow rate will cause a change in the residual reading.

A common misunderstanding by new users is the reading on the DGMa's flow meter and switch. The flow meter uses a plastic "float" to indicate the flow through the sensor housing, where the top of the float indicates the flow rate next to the markings on the body of the flowmeter cell. The switch portion of the meter is the plastic shaft inserted from the top of the cell. The magnet embedded in the float activates the magnetic flow switch when it is near.

A common example of a way the flow is improperly adjusted: The inlet and outlet valves are fully open and the flow through the sensor housing is at maximum, but the flow switch float is restricted by the switch shaft so it improperly shows ~18 g/h (0.3 gpm), although the actual flow may be several times that because the float is prevented from rising higher and showing the actual flow.

If the flow is properly adjusted, the float is barely touching the bottom of the shaft, and any slight restriction of the flow valves will cause the float to fall away from the shaft. Secondly, it is important that the sample flow at the petcock should be a slow trickle, enough to take a sample but not a vigorous stream, and never a vacuum. A vacuum is indicated where opening of the petcock draws air into the sample stream. A vigorous stream indicates excessive backpressure that must be eliminated. The DGMa modular probe housing is designed to withstand 1 bar [15 PSIG] pressure under normal operation.

This proper flow adjustment is important because any inadvertent increase in sample flow will cause the residual reading to increase with respect to the actual residual in the water. If this occurs, and the residual sensor is being used to control the chlorine, the actual residual will drop as the inflated sensor reading is used to achieve setpoint. This will errantly make it look like the sensor is not accurately showing the chlorine concentration.

6.2.6 A Word About Stabilizer

If specifying or installing a DCM3-CI control system, be aware that adding Cyanuric Acid stabilizer to the pool or spa stabilizes the water by changing the free chlorine chemistry to an organic chloramine, and the chlorine in the water is therefore no longer free chlorine. Since the CLB3 sensor is measuring free chlorine specifically, the chemistry is no longer compatible with the CLB3 sensor. There are some field reports of CLB3 sensors working well with up to 10 ppm (mg/l) of Cyanuric Acid Stabilizer, but expect the free chlorine measurement and response to be poor, to nonexistent, in stabilized water of any concentration.

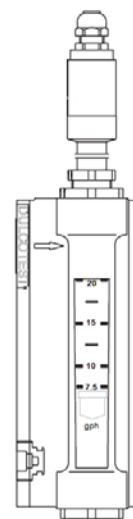


Figure 11
Flow meter
and switch

6.3 Electrical Installation

User qualification, electrical installation Electrical technician, see ↗ Section [4.5 Users' qualifications](#)

NOTICE

Moisture at The Electrical Contact Points

It is important that you use suitable measures to protect plugs, cables and terminals from moisture and corrosion. Moisture at the electrical contact points can interfere with the operation of the controller.



WARNING!

Safe operating status

Both hardware and software safety precautions must be taken to ensure that the DCM3 adopts a safe operating condition in the event of a fault.

Use limit switches, mechanical locks, and other appropriate safety devices.

During installation the device must not be electrically live.

The installation must only be carried out by technically trained personnel.

Observe the technical data in these instructions.

6.3.1 Specification and location of the cable grips and conduit entries

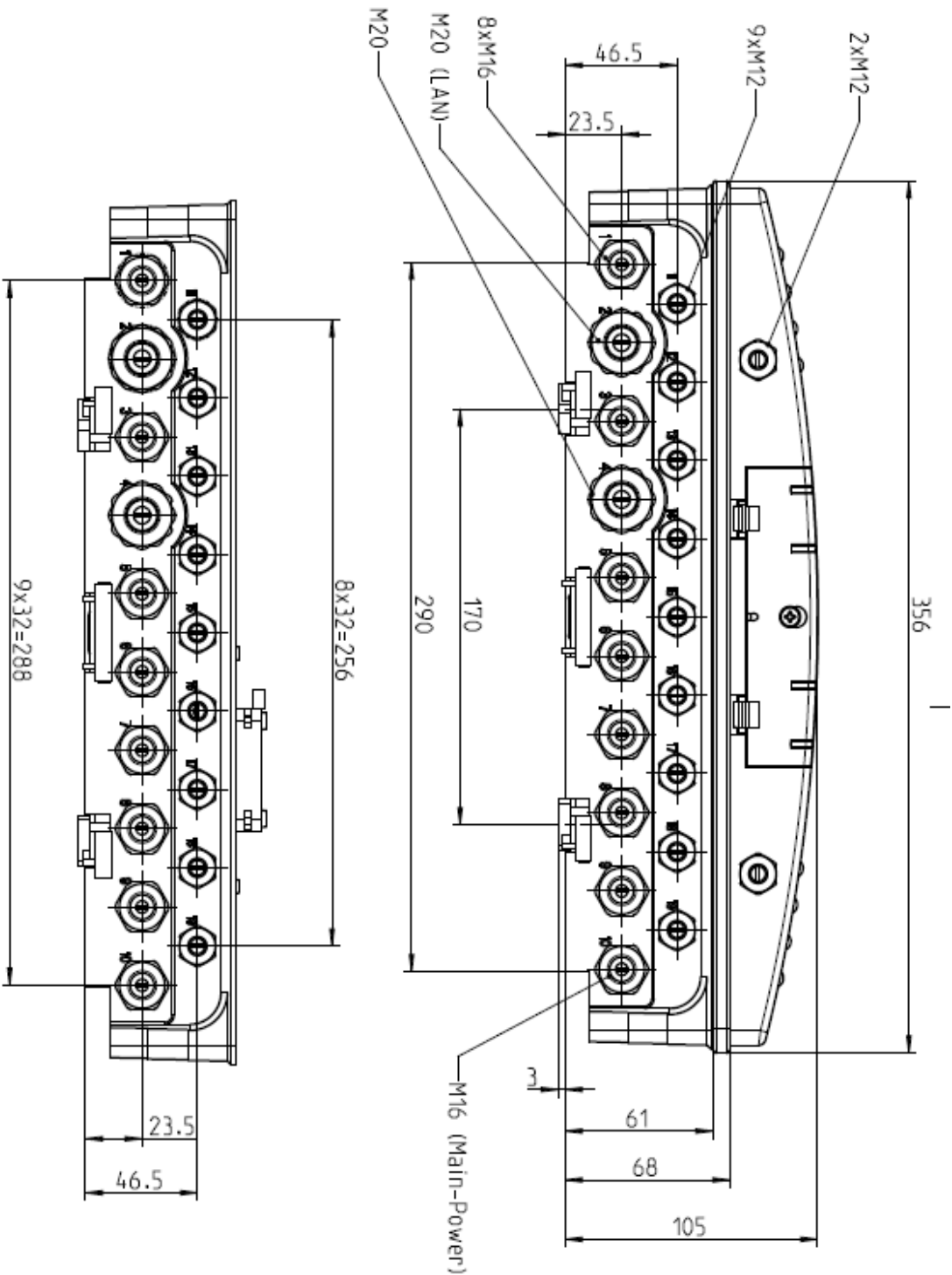


Figure 12 All Dimensions in millimeters (mm)

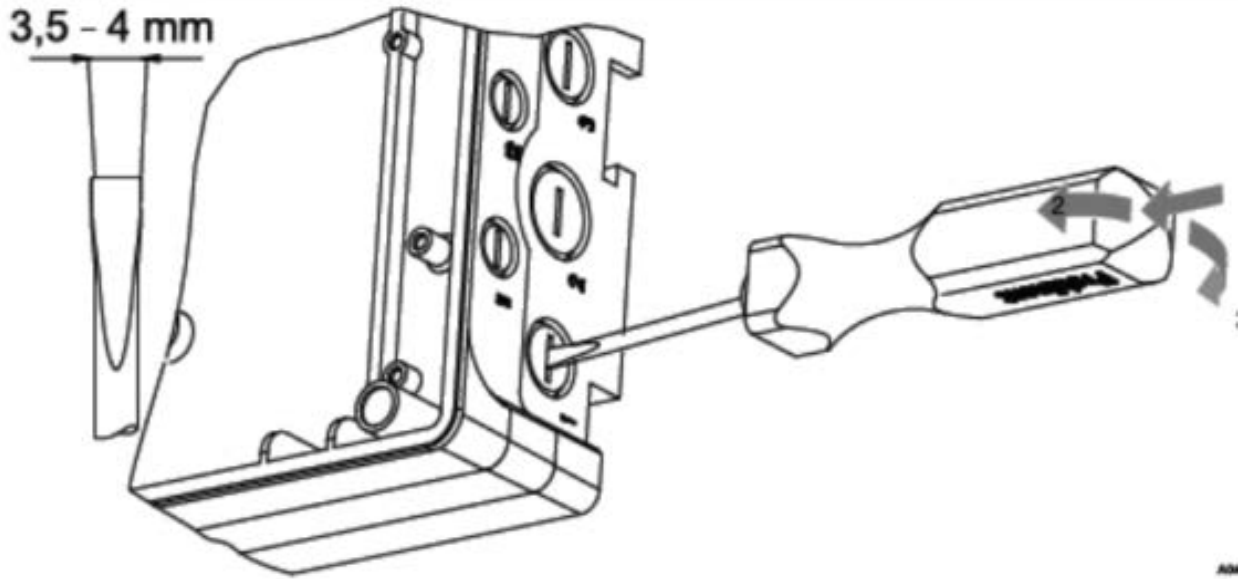


Figure 13A Use a screwdriver to break open a sealed enclosure position

6.3.2 Sensor Seals and Termination Procedure

Select the correct fitting cable glands (cord grips) for the controller's cable openings. Seal the open holes with blanking plugs (1) in the cord glands as shown below. This is the only way to ensure an acceptable air and moisture seal. Non-sealing dust caps are not effective for preventing non-warranty damage from moisture, corrosion or insects. Standard sizes for the cable glands are the metric sizes M12, M16 and M20.

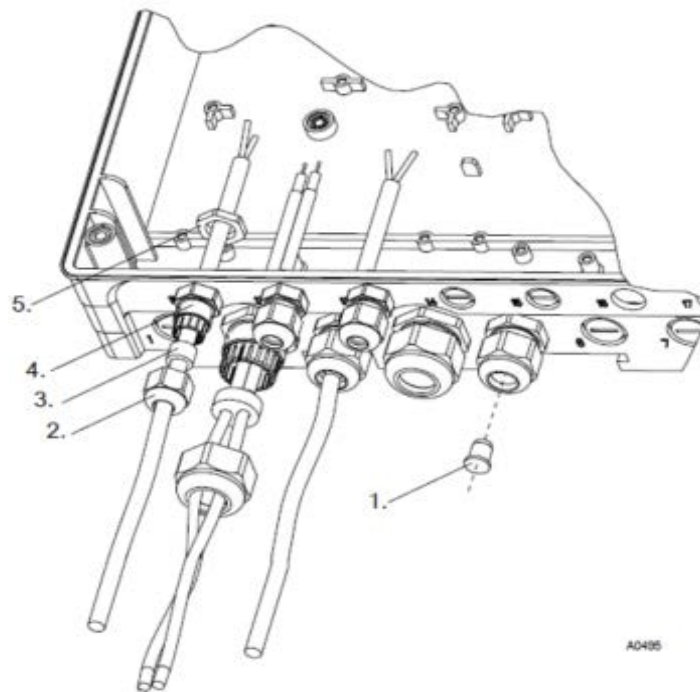


Figure 13B Examples of cable gland assembly.
1. Plug, 2 Cap, 3. Gland, 4. Connector Body, 5. Nut

6.3.3 Parking the Hood

The hood, also called the lid or cover, of the DCM3 enclosure can be 'parked' so that access to the internal wiring and all of the display indications are accessible while mounted vertically. To park the hood, loosen the four captive screws until the hood can be carefully pulled straight out from the enclosure base. Note the plastic brackets attached to both sides of the lower portion of the hood, and the slots they were removed from. Notice identical slots higher on the base that the hood can be inserted into. Carefully insert the brackets into the slots until they click and seat.

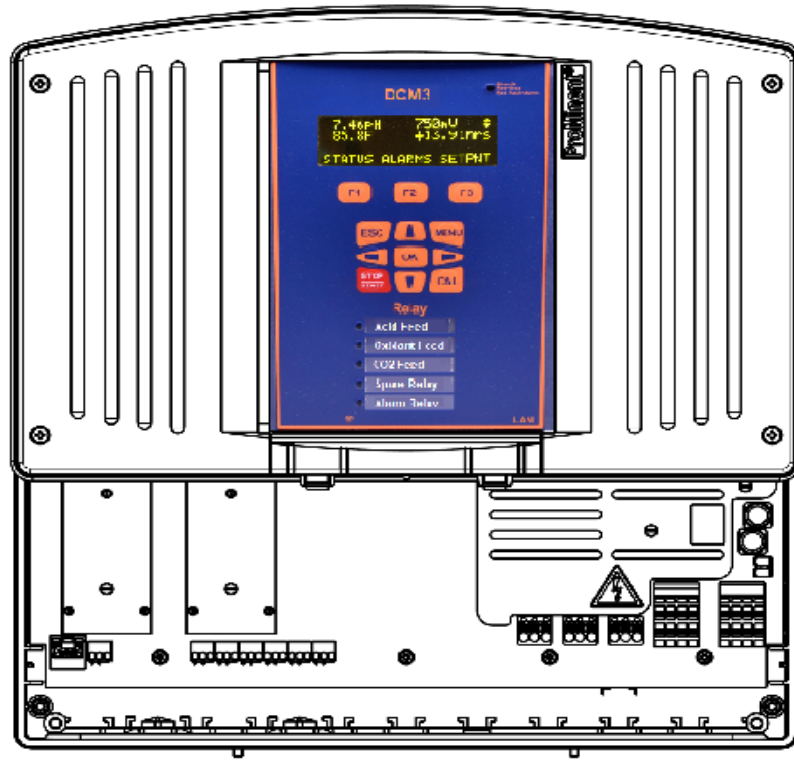


Figure 14. Hood in the parked position

6.3.4 General Layout and Terminal Diagrams

Figures 15 through 18 show general position of electronic components and wiring terminations.

Figure 15 shows the position of the internal relays and indicators for each relay R1 through R5. These lights are repeated on the controller cover.

Figures 16A, B and C show general component layout.

Figures 17A, B and C are electrical schematics of the I/O.

Section 6.3.5 depicts wiring rules and examples.

NOTICE

As with most electronic devices, moisture in the controller can lead to operational abnormalities and damaging corrosion. Note the instructions on the terminal diagrams provided.

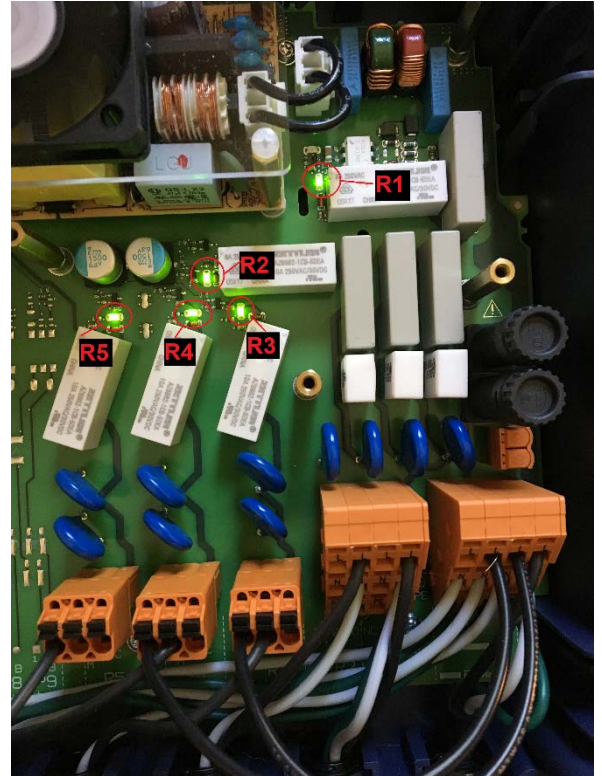
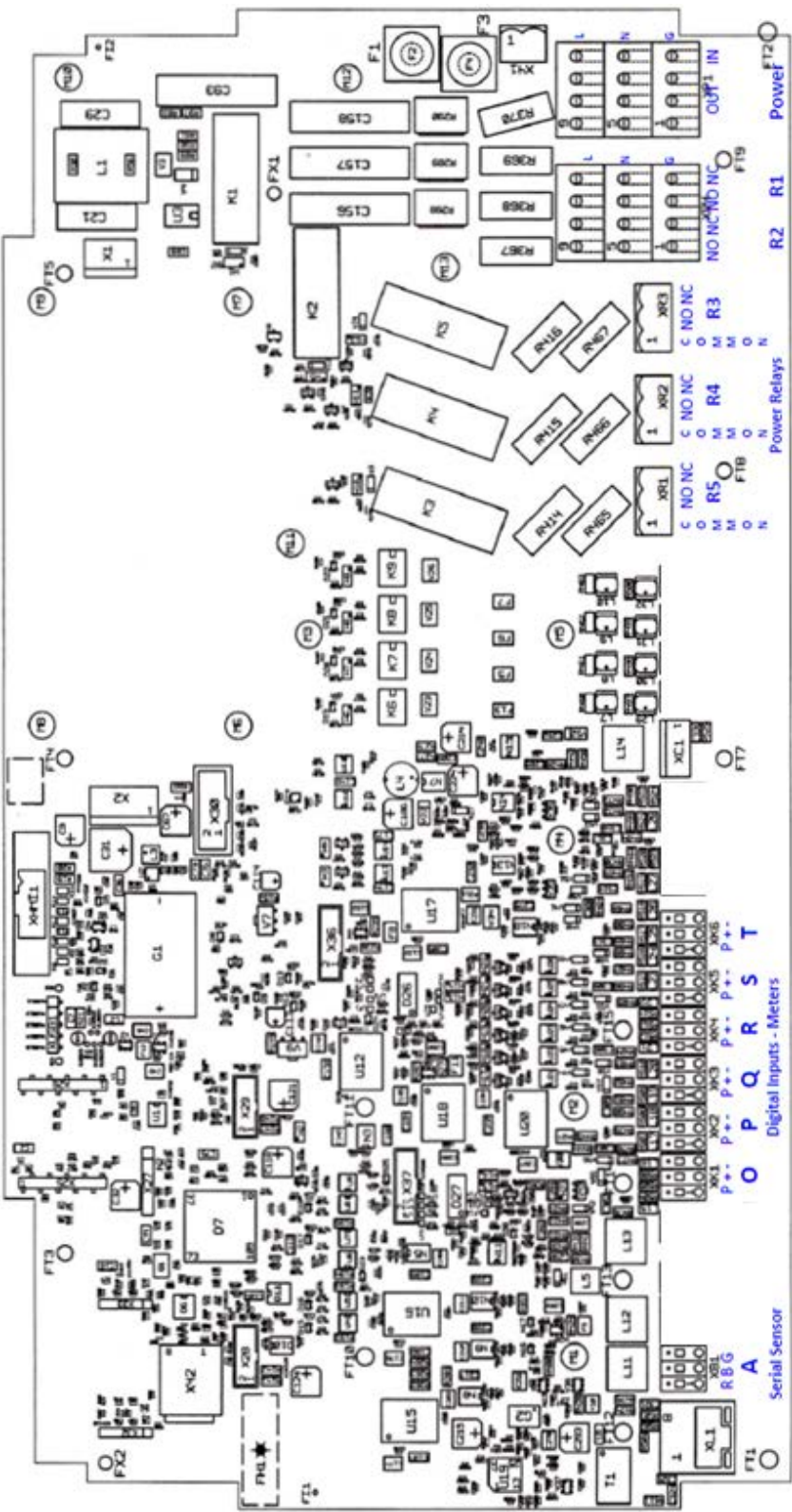


Figure 15 Internal Relays & Indicator LEDs



- Building Power In
- Line Power out x3
- AC powered Control Relay R1
- AC powered Control Relay R2
- Unpowered AC/DC Relay R3
- Unpowered AC/DC Relay R4
- Unpowered AC/DC Relay R5
- Digital Input T
- Digital Input S
- Digital Input R
- Digital Input Q
- Digital Input P
- Digital Input O
- Serial Input A (CTFS)

Figure 16A I/O Terminal Arrangements and Callouts

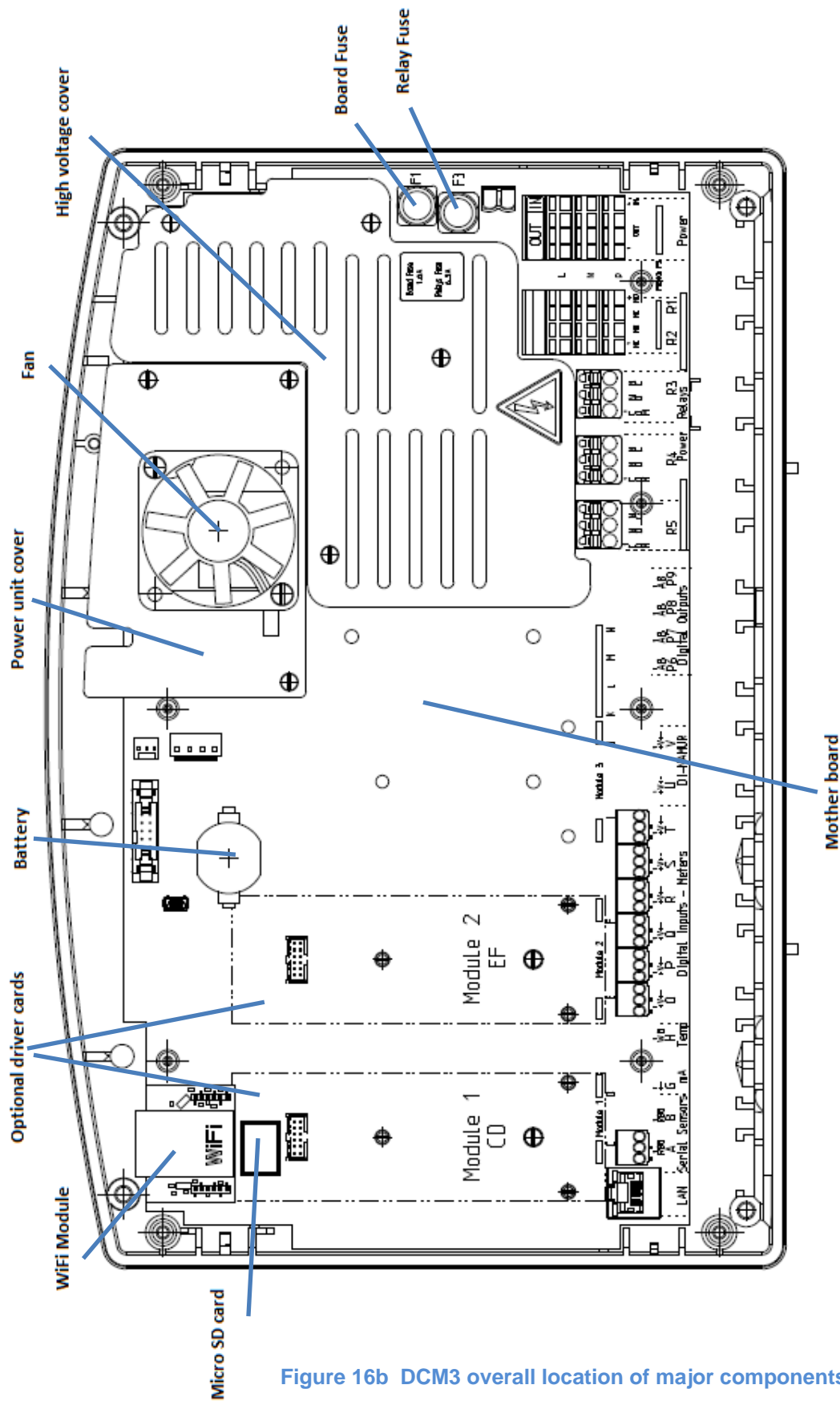


Figure 16b DCM3 overall location of major components

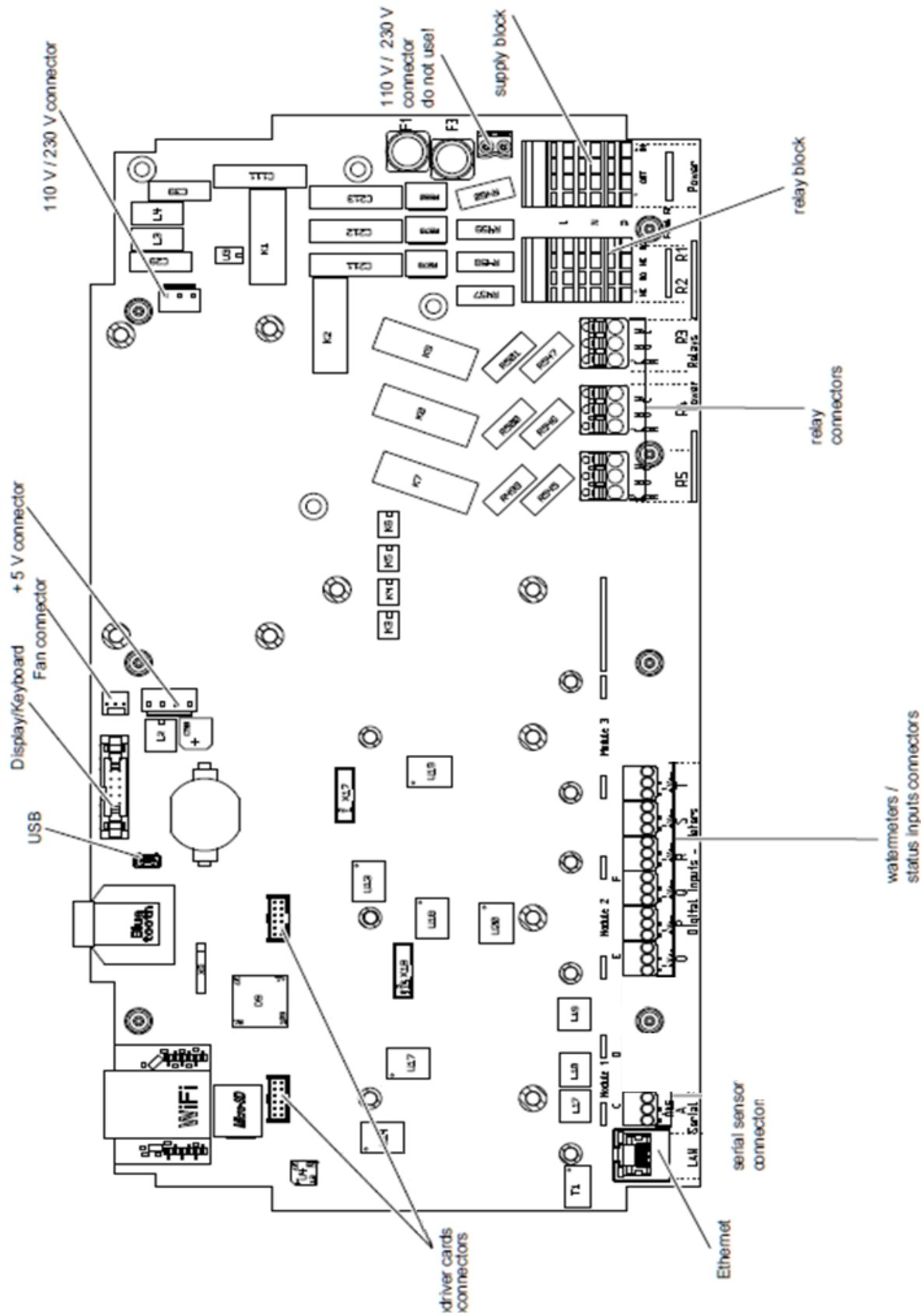


Figure 16C DCM3 motherboard layout

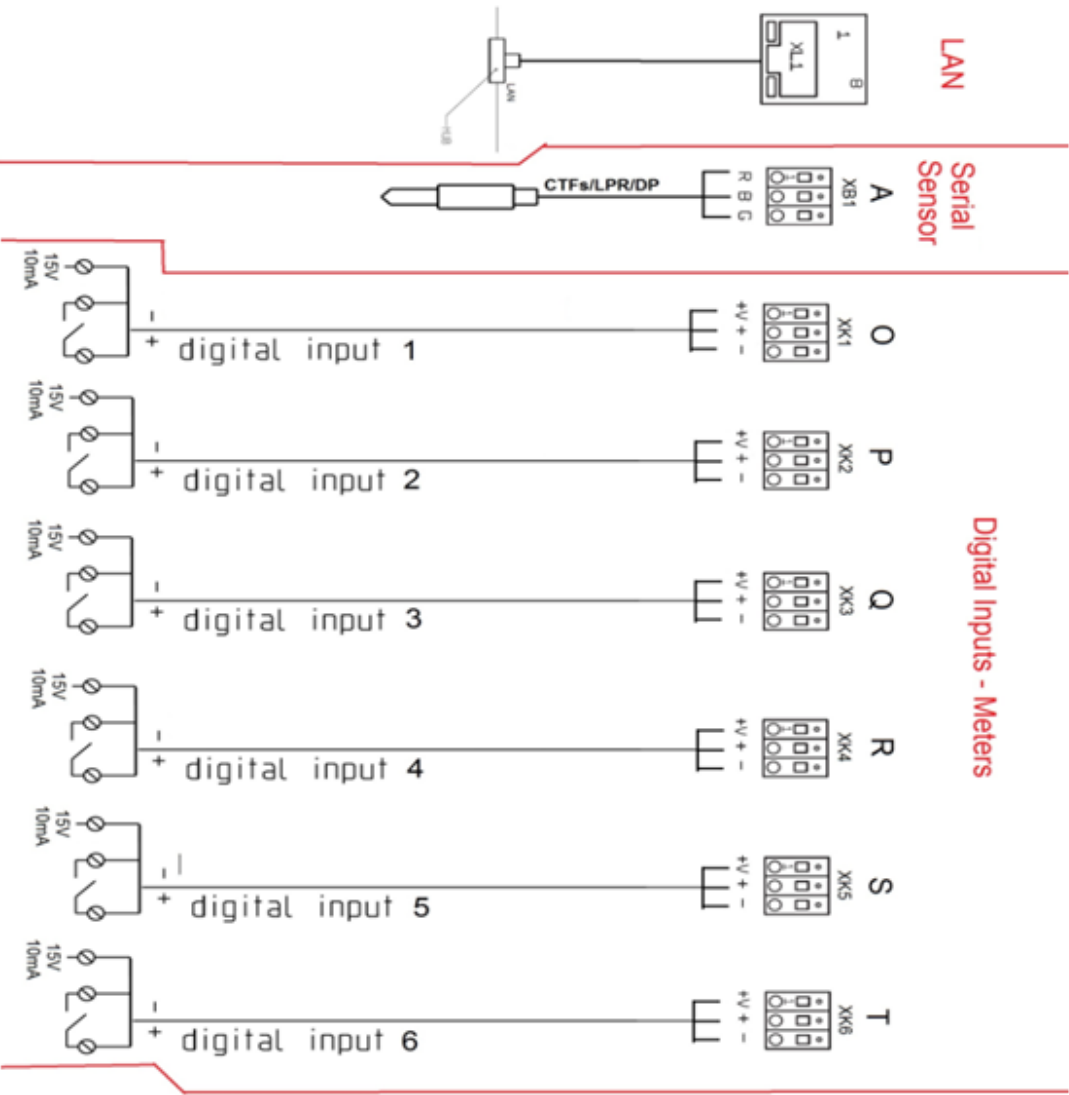


Figure 17. Main PC board Input Wiring diagram

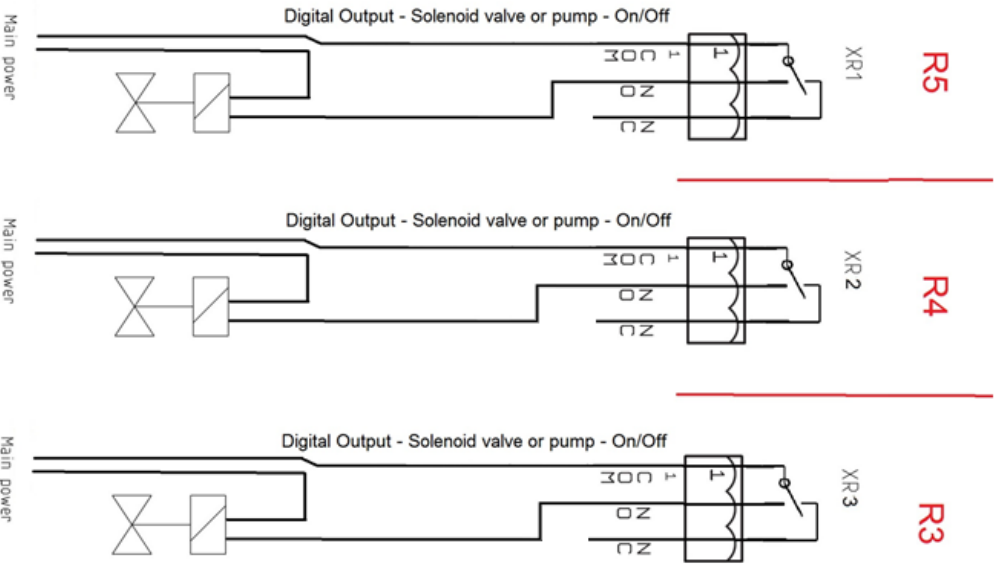


Figure 17A. Main PC board Output Wiring diagram Relays R3-R5

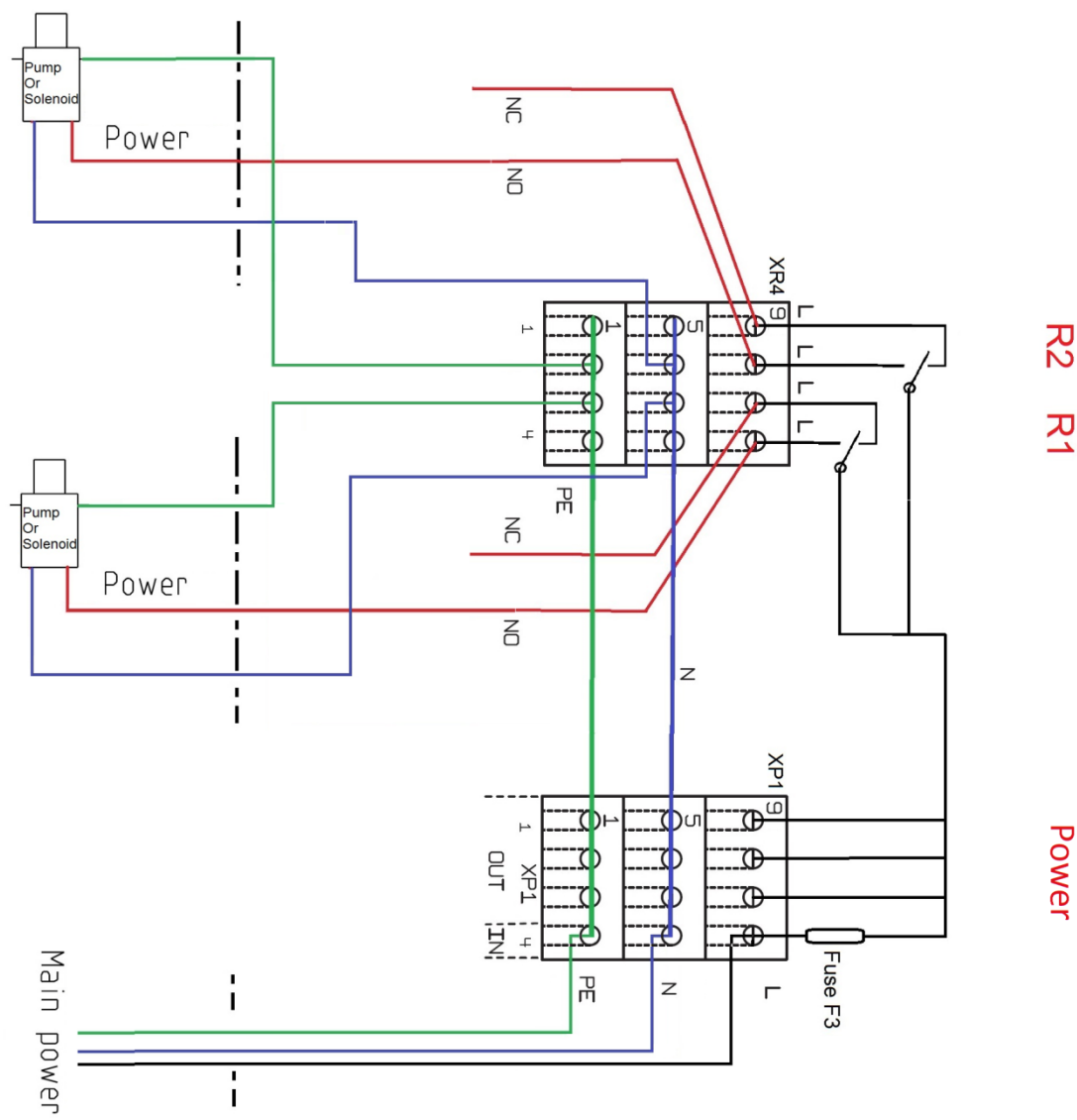


Figure 17B Main PC board Output Wiring diagram; Part 2: Relays R1, R2 and the Power block

The ground (PE) and Neutral (N) connections are all tied together through the printed circuit board as shown in the schematic 17C. The hot wire (L) does not with the other L terminals until after it passes through the main fuse F3. This means the outputs that use the additional power terminals to supply line voltage are protected by the same 5A fuse F3.

Main power is terminated on the bottom rung of the Power block marked IN in figure 17C.

See section 6.3.5 Power In and Relay Output Termination

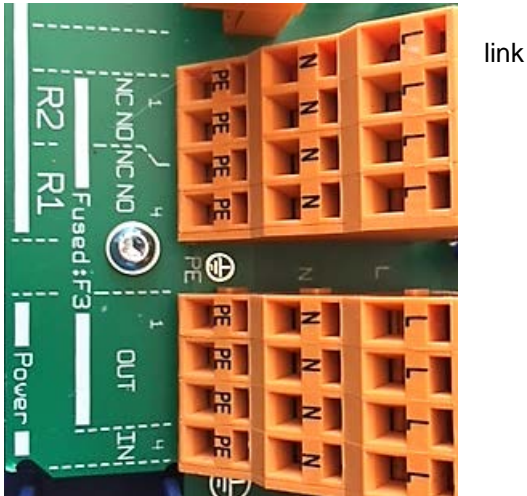


Figure 17C Relays R1, R2 and the Power block

6.3.5 Power In and Relay Output Termination

All electrical wiring shall be performed by a licensed electrician, in accordance with local and national electric codes.



CAUTION!

This controller is not designed to use multiple phase power.



The following wiring diagrams and information show typical configurations, but not all possible combinations of this versatile controller.

6.3.5.1 Overview

The power/relay section of the controller is shown in Figure 18 without wiring. Here we can see the labels on the controller circuit board indicating (from right to left) power in, power out and relays R1 through R5. See also figures 17B and 17C above.

The two large orange terminal blocks at the lower right, each have 3 levels; **Line**, **Neutral** and **Ground (PE)**. Input power is connected to the right most column of the Power block. See Figure 20.

In the USA, this connection is prewired in the factory for use with 120VAC at 60Hz. However, the input power supply will accommodate 90-253 VAC 50/60Hz. No controller AC power configuration is required. **CAUTION:** This controller is not designed to use multiple phase power. Use wire/cables/plugs that are matched to the power you are using. See also [6.3.6.4 Connecting a Power Cord](#).

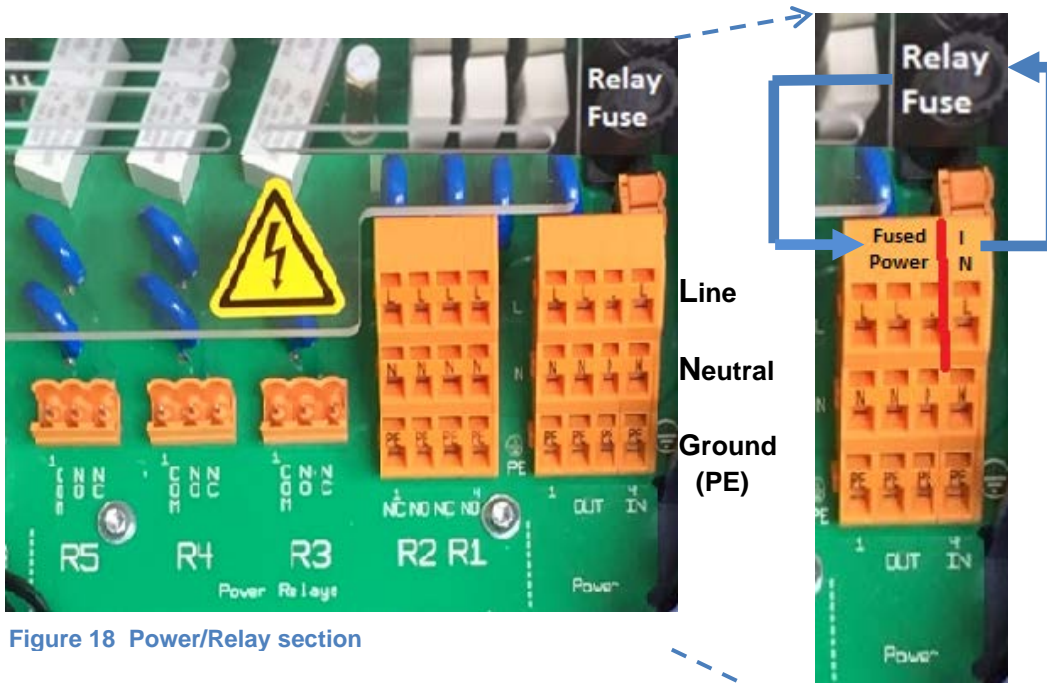


Figure 18 Power/Relay section

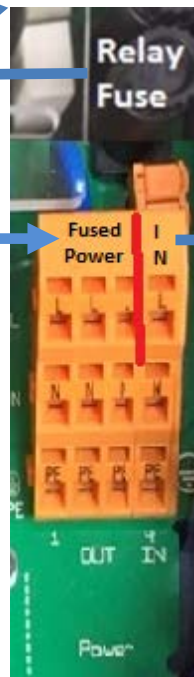


Figure 19 Power Block



Figure 20 Factory installed power

Note: The terminal connectors have been removed from relays R3, 4 and 5 for clarity. See them in Figure 25.

Input power is fed through the circuit board to the Relay Fuse (F3) located above the Power block, then back to the Power block's three output terminals. See Figure 17B and 19. The main circuit board under the Power block ties all 4 Neutrals together and all 4 PE (ground) terminals together. (See figure 17B)


The three fused powered outputs can be used to power the dry contacts on relays R3, R4 and R5. See also Figure 25.

Fused power is also connected to the common inputs of R1 and R2 (not shown). These relays are 'powered' relays. See Figure 17B


All 5 relays can be used to turn on and off pumps and solenoids as well as motor operated valves (MOV). MOV terminations are explained in section [6.3.5.3 Wiring Relays R1 and R2 for a Motor Operated Valve](#), and section [6.3.5.5 Wiring Relays for Externally Powered Motor Operated Valves \(MOV\)](#).

Note: *These relays cannot be used to control pump speed using pulse frequency control.*

To connect wires into the terminal blocks, (see figure 22) insert a small screwdriver or similar device, into the spring box opening as shown, then push up on the driver handle. This will force the spring loaded metal clip downwards and open the wire grip in the slot below.

 **These blocks accept a maximum of 14 AWG gauge wire**

To enter wires into the digital inputs and digital outputs, depress the spring loaded tab. See figure 21

 **The orange output terminals accept a maximum of 12 gauge wire.**

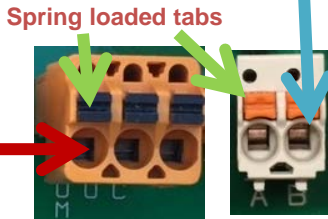


Figure 21 Spring loaded terminals

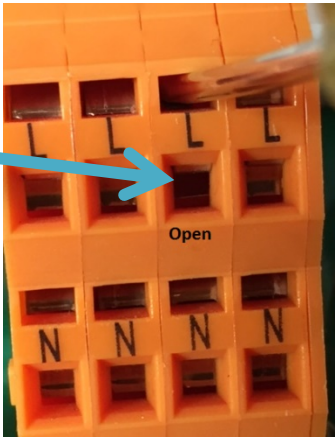



Figure 22 Open the terminals

6.3.5.2 Wiring Relays R1 and R2



CAUTION!

All electrical wiring shall be performed by a licensed electrician, in accordance with local and national electric codes.



CAUTION!

Verify the power is turned off and locked out before performing any wiring operation. Comply with all OSHA and local safety codes.

Figure 23 shows relays R1 and R2 wired to outlet plugs. (Plugs not shown). Notice that the black, white and green wires for R1 are in the right most column of the terminal block, the NO column (Normally Open). Relay R2 also utilizes the NO column. These plugs will supply power when the controller turns them on. Powered relays R1 and R2 are designed to operate pumps and solenoids with a 120 Volt, 5 Amp rating or less. Relays R3, R4 and R5 can also supply up to 5 amp devices.

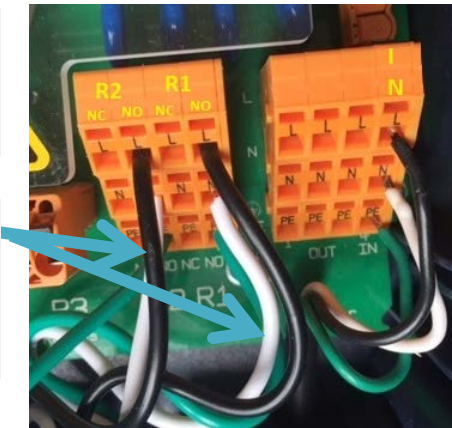


Figure 23 Terminating R1 & R2

NOTE: The fuse protecting these AC powered outputs is 5.0 Amps, so all devices connected cannot exceed 5 Amperes.

See section [6.3.5.5 Wiring Relays R3 – R5 Using an External Power Supply](#)

6.3.5.3 Wiring Relays R1 and R2 for a Motor Operated Valve

Motor Operated Valves are not common in Aquatic applications.

Motor Operated valves typically have two hot wires, a neutral and a ground. The two hot wires will be terminated on the NO and NC terminals. The NO terminal will open the valve when the controller turns on the output relay. The NC terminal will close the MOV when the controller turns off the output.

Figure 24 shows an MOV terminated on R1. The red wire is connected to R1 NO and the black wire is connected to R1 NC. See also section [6.3.5.6 Wiring Motor Operated Valves \(MOV\) to Relays R3 - R5](#)

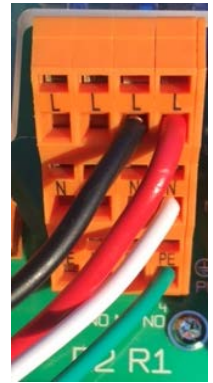


Figure 24 R1 MOV

6.3.5.4 Wiring Relays R3 – R5 Using On-board Power

Terminal connectors for R3, R4 and R5 can be removed from the PCB by pulling them up and off the pins on the PC board to make wiring easier, if you choose. Relays R1, R2 and the power block cannot be removed.



CAUTION!

The unpowered (dry) relays R3, R4, and R5 are not fused and any external connection to these relay terminals will require additional circuit protection provided by the installer at the time of installation.

Failure to protect these circuits can cause non-warranty equipment damage and could pose a safety hazard.

Relays R3, R4 and R5 have unpowered (dry) contact terminals. Unlike R1 and R2, they have no pre-wired power. This allows the user to operate these outputs as a simple low voltage DC contact, supply power from a remote source or use power from the Output side of the power block.

In Figure 25, we show a jumper wire from the Fused Power output block Line terminal (L) to the COM (Common) input on R3 – the left-most terminal. The NO terminal is used to power the outlet plug and feeder – Center terminal, also black wire. The White and Green wires, Neutral and Ground (PE) respectively, are connected to the N and PE (Ground) connections on the Power output block as shown.



Figure 25 Wiring R3 using on-board fused power

6.3.5.5 Wiring Relays R3 – R5 Using an External Power Source



CAUTION!

The unpowered (dry) relays R3, R4, and R5 are not fused and any external connection to these relay terminals will require additional circuit protection provided by the installer at the time of installation.

Failure to protect these circuits can cause non-warranty equipment damage and could pose a safety hazard. Follow the electrical codes for your area.

An external power source can be used on relays R3, R4 and R5. Figure 26 illustrates a fused external power source connected to relay R5 at the COM terminal (black wire). A second wire (red) on the NO (Normally Open) terminal is the switched output to a pump, solenoid, alarm light, etc. The neutral and ground wires for an externally powered device **must not** be terminated in the controller.

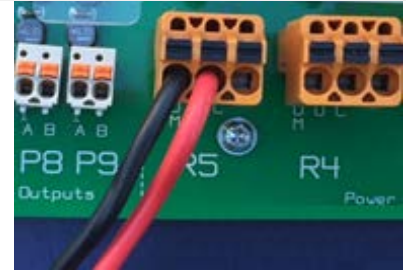


Figure 26 Remotely powered relay

6.3.5.6 Wiring Motor Operated Valves (MOVs) to Relays R3 - R5

NOTE: *Motor Operated Valves are not common in Aquatic applications.*

Motor Operated valves typically have two hot wires, a neutral and a ground. The two hot wires will be terminated on the NO and NC terminals. The NO terminal will open the valve when the controller energizes the output relay.

Figure 27 shows internal power used on R3 and external power used on R5 to control an MOV.

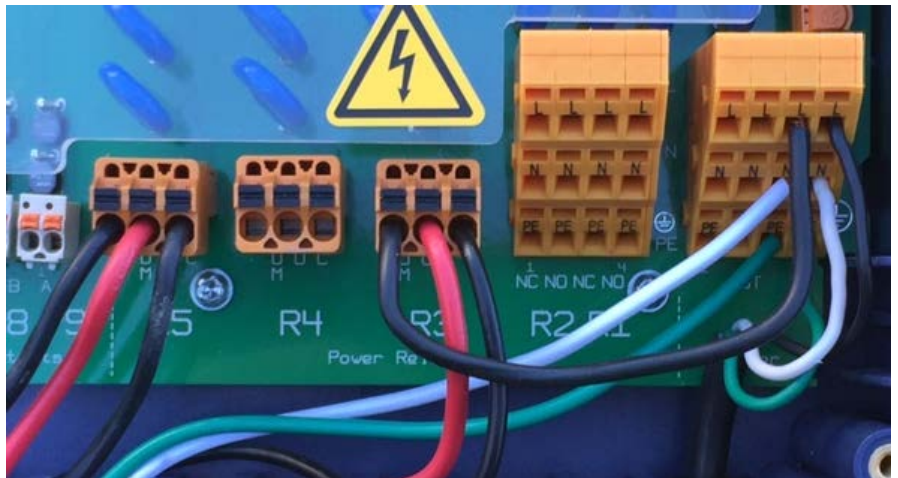


Figure 27 Motor Operated Valves wired to R3 and R5

6.3.5.7 Connecting a Power Cord



CAUTION!

All electrical wiring shall be performed by a trained electrician, in accordance with local and national electric codes.



CAUTION!

Verify the power is turned off and locked out before performing any wiring operation. Comply with all OSHA and local safety codes.

The default configuration of the DCM3 controller has a power cord attached as described below. These instructions should only be needed if the controller is wired directly into a building electrical system or is a replacement for the original and does not have a power cord installed.

If needed, remove a knock-out from the bottom of the controller and install the cord using a NEMA4/IP66 cable gland (cord grip) as shown in figure 28. See also Figures 13A and 13B along with section **6.3.2 Sensor Seals and Termination Procedure**.

Terminate the line, neutral and ground wires as shown in Figure 28. See also Figure 22 in the overview section to open the terminations to accept wires.



Figure 28 Power cord

6.3.5.8 Converting from Power Cord to Conduit Connection

With the power cord unplugged, use a small screwdriver (see Figure 22) to release the spring clamps and remove the power cord connections from the **Line**, **Neutral** and **PE** (Ground) terminals. Remove the cord grip shown in Figure 28 to make room for the NEMA 4X conduit fitting. See also Section 6.3.2.

Terminate the line, neutral and ground wires as shown in Figure 28. See also Figure 22 in the overview section to see how to open the spring loaded connector terminals.

6.3.5.9 DC Output Control Termination

DC outputs use R3-R5 and the external or dry contact configuration described above in section 6.3.5.5 External Power Source.

6.3.6 Using an “ON/OFF” or “Enable/Disable” Output Relay

ProMinent pump types, Beta, Delta and Gamma using a Universal Control Cable will terminate using the brown and black wires as shown in Figure 29D. This connection is not polarity sensitive. The black is common. The brown wire is for pause/enable. When the brown wire is not connected to the black wire, the pump will be in pause mode. In the configuration shown, the controller will be enabled or “turned on” each time the output closes, and will PAUSE whenever R4 turns off.

A ProMinent Concept Plus pump uses the same color code for pausing the pump. However, the action is opposite. When the wires are shorted through the relay, the pump will pause. When the relay is open, the pump will run. You may need to reverse the response of the relay, or rewire the output. See Figure 29E.

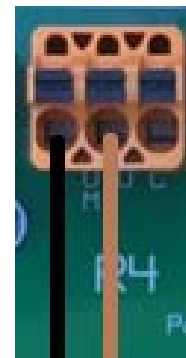


Figure 29D Universal Control Cable on Output Relay R4 (Enable/Disable-ON/OFF Mode)

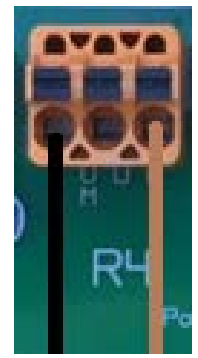
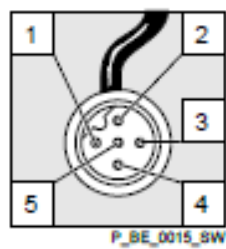


Figure 29E Concept pump cable on Output Relay R4 (Enable/Disable-ON/OFF Mode)

6.3.7 ProMinent Control Cables Available

Universal control cable for ProMinent Beta, Delta and Gamma pumps have this configuration.



Pin	Function	5-wire cable
1	Pause	brown
2	External contact	white
3	mA input*	blue
4	Earth / GND	black
5	Auxiliary capacity / Auxiliary frequency	grey

External control connectors

Colour	Function
GND	black
Contact (Pulse)	blue
Pause	brown

Figure 30B External Control cable connections for the Concept Plus pump

Figure 30A Universal Control Cable

See Figure 30A. With Non-Concept ProMinent pumps in manual speed mode, black and brown will **enable** the pump when connected and **pause** when open.

See Figure 30B. When ordered with a control cable, Concept pumps pause function also uses the Black and Brown wires, but it acts as a **pause** signal when connected and an **enable** when open. This is opposite from the Beta, Delta and Gamma series ProMinent pumps.

6.3.8 Wiring sensors to the controller

NOTICE

Poor electrical connection may cause incorrect sensor measurements. Once a wire is terminated, tug gently on the wire to ensure it is securely connected.

Signal inputs to the controller attach to the main printed circuit board (PCB) or to expansion driver cards. See Figure 36.

Each analog input (sensor) signal are each assigned a letter, A through N, for program identification. Digital (contact) inputs are assigned a letter from O through T. Digital outputs (Relays) are assigned numbers 1 through 5. In this way, outputs may be programmed to operate based on the status of specified inputs. Relay 3, for example, might be energized when sensor E reaches a programmed setpoint. Analog outputs are not available on a DCM3 controller.

6.3.8.1 Inputs on the Main Board

The main PCB inputs are shown in Figure 31.

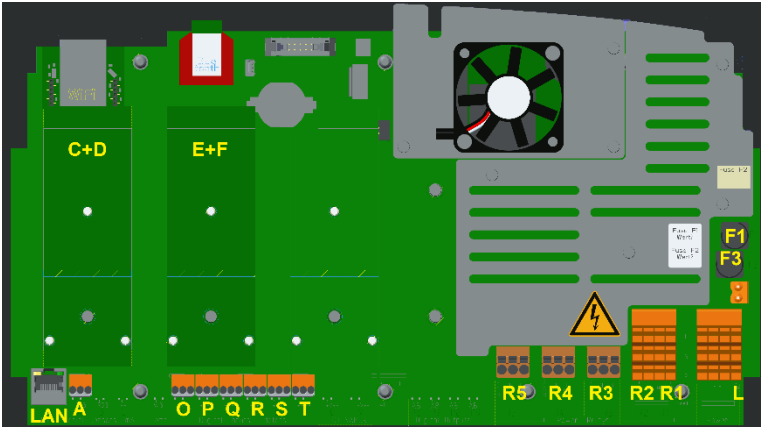


Figure 36 Expansion Card Slots and Letter Designations



Figure 31 Main PC Board (Motherboard) inputs

Input A is for ProMinent serial conductivity sensor (CTFS). These sensors have 3 wires; transmit, receive and common. Do not connect other probes to these inputs. Notice the color code of the wires is stenciled on the main board (**R**ed **B**lack **G**reen).

NOTICE

The CTFS conductivity sensor is not the same as the legacy CT conductivity sensor. The DCM3 controller cannot use the 4 wire CT sensor. The legacy DCM500 conductivity temperature (CT) sensor has 4 wires and is not compatible with input A on the DCM3.

See section [15 Spare Parts and Accessories](#) for a list of DCM3 compatible sensors.

6.3.8.2 Digital Inputs O through T

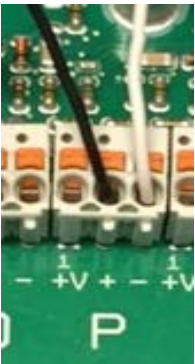


Figure 34 Digital Input wiring

Inputs O through T are digital inputs. They expect to monitor dry (unpowered) square wave contact signals from flowmeters or any dry contact switch or relay contact. See Figure 31. Wire the input contacts between the + and – terminals. See Figure 34. Black is on + and white is on – of input P, but polarity is not important on these inputs.

Each input has a 15 volt DC (+V) terminal available as a power source for the sensor or input device if needed.

Digital flowmeters that use these terminals must not supply a sine wave or powered signal. If the meter uses a 'hall effect', 'open collector', 'square wave' or 'dry contact' output, you can connect to these inputs. Signet 2536 "blue cap" or 2551-XX-11 water meters with a square wave pulse output are compatible and frequently used in aquatic applications. Signet 515 'red cap' and similar sine wave output meters are **not compatible** with these digital inputs because the signal they generate is not compatible. Many other brands and models are also compatible.

NOTICE

Various types of flowmeters use the V+ terminal. The color and purpose of the wires does not adhere to a standard. Some meters use black for power and red for the signal. Check the flowmeter manufacturer's manual.

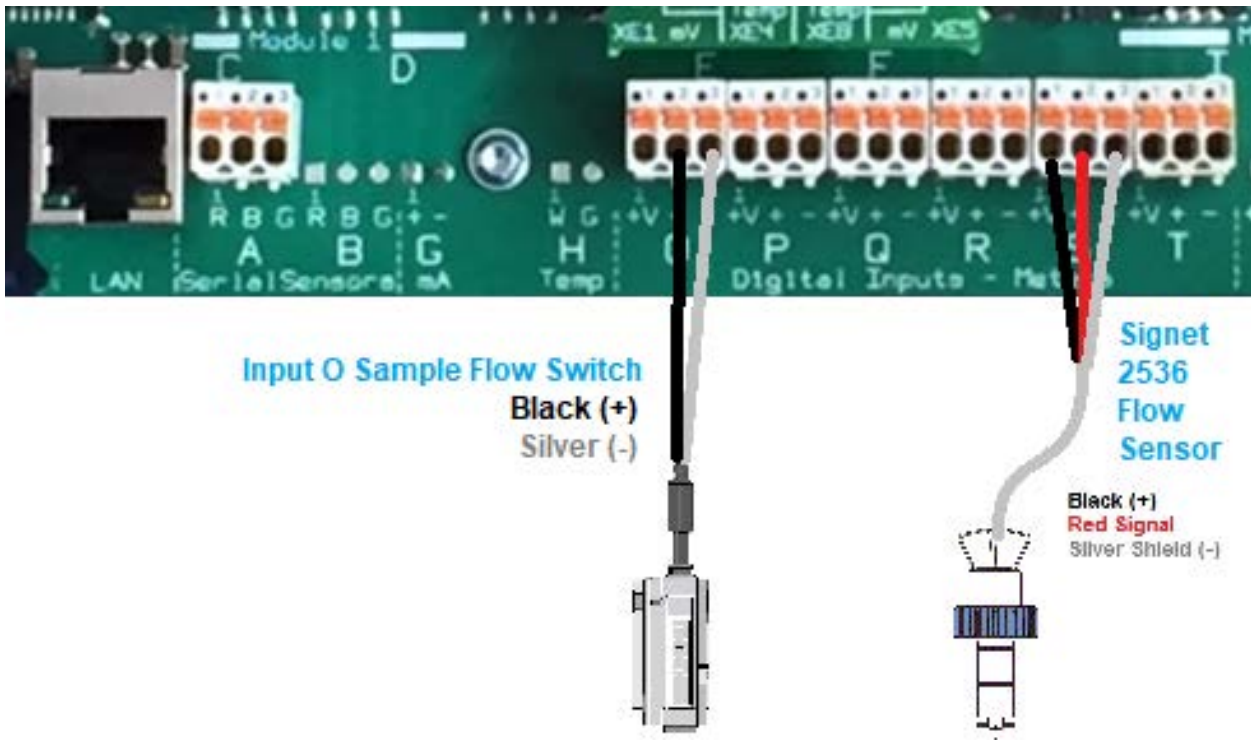


Figure 35 Sample Flow Switch and commonly used G+F Signet 2536 water meter wiring connections.

6.3.9 Sensor Driver Cards

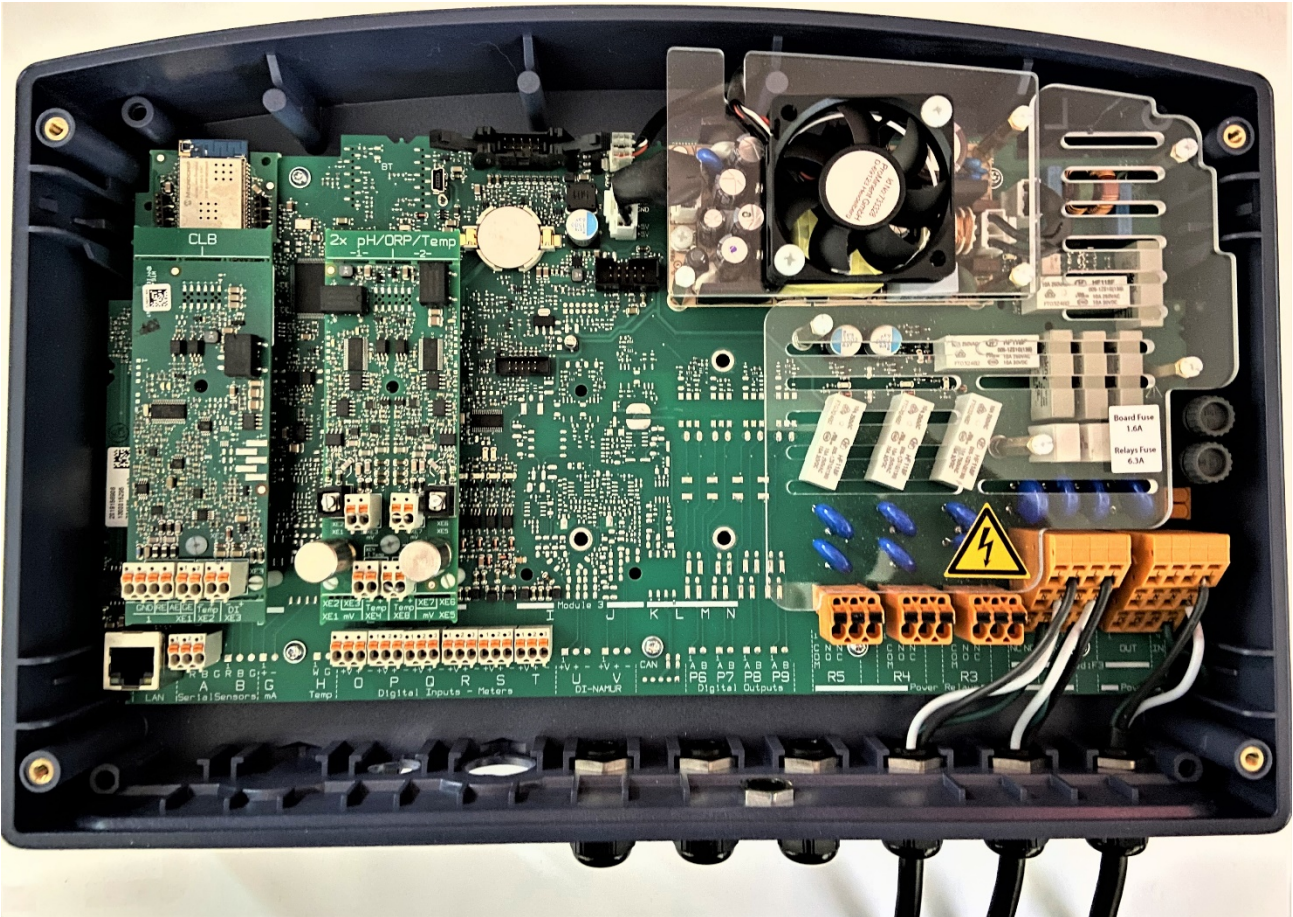


Figure 35a Overall view of the DCM3 interior with both driver cards as factory installed

The following sections identify wiring diagrams of the sensor driver cards. There are two available driver slots as shown in section 6.3.4 General Layout and Terminal Diagram and Figure 16C.

NOTE: The drawings show the location of connections and are meant to be used with the adjoining tables which provide additional information for wiring connections.

There are two expansion cards to choose from, the Dual pH-ORP-Temp Driver, and the CLB Sensor Input Driver. Each is described in detail below.

The two Driver slots (C+D and E+F) are shown in Figure 36 and previously in Figure 16C.

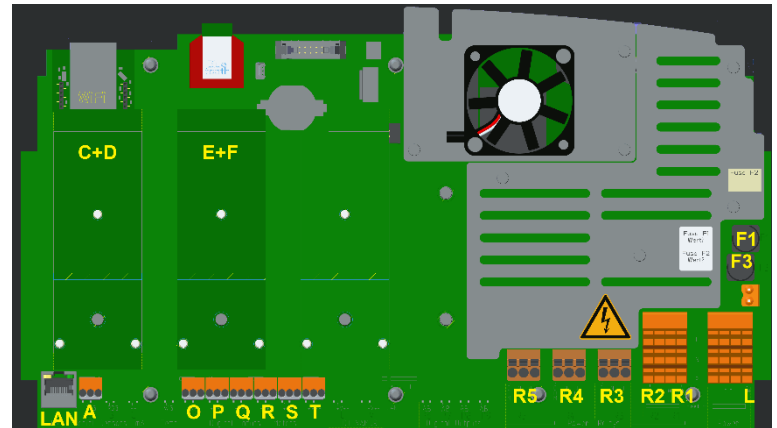


Figure 36 Expansion Card Slots and Letter Designations

Note the letter designations in yellow. Inputs on these cards are identified in the program by these same letters for continuity.

6.3.9.1 Dual pH-ORP-Temp Driver

Two inputs; can both be pH or both be ORP, but usually one of each. Normally located in the E+F slot with E being the pH sensor and F being the ORP sensor. *There is no restriction to moving the dual mV input driver to the C+D slot, except the coaxial cables are cumbersome when located above the Ethernet LAN port.*

Any of our 2-wire pH sensors will work if the mV/pH is ~59.1. Any of our 2-wire ORP sensors will work if mV is in the range of +/- 1,000mV.

The pH, ORP or temperature (Pt100 or Pt1000 only) sensors can be extended a maximum of 10 meters (33 feet) from the controller. Temperature can be used for display, control or compensation.

This card is **not compatible** with our legacy 'SGT' Solution Ground Temperature sensor used in the DCM2 ,DCM2-Clor DCM500 series controllers.

If a small electrical potential exists in the water, it should be removed, but is normally not a problem due to the isolation used on these inputs. If it is an issue and cannot be removed, a potential equalization electrode (also called “liquid potential” or “solution ground”) connection can be used. If a potential equalization electrode is used, the default wire jumper(s) on XE3 and XE7 must be removed before connecting the potential equalization electrode to input XE3:2 and/or XE7:2. If not using a potential equalization electrode, leave the default jumpers in place on XE3 and XE7.

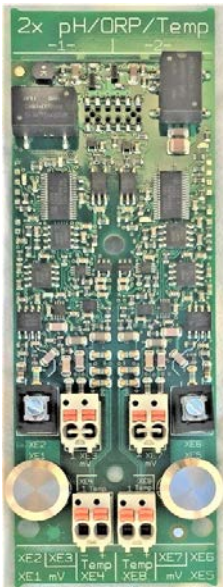


Figure 44 Dual pH/ ORP Driver

Assignment Variants 734131

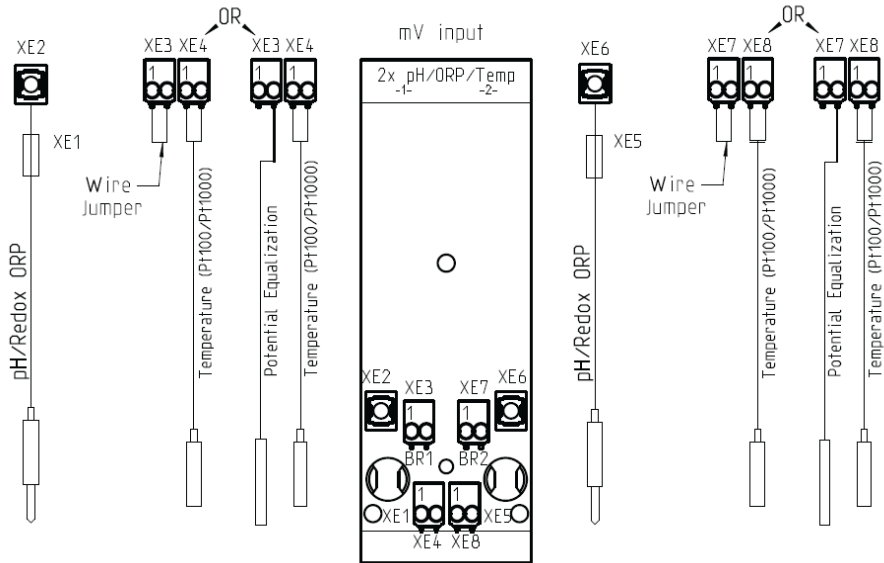


Figure 45 Dual pH/ORP input Driver Connections



When is potential equalization (Solution Ground) used?

Potential equalization (also called “liquid potential” or “solution ground”) is used if the pH/ORP measurement is interfered with by disturbance potential (millivoltage) from the measurement media (Pool/Spa Water). For example, a disturbance potential can be caused by electric motors with incorrect interference suppression or due to insufficient galvanic insulation of electrical conductors etc. Potential equalization does not remove this disturbance voltage; however it does reduce its effect on the measurement. Therefore, it is ideal to remove the source of the disturbance potential.



Ready-made coaxial cable

Whenever possible, only use ready-made coaxial cables that you can select from the ProMinent catalog.

Coaxial cable 0.8 m-SN6 (31.5”), ready- made, order no. 1024105

Coaxial cable 2 m-SN6 (6.5’), ready-made, order no.1024106

Coaxial cable 5 m-SN6 (16.4’), ready-made, order no. 1024107



Figure 46 Ready-made coax

Dual pH/ORP with Temp Input HW Version: 734131 Rev.3			
	Connector	Pins	Description
Channel 1	XE1	-	Reference electrode (Shield)
	XE2	-	Measurement signal (glass electrode)
	XE3 Without liquid potential	1	Short circuit using jumper
		2	
	XE3 With liquid potential	1	NC
		2	
	XE4	1	Temperature sensor (Pt100 or Pt1000)
		2	
Channel 2	XE5	-	Reference electrode (Shield)
	XE6	-	Measurement signal (glass electrode)
	XE7 Without liquid potential	1	Short circuit using jumper
		2	
	XE7 With liquid potential	1	NC
		2	
	XE8	1	Temperature sensor (Pt100 or Pt1000)
		2	

Table 7 Dual pH-ORP-Temp Connections

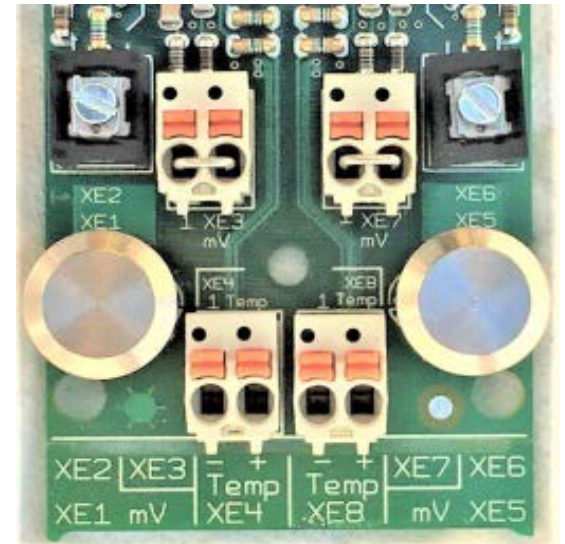


Figure 44a Dual pH/ORP Driver Connections

NOTICE

Jumper and potential equalization (liquid potential or solution ground).

If a "liquid potential" jumper and a potential equalization electrode are both or neither connected, it will cause incorrect sensor readings.

Always leave the jumper connected if not using potential equalization, or remove the jumper when connecting potential equalization.

Coax cables accompany pH and ORP sensors. They should never be spliced or extended, but they can be shortened. If you shorten them, be sure to create an end that is a good fit for the card termination. If one of the coax cables is too short, longer cables up to 10 meters (32 feet) can be ordered from ProMinent.

Remove the black plastic layer from the inner coaxial cable. This is present on all types of cable. In doing so, ensure that individual threads of the bare wire shielding do not come into contact with the inner conductor.

Braided conductor (4)~10mm
Insulation (2)~7mm
Inner conductor (3)~7mm

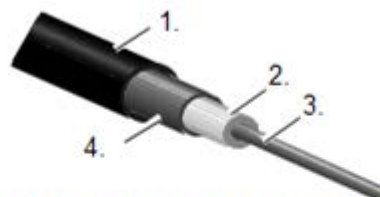


Figure 49 Coaxial Cable Construction

1. Protective Outer Sleeve 2. Insulation
 3. Inner Conductor 4. Outer Conductor and braided shielding



Figure 50A Coax cable preparation with conductive sleeve (wrong)



Figure 50B Coax cable preparation with conductive sleeve removed

6.3.9.1.1 Attaching the pH/ORP coax cable.

Once the cable has been prepared, (Figure 50) attach it to the pH/ORP driver card. Remove the shield grounding nut, XE5, and loosen the center conductor screw, XE6, as shown in Figure 47.

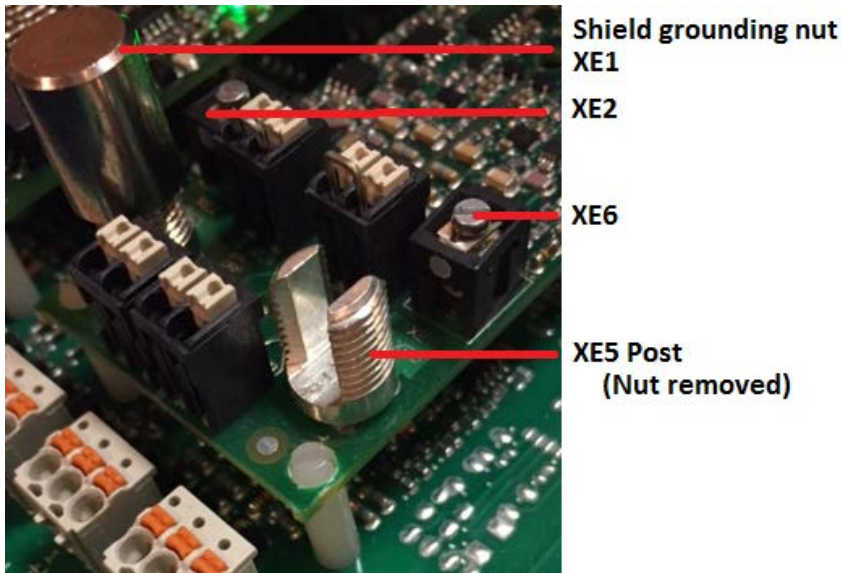


Figure 47 pH/ORP driver card coax connection

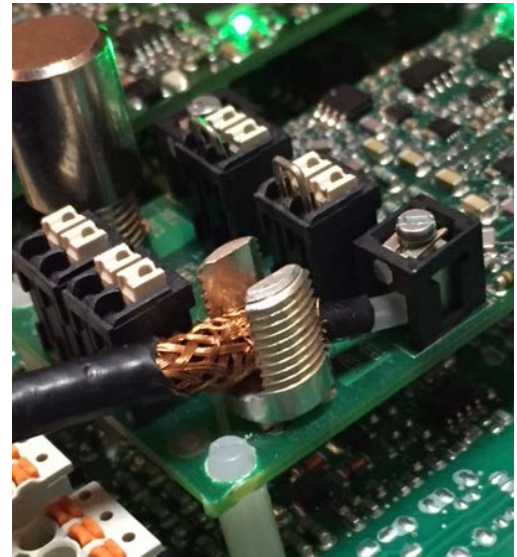


Figure 48 Coax placement

Insert the coax center conductor into the XE2 or XE6 terminal and tighten. Place the shield grounding nut on the post, screw down and hand tighten. This nut is smooth for a reason. Finger tight is sufficient, *Do Not over-tighten!*

6.3.9.1.2 Temperature inputs

There is only one temperature input on the DCM3 controller, the XE4 (E1) input on the pH/ORP driver card. It is for either a Pt100 or our Standard Pt-1000 temperature sensor. The Pt-1000 RTD temperature sensor for the pH input is part number **1080101**.



Figure 52 ProMinent Industrial ORP and pH sensors

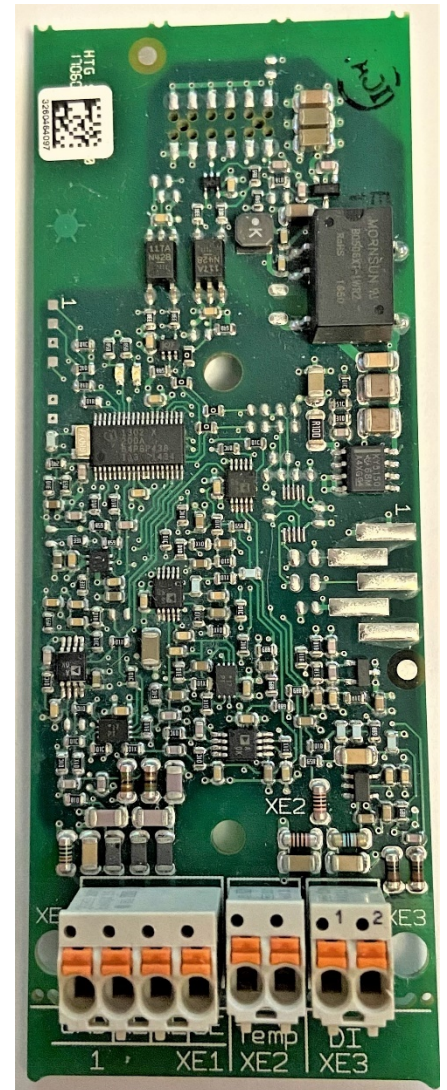
6.3.9.2 CLB Sensor Driver

The CLB driver measures the raw signal from the CLB sensor and converts it to a ppm value, applies the temperature compensation and calibration offsets and then sends it to the DCM3's internal network.

The CLB driver card has a single input, the 4-wire CLB3 sensor. The required temperature compensation comes from the DCM3's standard temperature sensor connected to the pH driver card.

The CLB driver is normally installed at our factory in the C+D slot with C being the CLB sensor and D is not available. See Figure 35a above. There is no restriction to moving the CLB driver to the E+F slot, except the pH/ORP coaxial cables are cumbersome when located above the Ethernet LAN port. If the CLB driver is installed in the E+F slot, the CLB sensor will then be the E sensor with the F sensor not available.

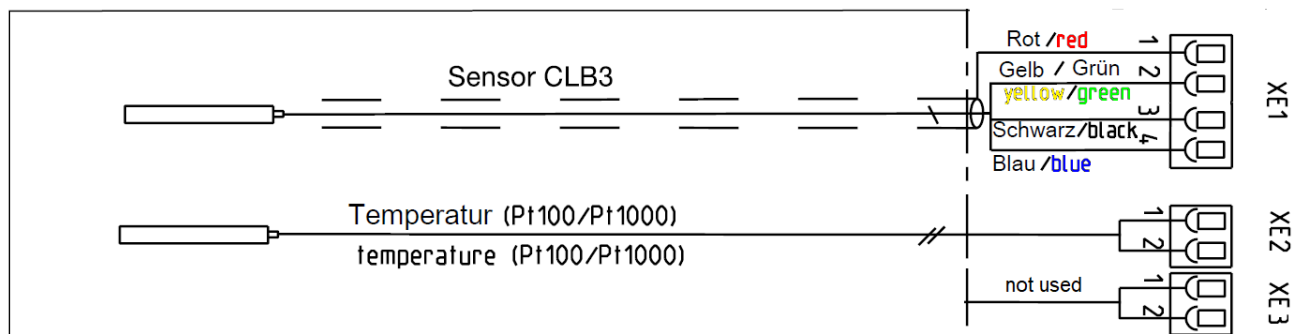
To the right is a photo of the complete CLB driver card. Below are diagrams that show where the color coded CLB3 sensor wires connect to the CLB driver.



CLB3 Sensor Connections



Terminal diagram



6.3.10 Salt Generator Pool Considerations

6.3.10.1 Salt Compatible sensors

Some of the standard sensors used in fresh water pools are not compatible with on-site chlorine generators. Generators that utilize salt dissolved in the pool or spa water create special conditions that require special sensors. Standard ppm and ORP sensors used in salt water pools will seem to work at first, but will become less responsive over a short period of time. For the special saline generator environment, we have specific sensors that must be used in these applications. Contact your authorized ProMinent Distributor for more information.

6.3.10.2 Temperature and pH Sensors

Conductivity, Temperature and pH sensors are fairly universal and are not adversely affected by salt water, so there are no special salt compatible sensors for Conductivity, Temperature or pH, our standard sensors will work fine.

6.3.10.3 ORP Sensors

The platinum element used in standard ORP sensors does not work well in salt pools, so a gold element version of our ORP sensor must be used. The part number **1003875 RHEP-Au-SE** ORP sensor is 13.5mm in diameter, and utilizes a more sensitive and salt generator compatible gold plated pin tip.

6.3.10.4 Chlorine Sensors

Consult your ProMinent Distributor for the chlorine sensors available for salt-generator pools.

6.3.10.5 Conductivity sensors

Conductivity sensors are more popular in salt pool applications as they allow the user to monitor the salinity level of the water, which is critical for optimal performance of salt generators. Depending on the pool chemistry, it may be necessary to add a cell to the DGMA sensor housing to accommodate a conductivity sensor. Conductivity sensors do not require a specific orientation as do electrolyte sensors, so conductivity sensors use an adaptor to screw into the bottom of one of the 25mm cells as shown below.

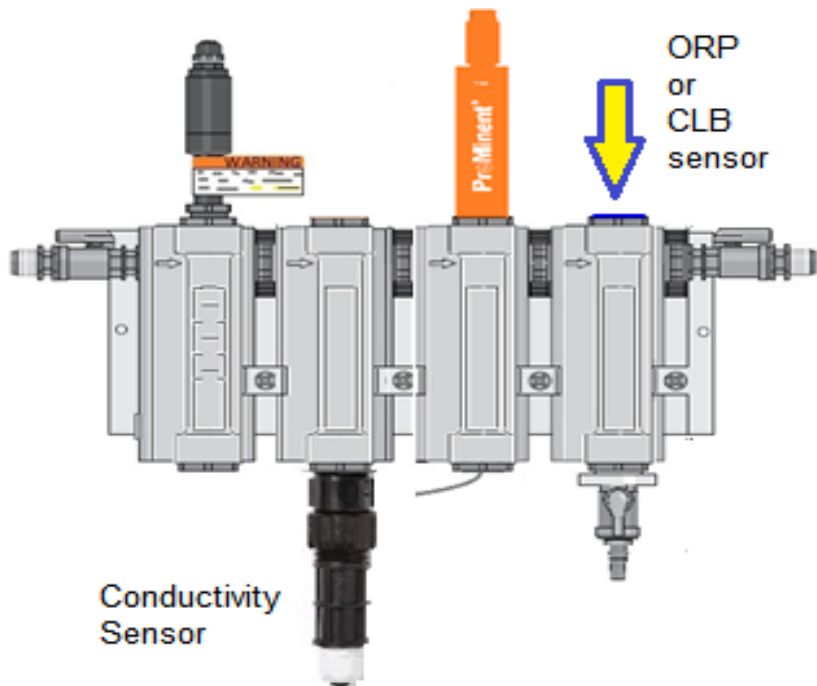


Figure 63 DGMA with Conductivity sensor

7 Communication Hardware

7.1 Diagram of the Communication Modules

See also section [11.1 Communications](#) in the System Menu

To the right is Figure 65 which is a diagram of the location of the Wi Fi transceiver module and the Ethernet Local Area Network (LAN) port. The LAN port is normally connected to an extension cable that routes the port to the outside of the enclosure. If it is desirable to connect a patch cable directly to the Ethernet LAN port, unplug the extension cable and plug the Ethernet patch cable in its place. If this will be a permanent connection, be sure to route the cable through one of the NEMAX 4 gland fittings in the bottom of the enclosure to assure a tight seal against moisture, dust and vermin damage.

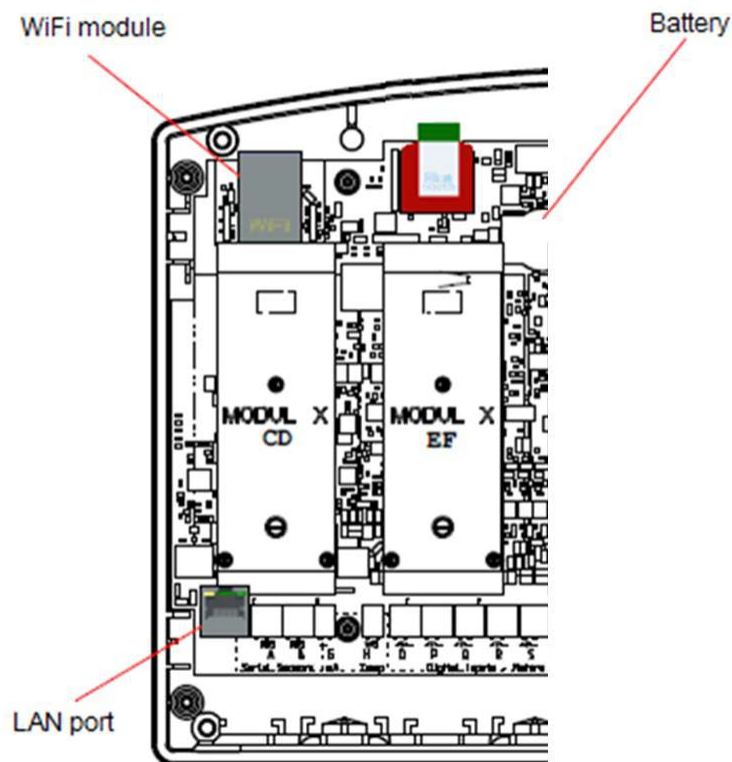


Figure 65 Location of DCM3 communication modules

8 Commissioning

User qualification: Trained user, see section [4.5 Users qualifications](#).

After mechanical and electrical installation, flush the sample stream before introducing the sample to the DGMa sensor manifold. Open the valves to the sample stream, check for leaks and purge any trapped air. Adjust the flow and pressure to the levels described in section 6.2.3 above.

8.1 Switch-on behavior during commissioning

Switching On - First Steps

Power up sequence will first show the 4 line x 20 character LED display for 3 seconds:

Powering up...
contact set states:
ON = + OFF = ÷

Followed by the “Home” screen of up to 6 sensor readings with the bottom line reserved for labels above the 3 dynamic keys F1, F2 and F3:

7.46pH 750mV #
77.0F +13.90hrs
STATUS ALARMS SETPNT

These sensor locations can be changed or rearranged to suit the preference of the operator. See section [2.2 Modifying the ‘Home’ Screen](#).



CAUTION!

Installation and function control

Check that all the electrical connections have been made correctly

Ensure that the supply voltage matches the voltage range indicated on the data plate

8.2 Defining Metering and Control Processes

Configuring the controller adapts it to your specific pool or spa.

8.2.1 Define the following parameters to set up a controller:

- What type of a process control is planned?
 - Salt generator?
 - Multiple acids for alkalinity control?
- Which measured variables are included? pH, ORP, Free Chlorine, Temperature, LSI/Ryznar?
- What other devices will interface the controller? (Heater, flowmeter, additional flow switches or interlocks etc.)
- Should the controls operate as ON/OFF, Time Modulated, Time Cycled or just monitor?
- Which relays or control outputs will be used?
- What control parameters are necessary?
 - Setpoints,
 - Alarm points,
 - Feeder timeouts.
- Are there chemicals to be fed or alternate setpoints using event timers?

9 Programming the Inputs

This section will depict the keystrokes necessary to edit the program, calibrate sensors or find information.

NOTICE

For a faster and easier initial configuration, ProMinent recommends that general configuration of the controller, especially during commissioning, be performed using a portable computing device like a laptop computer, a tablet device or a smart phone. Refer to the DCM3 Browser manual for more information.

The keypad interface instructions in this manual are intended to show an operator how these individual tasks can be performed from the keypad. They are not all inclusive.

Factory programming of sensor inputs is based on the sensors provided in your specific system. This may include controlling relays for pumps and solenoids. Some inputs may require further setup. The factory does not fully setup flow meter or level inputs. However, this can easily be accomplished in the field if the parameters of the input are known. Refer to the calibration section [9.5 General Sensor Calibration](#)

9.1 Analog and Digital Inputs



Available Sensors

Sensor availability in the menus is dependent upon the installed driver cards. All sensors possible for each of the driver cards are made available at bootup. Sensor will probably need to be enabled after the driver card and sensor(s) are installed, and the controller is rebooted.

CAUTION: Never attempt to remove or install a driver card with the power applied to the controller!



WARNING!

Sensor run-in period must be observed

This can otherwise result in hazardous incorrect metering

Take into consideration the sensor's run-in (polarization) period during commissioning:

There has to be adequate feed chemical in the sample water for your application (e.g. 1.5 ppm chlorine)

Accurate measuring and metering is only possible if the sensor is working correctly.

It is imperative that you adhere to the sensor's run-in periods before calibration and control.

Calculate the run in period when planning commissioning. It will take one to several hours to run in pH, ORP and Chlorine residual sensors.

Refer to the sensor's operating instructions.

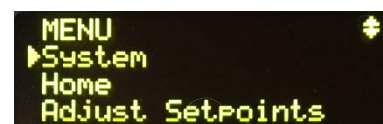
9.1.1 Enable an Analog or Digital Input:



This includes all analog and digital inputs other than the serial conductivity sensor. While most systems from the factory have all the shipped sensors pre-enabled, additional optional sensors on a custom system may need enabling. See section [9.1.2 Enabling a Serial Conductivity Sensor](#)

- 1- From the Home screen below,



- 2- Press the **MENU**  key



- 3- Use the **Up** and **Down**  ARROW keys to find and point to the **System** choice and press the **OK** button  once.

- 4- The display will change to the System menu. Scroll up or down through the choices (Inputs



Programming the Inputs

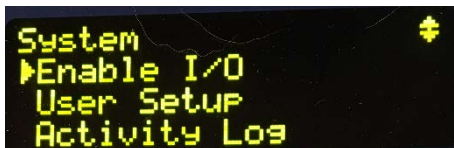
are Letters, Relays are numbers) until the arrow points to **Enable I/O** then press **OK**

OK

- 5- Using the arrow keys, scroll through the disabled inputs until the you see the input you wish to enable then Press the **ENABLE [F3]** key.



- 6- The input has been enabled and the display returns to the System menu to enable additional sensors if desired.



- 7- Press **ESC** (Escape) to exit to the MENU screen.

9.1.2 Enabling a Serial Conductivity Sensor

Wire the sensor according to the color code on the controller terminations, Red to **R**, Black to **B** and Green to **G**.



The A input should be enabled and activated as soon as the power is returned to the controller. You may need to configure the display to have the conductivity displayed on the home screen.

9.2 Changing a Descriptor

Once you have enabled an input or an output,

naming is helpful to avoid confusion and programming mistakes. Choose a unique name. Abbreviate as needed. There are only 16 characters allowed.



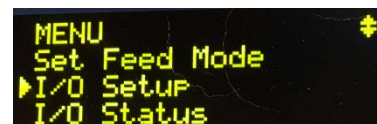
This procedure is the same for all I/O points; Inputs and Outputs, digital and analog. When you name an input, you are changing the “descriptor”. This is how it is done:

In this example we will make the name of Relay 3 = CO2 Feeder.

- 1- Press **MENU**.



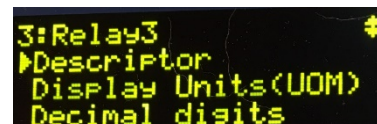
- 2- Scroll down to **I/O Setup**. Press **OK**.



- 3- Scroll down to the item you chose to rename and press **OK**. If your relay/sensor is not listed, it is not enabled. See section [9.1 Analog and Digital Inputs](#) for sensors and for relays, [10.1 Determine if a Relay is Enabled](#).



- 4- Press **OK** to edit the “descriptor” of the item.



- 5- Notice the **F2** key represents the word ‘alpha’.



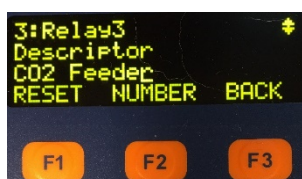
You have three choices, ALPHA (upper case letters), alpha, (lower case letters), and NUMBERS, 0 through 9. Since the lower case ‘alpha’ is seen, please realize that this is **a**

choice, not the current selection.

- 6- The default choice is upper case so use the up and down arrows to change the R in Relay to A for acid or C for CO₂, etc.
- 7- Use the right arrow to move to the second position. Press the **F2** key to choose **alpha**, lower case letters.



- 8- Notice that the F2 choice now shows NUMBER. That would be the next choice.
- 9- Use the arrows to change the 'e' to 'o' and continue until your descriptor is complete.
- 10- When finished, press **OK** to save.



9.3 Selecting an Analog Sensor Type

ProMinent sensors are connected with the DCM3 via their sensor specific, isolated input driver card(s). Once the sensor driver card is installed, the sensor connected, and the controller re-booted, the controller will recognize the new sensor, scale the input, provide default calibration and alarm limits for the type connected. If the input can be used for more than one type of sensor (i.e. pH or ORP) the controller will allow the admin user to change that assignment. That ability is only available in the DCM3 Browser interface, not with the local keypad. All of this is normally performed in the factory before shipment. Uploading a default configuration file will also perform these functions.

9.4 Analog Sensor Cleaning and Commissioning

9.4.1 General Remarks

Combination probes for the measurement of pH and ORP potential consist of a measuring electrode, and a reference electrode with a membrane between the two to allow the flow of electrons. A pH sensor uses a glass membrane for pH, and a platinum or gold

electrode is used for ORP measurement. The reference electrode is embedded in a gel behind a large porous PTFE membrane, arranged concentrically around the measuring electrode.

The optional CLB3 sensor is a 3 electrode amperometric sensor designed for the measurement of free chlorine between 0.05 and 5.0 ppm.

Note: In accordance with testing and approval by NSF, please consider an operation range of 0.5 to 3.25 ppm.



CLB3 Chlorine Sensors:

These sensors are shipped with a complete sensor-specific manual that may also be in digital PDF format. Refer to this manual for commissioning, cleaning and maintenance of the sensors. Refer to section 9.6 Calibrating a ppm Sensor.

9.4.2 Sensor Commissioning

Before putting into operation, the protective cap or case must be removed from the glass or metal tip of the sensor. The electrodes must be free from oil, grease and other contaminations. Likewise, the diaphragm of the reference electrode must be free from scale deposits, dirt or crystallized matter. For these reasons, electrodes should never be touched by your fingers. If contaminations are present or even suspected, refer to section [9.4.5 Cleaning and Servicing Probes](#).

9.4.3 Checking pH Probes with pH buffer solutions

Connect the probe to the controller by means of the coaxial SN6 probe cable, taking care that connectors and cable remain absolutely dry. Dip the probe into a pH 7.00 buffer solution and after 30 seconds, adjust controller to read this value.

Remove the probe, rinse it with water, preferably distilled or R.O. water.

Immerse the probe in a second buffer solution differing by a least 2 pH from pH 7 (usually pH 10 in aquatic applications) and calibrate after the value on the display has stabilized. If within 30 seconds a steady-state value is not

Programming the Inputs

produced or calibration attempt has caused an error, clean probe as described in Section 9.4.5, allow the sensor readings to stabilize after cleaning for at least 20 minutes and repeat calibration. If again unsuccessful, replace the probe.

9.4.4 Checking ORP Probes



ORP sensors measure more than just chlorine.

The only acceptable calibration check is to a calibrated mV source, never an oxidant residual. ProMinent recommends testing the probe for oxidative or reductive reaction and adjusting the set-points if necessary, to reach the desired oxidation control range.

With the probe connected to the controller by means of the coaxial SN6 probe cable (taking care that connectors and cable remain absolutely dry), dip the probe into a redox-ORP standard solution, of 465 mV.

The reading should reach this value +/- 30mV within not more than 30 seconds. If the reading rises rather sluggishly or falls short more than 30 mV, clean the probe as described in Section 9.4.5, allow it to stabilize after cleaning for at least 20 minutes and repeat test. If again unsuccessful, replace the probe with a new one, or adjust the ORP set-point accordingly.

Kind of deposit	Agent and duration of application
Oils, greases, lotions	Isopropyl alcohol, Dawn® or Formula 409®
Hard water scale	Diluted acid (approx. 0.1-3 %, 1-5 minutes) or CLR®

NOTE A calibration of the ORP input driver card is not required in the field. This procedure serves as a probe check only.

9.4.5 Cleaning and Servicing Probes

All pH and ORP probes should regularly (once a month) undergo a visual check and be cleaned if necessary.

The glass and ORP electrodes will withstand cleaning with a soft (baby's) toothbrush the following cleaning agents may be used:

Cleaning of pH and ORP sensors should be performed in proper order to assure the sensors recover in a timely fashion. Clean and degrease first, followed by an acid rinse. Both pH and ORP sensors recover quickest after an acid rinse.

It is essential that the probes are rinsed thoroughly after cleaning and be allowed to recover for ~20 minutes.



CAUTION!

Do not rub sensors

This might cause damaging static electricity and false readings.

NOTICE

There is a significant recovery time after cleaning and rinsing a sensor using the procedures described. Be sure to allow adequate recovery time before calibration checks.

If the laterally arranged ceramic diaphragm of the reference electrode on the CLB3 sensor is blocked, it may be cleaned like the glass electrode. In addition, it may be cleaned by cautious scraping with a fingernail, a razor blade or a fine file, but care must be taken that the diaphragm is not scratched. See the CLB3 Sensor Manual for more information.

9.4.5.1 Storage



CAUTION!

Do not allow the sensor tips to dry out as this will cause permanent non-warranted damage to the sensors.

From the factory, the pH and ORP combination probes are shipped with a cap filled with a saturated Potassium Chloride (KCl) salt solution.

In the field, the cap can be used to keep the probe tips wet and for protection when not in use. If a KCl solution is not readily available, pool water or city drinking water are excellent replacements as they typically have a near neutral pH and a slight chlorine residual to inhibit bacteria growth. Preferably, a pH of 4 to 7 and a slight amount of chlorine will keep the sensor from biological fouling during the time removed from service.

Ensure by a visual check that the pH probes clear bulb membrane is free from entrapped air bubbles. If air bubbles are present, remove them by gently tapping the probe while holding it vertical. If more aggressive measures are needed try swinging the probe with the tip downward (like an old-school mercury fever thermometer).

9.4.5.2 Service Life

Sensors are subject to natural ageing even if handled and maintained correctly. Depending on the application, a service life of between 12 months and maximum of several years may be expected.



CAUTION!

pH and ORP electrodes have a limited shelf life, which is why we do not recommend storing them for more than three months.

Do not use distilled water for storage or soaking, since this will lead to premature ageing and damage to the reference electrolyte.

9.5 General Sensor Calibration



CAUTION!


Proper sensor plumbing.

Prior to calibrating amperometric sensors, flow and pressure must be within recommended parameters.

Take the time to familiarize yourself with section 6.2 Mechanical Installation, especially sections 6.2.4 Sensor Installation

9.5.1 Calibration Notes

Conductivity Temperature Compensation:
Conductivity sensors are always temperature compensated. In the DCM3, the CTFS conductivity sensor uses an internally integrated temperature sensor.

The pH sensor can be calibrated directly based on a wet test, or using a 2-point buffer method. You can reset the input to factory default calibration as well. To calibrate the pH sensor using the **CAL**  shortcut button on the keypad:

- 1- Press the **CAL** button. 

```
CALIBRATE
A: Conductivity
C: Free Chlorine
E: pH Sensor
```

- 2- Use the arrow keys   to locate the pH sensor and press  **OK**.

Notice the underline cursor in the current pH value on the next screen. In this single point calibration screen, the up and down arrows will adjust this digit. The right and left arrows will move the cursor to a different decimal place to help enter a value to match your wet test. Pressing **F1 SAVE** completes the single point calibration adjustment, -or- Pressing **F3 MORE** gives you more calibration options.

```
E: pH Sensor
Enter value
  7.5pH
SAVE      MORE
```

The calibration program allows you to select a single or 2-point calibration method. Once chosen, the screen that follows step 2 above will be that choice.

From this screen, you can select **F3, MORE**, to switch back to the opposite mode or use the up arrow to select "Factory Reset" to return to the factory default calibration.

```
E: pH Sensor
Calibrate option
  2 Point Calib.
SELECT      BACK
```

```
E: pH Sensor
Calibrate option
  Factory Reset
SELECT      BACK
```

3a- (Single Point Calibration) *This is the most common and preferred calibration for aquatics applications.*

Edit the value to match the wet test taken and press **F1 to SAVE**. Choose **F1** again to calibrate another sensor or press **ESC** to exit.

-or-

Programming the Inputs

3b- (2-Point Calibration). Place the sensor into a known value sample or pH standard (i.e. 7.00 pH buffer). Adjust the reading until it is equal to the wet test or standard value. Press **F1** to continue to the NEXT buffer.

```
E:pH Sensor
1st pH buffer: 26sec
7.00Buffer 7.06ph
NEXT CANCEL MORE
```

- 4- Place the sensor in the second standard (10.00 pH) or known sample and edit as before. Press **F1** to **SAVE** and finish or **F3** or **ESC** to **CANCEL**.

```
E:pH Sensor
2nd pH buffer: 35sec
10.00Buffer 10.10ph
SAVE CANCEL
```

The controller should accept the value and show the Sensor Calibrated screen.

If the value entered is too far from what the controller has calculated as valid, based on the input signal, a fault message will be displayed. Then you will be given 3 choices on how to proceed.

```
E:pH Sensor
Sensor fault
Overrange
RE_CAL IGNORE RESET
```

Press **F1** to **RE_CAL** (re-calibrate) the sensor [try again, maybe you forgot to put the sensor in the buffer]

Press **F2** to **IGNORE** the fault and keep the current calibration even though it is not generally advisable. The controller will perform the math to make the display match your entry. The ability to track changes may be marginal or not possible if the sensor is faulty.

Press **F3**, **RESET** to cancel this calibration and return to the previously saved calibration.



CAUTION!

Correct sensor operation / Run-in period

Accurate measuring and metering is only possible if the sensor is working correctly.

Please read the specific operating manual for each sensor for more information.

The sensor run in periods should be considered when planning commissioning.

9.6 Calibrating a ppm Sensor

- 1- Press the **CAL** key
- 2- Scroll down to the Chlorine sensor. Press **OK**

```
CALIBRATE
A:Conductivity
C:Free Chlorine
E:pH Sensor
```



Calibration Clock

Use this clock if your test method calls for a specific waiting period before reading the test value.

- 3- Press **F1 DPD** to start the clock. With this act, the controller saves the sensor reading at the moment you pressed **F1**. Take a sample and run a DPD test. Use the timer on the screen if desired.

```
C:Free Chlorine
Sample & Press DPD
2.17PPM
DPD MORE
```

- 4- When the DPD Chlorine testing is complete, enter the residual value in ppm using the arrow keys, then press **F1** to **SAVE** the change.

```
C:Free Chlorine
DPD wait: 14sec
2.17PPM
SAVE MORE
```

- 5- Or use the **F3 MORE** button if you need to reset the calibration to factory default.

```
C:Free Chlorine
Calibrate option
Factory Reset
SELECT BACK
```

- 6- The controller should accept the value and show the Sensor "Wait-to-Verify" Calibrated screen.

```
C:Free Chlorine
Wait-to-Verify
NEXT
```

C:Free Chlorine
Sensor fault
Overrange
RE_CAL IGNORE RESET

- 7- If the value you enter is too far from the measured input signal, a sensor fault message will be displayed.

If there is a Sensor fault:

Press either **F1, RE-CAL** (re-calibrate) to repeat the sensor calibration.

Or press **F2 IGNORE** to ignore the fault and keep the new calibration, even though it is not generally advisable. The controller will perform the math to make the display match your entry.

PLEASE NOTE: *If the sensor is fouled or faulty, the ability to track chemistry changes may be marginal or impossible in this 'forced calibration' situation. Extreme caution is advised.*

Or press **F3 RESET** to cancel this calibration and return to the previous calibration.

9.7 Analog Sensor Alarms

Analog inputs have high and low alarms to alert the operator if a measured value is out of the normal operating range.

9.7.1 Latching Alarms

Latching alarms do not reset themselves if the parameter recovers back into the acceptable range. Alarms in the DCM3 are latching by default, but sensor alarms can also be set as non-latching. The operator must acknowledge the alarm for the alarm light and alarm relay to reset. If this is undesirable, in the Alarms menu, select non-latching=**Yes** for each input. The alarm will then clear when the value returns to normal levels.

Latching alarms are especially helpful for remote installations where the operator checks on the system only a few times a day or less. Under certain circumstances, if there is a control or feed problem and the alarm does not latch, the operator would not be alerted if there is an issue.

To access the Latching choice Press MENU, I/O Setup, OK, Sensor Choice, OK, Adjust Alarms, OK, F2 MORE, F1 SWITCH.

9.7.2 Delay on Alarm

The DCM3 also has an option to delay the alarm before alerting the operator. This feature is most helpful in applications where trapped air, autofill or other conditions cause the sensor reading to spike occasionally, but it is normal operation for that sensor. Without the delay, the controller would have frequent nuisance alarms that would require acknowledgement by the operator. This delay time is in minutes and adjustable from the alarms menu of the sensor or I/O (Input/Output). See below to adjust Delay on Alarm.

Press **MENU**, then use the arrow keys to select **I/O Setup** then press **OK**

MENU
▶ I/O Setup
I/O Status
System

Use the arrow keys to select any Sensor or the sensor alarm delay you want to change (we chose E:pH) and press **OK**.

I/O Setup
C:Free Chlorine
▶ E:pH Sensor
F:ORP Sensor

Use the arrow keys to select **Delay on Alarm** then press **OK**.

E:pH Sensor
Adjust Alarms
▶ Delay on Alarm
Clear Alarms

Use the arrow keys to adjust the delay value to your desired delay time, one decimal place at time, then press **OK**.

E:pH Sensor
Delay on Alarm
5.0 minutes

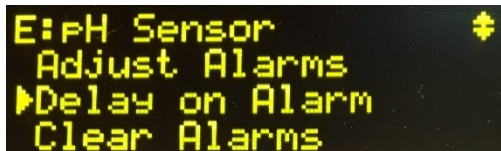
E:pH Sensor
Delay on Alarm
5.1 minutes
RESET

The screen will then return to the Alarms menu for the sensor you chose to adjust.

Programming the Inputs

Alarm settings for all Inputs and outputs work in a similar way. There are 3 types of settings for the alarms on any input.

- **Adjust Alarms** changes the High and Low alarm limits.



```
E:PH Sensor
Adjust Alarms
Delay on Alarm
Clear Alarms
```

- **Delay on Alarm** adjusts the time the DCM3 will wait before activating an alarm on that sensor value.
- **Clear Alarms**, as implied, will clear all alarms and reset the **Delay on Alarm** timer.

9.7.3 Analog Alarm Configuration

- 1- Press **MENU**



```
MENU
Home
Adjust Setpoints
Prime, Force ON
Adjust Alarms
```

- 2- Scroll down to **Adjust Alarms** and press **OK**



```
MENU
Adjust Setpoints
Prime, Force ON
Adjust Alarms
```

- 3- Scroll down until you locate your sensor and press **OK**



```
Adjust Alarms
1:Acid Feed
2:Oxidant Feed
3:CO2 Feeder
```



```
Adjust Alarms
A:Conductivity
C:Free Chlorine
E:PH Sensor
```



```
C:Free Chlorine
HiAlarm: 5.00PPM
LoAlarm: 1.00PPM
OTHER MORE DELAY
```

Note the underline in the high alarm value. This is the cursor. You now have 3 choices; Edit the High and Low values, (**F1 OTHER** toggles between the Low and High alarm adjustment setting) **F2 MORE** takes you to the latching and alarm on/off page, or **F3 DELAY** to adjust the delay time.

The delay time postpones the controller from reporting an alarm unless the sensor is continuously in the alarm state for the number of minutes you choose here.

To adjust the High and Low values:

- 4- Use arrows to adjust the high alarm value as needed. Press **F1 OTHER** to toggle between the High and Low alarm.



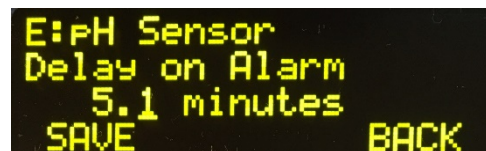
```
C:Free Chlorine
HiAlarm: 5.00PPM
LoAlarm: 1.00PPM
OTHER MORE DELAY
```

- 5- Use the arrows to adjust the alarms and press **OK** to save.

- 6- To turn the alarm off or adjust the latching function: Press **F2 MORE**

If you wish to edit the delay, press **F3 DELAY**

Use the arrows to edit the time in minutes and seconds and press **F1** to **SAVE**.



```
E:PH Sensor
Delay on Alarm
5.1 minutes
SAVE BACK
```


9.9 Analog Sensor Diagnostics

Each sensor type has a diagnostic page to assist in determining sensor and driver card settings.

```

6.8pH      2.77PPM #
84.3F      +15.24hrs
           488uS
STATUS ALARMS SETPNT

```

- 1- Press the STATUS button (F1) or scroll up to I/O Status and press **OK**.

```

1:Acid Feed
OFF:Setpoint
by E:pH Sensor
SETPNT PRIME MORE

```

- 2- Use the arrows to find the I/O point you wish to evaluate and press **OK**.

```

C:Free Chlorine #
  3.24PPM
Alarmed Low
CAL  ALARMS  MORE

```

- 3- Press **F3 MORE**, to see the first Diagnostic for this sensor.

```

C:Free Chlorine #
Diagnostic: 1
Sensor Type
CLB Chlorine

```

- 4- Press the down arrow to scroll through the remaining Diagnostic screens.

```

C:Free Chlorine #
Diagnostic: 2
Raw sensor
  3.27

```

```

C:Free Chlorine #
Diagnostic: 7
Configure: 3804
Status: 3D00

```

```

C:Free Chlorine #
Diagnostic: 3
Gain Multiply
  1.0000

```

```

C:Free Chlorine #
Diagnostic: 8
Device: 000C3947
Product: 0E125177

```

```

C:Free Chlorine #
Diagnostic: 4
Offset Adjust
  0.0000PPM

```

```

C:Free Chlorine #
Diagnostic: 9
Rev.#: 00000001
S/N:: 15082008

```

```

C:Free Chlorine #
Diagnostic: 5
Alarmed Low
11:23:33 2019-Aug-23

```

```

C:Free Chlorine #
Diagnostic: 10
A.ID#: 31032004
A.Part#: -1

```

```

C:Free Chlorine #
Diagnostic: 6
Sensor driver type
CLB chlorine

```

```

C:Free Chlorine #
Diagnostic: 11
A.rev#: 0
Firmware:02.00.03.01

```

List of typical sensor Diagnostics:

Sensor Type, Raw Sensor input value, Gain Multiplier, Offset Adjustment, Last alarm, Current Status, Serial number and more.

Driver cards have a list of other items that are used for factory tracking and troubleshooting.

9.9.1 pH-ORP Driver card Diagnostics

pH - ORP driver card diagnostics are similar to the CLB driver diagnostics in the previous section. To see diagnostic, from the **HOME** screen, press **F1 STATUS**

Use Up/Down Arrow keys **^v** to navigate to desired pH-ORP input then press **F3 MORE**

- Diagnostic 1: sensor Type pH Sensor
- Diagnostic 2: Raw sensor value (= 100 x pH; = actual mV ORP read)
- Diagnostic 3: Gain may change based on calibration
- Diagnostic 4: Offset may change based on calibration
- Diagnostic 5: reports latest Alarm
- Diagnostic 6: Driver Type, Dual pH or ORP
- Diagnostic 7: Factory Use (Configuration and Status)
- Diagnostic 8: Factory Use (Driver Type and Product Code)
- Diagnostic 9: Driver card Revision and Serial Number
- Diagnostic 10: Factory Use (ID# & Part #)
- Diagnostic 11: Driver card A. Rev & Firmware version for example "01.00.02.00"

9.9.2 Serial Sensors (CTFs) Driver Diagnostics

To see diagnostic press **F1 STATUS**

Use Up/Down Arrow keys **^v** to navigate to the 'A' input (if enabled) then press **F3 MORE**

- Diagnostic 1: sensor Type (Conductivity)
- Diagnostic 2: sensor Raw value
- Diagnostic 3: Gain, changes based on calibration
- Diagnostic 4: Offset, changes based on calibration
- Diagnostic 5: reports latest Alarm
- Diagnostic 12: if sensor connected it will display (Sensor OK Connected) if no sensor connected to terminals (Sensor disabled Disconnected)
- Diagnostic 13: will display virtual input Temperature value and also if the Thermal flow switch is ON/OFF (Thermal F/S not used on the DCM3 nor any aquatics applications).

Note: Sensor Value = Raw x GAIN + OFFSET.

For example, =235x8.5+0=1998uS about 2000uS

9.10 Configuring Digital Inputs

9.10.1 Configure a Digital Input as a Water Meter or Status Input (Contact Set):

A digital contact input is used to inform the controller of the status of an item connected to the pool or spa.

EXAMPLE: The sensor "Sample Flow" switch uses a contact set on input 'O' to show the status of the water sample to the sensors. Any device that has two states can be used as a status input. Another common example is a float switch to sense water level and be used for Automatically keeping the pool full. The input connections provide +15VDC to 'read' a status input from a dry contact, Hall Effect contact or reed switch. Sine Wave or powered outputs are incompatible with these digital inputs.

NOTE: *Contact Head water meters (Gallons per pulse) are extremely rare in aquatic applications. Paddlewheel or 'Turbine' flow meters (K-Factor of pulses/gallon) are very common. NOTE: All 5 digital inputs P through T can be configured for either a pulsing water meter (square wave/open collector) or contact set (On/Off input). The default configuration is an ON/OFF Contact Set.*

A water level control (Auto-Fill) setup is a two-step process. First, we must enable a float switch contact input (P), then enable and link a digital output to turn on a solenoid valve (5) to fill the pool as needed.

- 1- To Enable and configure a digital input, press **MENU**
- 2- Scroll to **System** and press **OK**
- 3- Scroll to **Enable I/O** and press **OK**
- 4- Scroll to select the desired input (P:Contact Set), or any unused digital input P through T) and press **F3 SELECT**
- 5- Press **F3** again if needed to switch from Water Meter to **Type:Contact set**, then press **OK**

Continue the Auto-Fill setup by enabling and configuring R5:

- 1- Press **MENU**
- 2- Scroll to **System** then press **OK**
- 3- Scroll to **Enable I/O**, then press **OK**.
- 4- Scroll to **R5:R5 unused**, then press **OK** or **F3 Enable**.
- 5- Use **F1** to switch to toggle to **Control:FEED**, then press **OK**.
- 6- Press **MENU**
- 7- Scroll to **Set Feed Mode** the press **OK**.
- 8- Scroll down to **R5:Relay5**.
- 9- Scroll down to highlight **Sensor Control** and press **OK**.
- 10- Use the arrow keys **^v** to highlight **P:Contact set**. As the control sensor then press **OK**.
- 11- Press **F2** to go to the **SETPNT** menu and use the arrow keys to select the deadtime setting used to keep the solenoid valve from turning on and off too quickly. The default is 60 seconds. Then press **OK**.

Now Relay #5 will turn on the fill water solenoid whenever the float switch on input P drops and closes for 60 seconds or more, and will continue to fill the pool until the P input opens for at least 60 continuous seconds. All that is left to do is name P and 5 with something appropriate like "Water Low" and "Fill Valve", and set up any alarms or interlocks desired.

Note: See [9.2 Changing a Descriptor](#) to rename a relay. For example change the name of "Input P" to "Water Level Low".

9.10.2 Disable an Analog or Digital Input

Inputs configured to use outputs cannot be directly disabled. (i.e. A pH sensor being used to control pH using Relay1 cannot be disabled while Relay1 is so configured). **Disable the output to break the link, or choose a different analog sensor for the chemical control.** Use sections [9.10.3](#) as a guide to unlink the output, then return to this menu to disable the input.

- 1- Press **MENU**
- 2- Scroll down to **I/O Setup** and press **OK**
- 3- Scroll down until you locate your sensor, analog or digital, and press **OK**. (This example shows an analog input)
- 4- Scroll down to **Configure** and press **OK**
- 5- If the sensor is not currently being used to control a relay, you can disable it. Scroll down to **Disable** and press **OK**.
- 6- If the sensor is in use by a relay, scroll down to **Used by I/O** to see which relay is using the sensor. Press **ESC** (Escape) to back out of this menu and proceed to that output for corrections before returning to this menu.

9.10.3 Changing or Unlinking an Analog Input that is using an Output Relay

Inputs linked to outputs must be un-linked prior to being disabled. The easiest way to accomplish this is to disable the output relay or device that is linked to the sensor. Another way is to change the feed mode of the output relay from Sensor Control to Percent Time, so that the relay has no need for the pH sensor and disconnects or un-links from the sensor.

For this example we want to disable the E:pH sensor, but it is linked to Relay1 “Acid Feed”. To disable Relay 1 follow these instructions:

- 1- Press **MENU**
- 2- Scroll down to **I/O Setup** menu. Press **OK**
- 3- Scroll down to the relay indicated (Relay 1) and press **OK**.
- 4- Scroll to the **Disable** selection and press **OK**.

Now you can disable the sensor that was previously linked to this relay E:pH Sensor.

9.10.4 Changing or Unlinking a Digital Input Linked to an Output Relay

Inputs linked to outputs must be un-linked prior to the inputs being disabled. You can always unlink an output by deleting the output. Re-enable it if needed. See section 9.1 Analog and Digital Inputs.

If a digital input is used as an interlock for a relay, it must be unlinked prior to being disabled. **NOTE: Input O is special. It is a dedicated safety device (Sensor Sample Flow Switch) and its function cannot be altered nor deleted.**

- 1- Press **MENU**
- 2- Scroll down to **I/O Setup** and Press **OK**.
- 3- Scroll down to the Relay where the interlock is being used. Press **OK**.
- 4- Scroll down to **Interlock** and press **OK**
- 5- Press **F1 REMOVE** to unlink the digital input from this output.
- 6- Choose a new interlock or press **OK** to save the change. If more than one interlock is being used, use the arrows to see them and **F1 REMOVE** as needed. Pressing **ESC** before pressing **OK** will abort and void all changes.

See also [10.7 Interlocks](#)

Return to [9.10.2 Disable an Analog or Digital Input](#) to finish.

9.11 Virtual Inputs

The DCM3 has a maximum of 6 analog inputs, A, A1, C, E, E1 and F. Analog inputs are linked to the first 14 letters of the alphabet, A through N, which means 10 letters, B, D, and G through N cannot be assigned to any wired input. They have no terminals. These are reserved as phantom or virtual analog inputs that receive their analog signal from a calculation or are a duplicate or ‘mirror’ of another input.

Digital Inputs are lettered from O to Z. Wired or ‘real’ digital inputs are labeled from O to T. Input designators U, V, W, X, Y and Z can be used as virtual digital inputs.

In some cases, it is advantageous to create a virtual sensor to duplicate an existing hardware sensor. This could be useful if you want a second set of alarm points for the same sensor, or the reverse logic of a digital input. Another common use is to assign a virtual input to show and data log a flow rate that is calculated from a “turbine meter” sensor. We will use the flow rate as an example of how this is done.

Any analog input, including virtual inputs, can be used as a manual input to data log operator test data. If you test the water regularly, you can log those values into this controller using the Calibrate function. The manually entered values will be time stamped and become part of the complete digital historical database with all sensors,

relays and other virtual inputs.

Analog virtual inputs can be programmed to be used in control outputs in the same manner as any other sensor input.

To create a virtual input, enable an unused virtual analog or digital input. Use the Configuration choice in the I/O Setup menu to edit the Descriptor (Name), Display units (UoM-Units of Measure) and decimal places.

Refer to [Section 9.1.1 Enable an Analog or Digital Input](#)

9.11.1 Create a Flow Rate Virtual Input

Pulse flow meter inputs to the DCM3 are configured primarily as a totalizer type flow meter, recording the changing volume of the water flowing by. We can use that information to create a flow rate meter, using a virtual input. Follow the instructions below.

Enable an unused Digital input. (Typically “S”) and an unused Analog Virtual (Typically “M”). See section [9.1 Analog and Digital Inputs](#).

- 1- To enable a digital flowmeter input, Press **Menu**
- 2- Scroll down to **System**. Press **OK**
- 3- Scroll up or down to the **Enable I/O** selection and press **OK**.
- 4- Scroll down to the digital input **S** or where your flow meter sensor wires will be connected, then press **F3 ENABLE**.
- 5- The next screen has a choice for the default “Contact set” (ON or OFF) or “Water Meter” (pulses from a water meter) Select **F3 SWITCH** to toggle between the two until it shows “**Type:Water meter**” then press **OK**
Now we have to choose a water meter type, Contact Head (Gallons / Pulse-rare in Aquatics) or Turbine Meter (Pulses / Gallon).
- 6- Press **MENU**
- 7- Then scroll to **Water Meter Setup** and press **OK**
- 8- If more than one water meter is enabled, you will need to scroll to the **S:** input and press **OK**
- 9- The **F3 SWITCH** key chooses between Contact Head Meter and Turbine Meter types. Toggle **F3 SWITCH** until it indicates **Turbine Meter**, then press **OK** to edit the K-factor for your meter (you can leave it at the default and correct it later if you don’t have the K-Factor handy), then press **F1 SAVE** to save the selection and K-factor.
Now input S is configured as a Turbine Meter.
- 10- Next, to enable the virtual Flow Rate input, press **MENU**
- 11- Scroll to **System** then press **OK**.
- 12- Scroll to **Enable I/O** then press **OK**
- 13- Choose your virtual input (usually K, L, M, or N) to use for the Flow Rate display. We will select (M) then press **F3 ENABLE**.
- 14- You will then be asked to choose a source. (since a virtual input is using another ‘real’ input to generate the signal that will be displayed). Since our example used S, and we are interested in displaying the flow rate, choose **S1:Rate**, then press **F3 SELECT**.

S and M are the two inputs that will be used to collect the flow rate information and display the flow rate on the screen and log the flow rate information. Next, we must configure the meter digital input S, followed by the virtual analog input M that will display and log the Flow Rate.

9.11.2 Configure the Flow Meter Input

After the flow “turbine” meter input is enabled and has a K factor assigned, you may want to assign it a different name or Descriptor. The default descriptor will probably be “Water Meter” assigned by the program when the “Water Meter” choice was saved. To change the Descriptor, see the instructions in [Section 9.2](#).

The other configure items that are available are Display Units which are defaulted as G for gallons and decimal digits which are defaulted at 0. These should be adequate for the typical aquatics application. Compensation

should be left at **none**, and alarms should be set at **F2 ALM OFF** to avoid nuisance “gallons per day” alarms.

9.11.3 Configure the Flow Rate Display

The configuration settings available for the virtual Flow Rate display can be accessed by:

- 1- Press **MENU**, scroll to **I/O Setup** and press **OK**
- 2- Scroll to **M:Flow Rate** and press **OK**
- 3- Scroll to **Configure** and press **OK**
- 4- Scroll to **Descriptor** and press **OK**
- 5- To change the Descriptor, see the instructions in [Section 9.2](#).

Other configuration choices are Display Units (gpm), and Decimal Digits to display (1).

Both of these settings should be adequate for most applications but can be adjusted as desired.

Adjusting Flow Rate alarms for high and low flow rates can be accomplished by pressing:

- 1- **MENU**, scroll to **I/O Setup** and press **OK**
- 2- Scroll to **M:Flow Rate** and press **OK**
- 3- Scroll to **Adjust Alarms** and press **OK**
- 4- Hi and Low alarm settings will be shown and the High alarm value will have an underline cursor. Use the arrow keys to adjust the high alarm value to what is desired.
- 5- The low Flow Rate alarm is usually more important to operators to alert them to circulation and filtration issues. To switch to the Low Alarm value setting press **F1 OTHER** and continue changing the Low Alarm value then press **OK**.

F2 MORE will switch to the Alarm OFF, Latching or Non-Latching alarm choice menu screen.

F3 DELAY will take you to the Alarm Delay menu Screen where you can adjust the Flow Rate Alarm Delay time.

10 Programming the Control Outputs (Relays)

This section will describe how to configure relays to control a process. Outputs can be energized based on a sensor with a set-point (pH or Chlorine/Bromine control), a direct control from a digital input (like auto-fill of pool water level), a timed event (Initiate a filter Backwash or feed filter polymer), and a combination of an event and a sensor (an alternate overnight setpoint). There are also other less used options, such as percent timer, interlocking with digital inputs, blocks from other relays and a few special controls. Special Controls include Timed Cycling, and Time Modulation.

The part number or identification code on the order placed with ProMinent will determine the sensors and outputs that were configured as default at the factory. Some sensors will be pre-wired, (pH and ORP coaxial cables, conductivity and temperature sensors, as well as ppm residual sensors). Other sensors like water meters and chemical feeders may have been configured, but will have to be field installed, wired, enabled and possibly re-configured during commissioning. These tasks will probably be performed by your factory trained and authorized ProMinent distributor.

Note1: Relays can be enabled as one of two types; Feed or Events-Other. Feed options are generally for feeding of chemicals by a pump or solenoid valve. Choices are Sensor Control, Water meter, or Percent Time. Sensor Control is the only one normally used in aquatic applications. Events-Other would be the choice for time-controlled outputs like an overnight setpoint change, initiating a filter backwash or being used as an alarm relay.

Once a relay is enabled, the only way to change the type assignment, from the keypad, is to disable the relay and enable it as a different usage. The relay type assignment can be changed without deleting it, using the browser interface with admin access.

Note2: When an output is disabled and then re-enabled, the control is reset and all previous user's control

settings are removed. This action puts the relay control into a defined state prior to reconfiguring.

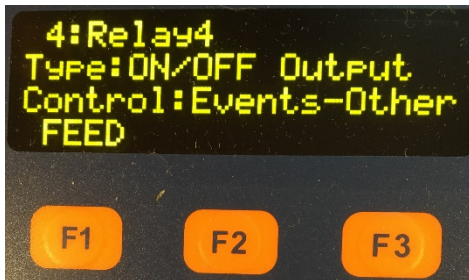
A sensor input can be used as an analyzer or monitor, but to be able to control a feeder or a valve, it needs to be linked by the software to an output relay. Linking is achieved in the configuration process. See Section [10.5 Configuring a Feed Relay](#)

10.1 Determine if a Relay is Enabled:

- 1- From the Home display, press the **F1 STATUS** key.
- 2- Scroll through the enabled I/O. If you do not see your relay, it is disabled.

10.2 Enable a Relay

- 1- Press the **MENU** key
- 2- Use the ARROW keys to scroll to **System** then press **OK**.
- 3- Scroll down to **Enable I/O** then press **OK**
- 4- Scroll through the disabled I/Os until you see your relay.
- 5- Once the output relay is selected, press **F3 ENABLE** key. To complete the enable process, you must then choose a relay type.



This menu shows the default type of output as “ON/OFF” and the control as “Events-Other”. To use it as a sensor-controlled feeder, the type must be changed to **FEED** by pressing the **F1** key. Press **OK** to complete and save the selection.

Relays 1 – 5 programming: Choose which type of relay program you wish to use, **F1** for **FEED**, or **OK** to keep the **Event-Other** choice. If **F1** is pushed, follow **F1** with another **OK** to save the control type.

At this stage of the process, we recommend naming the relay to avoid confusion during programming. The default descriptors (Names) for Relay 1 and Relay 2 are Acid Feed and Oxidant Feed, respectively. Once named, we will set up the remaining relay attributes with typical examples.

10.3 Naming the Output

In section 10.2, we showed how to enable a relay. Regardless of the type of relay you choose, the next step is to name it. Pick a name that best identifies the relay purpose; Oxidant Feed, Acid Feed, CO² Feed, General Alarm, etc.

NOTICE

This naming/Descriptor procedure is the same for all I/O points; Inputs and Outputs, digital and analog. It is much easier for most operators to use the Browser interface for naming.

- 1- Press **MENU**.
- 2- Scroll down to **I/O Setup**. Press **OK**.
- 3- Scroll down to the relay you chose to name and press **OK**. If your relay is not listed, it is not enabled. See [10.1 Determine if a Relay is Enabled](#).
- 4- Press **OK** to edit the Descriptor of the relay.



Please notice that the F2 key represents the word 'alpha'.

You have three choices, **ALPHA** (upper case letters, and the current setting), **alpha**, (lower case letters), and **NUMBERS**, 0 through 9 and some special characters including the **space** character. Since the lower case 'alpha' is seen, please realize that this is the next choice, not the current selection.

- 5- Use the right arrow to move to the next position. Press the **F2** key to choose **alpha**, for lower case letters. Notice that the **F2** choice now shows **NUMBERS**. That will be the next choice.
- 6- Use the arrows to change the next letter/space and continue until your Descriptor name is spelled out. Up to 16 characters, including spaces, are allowed.
- 7- When finished, press **OK** to save.

10.4 Relay Output Configuration

The **Feed** option prepares the output for a chemical feeder based on sensor setpoints (the most common), Percent Time and Water Meter (both rarely used in Aquatics applications). See [10.5 Configuring a Feed Relay](#)

A feed output also has two special control options; Timed Cycling, and Time Modulation.

Event-Other is used to configure a timed event relay. Timed events are used to deliver chemicals periodically (Sensor Wash), or change the Oxidant Feed setpoint for a limited time (Night Setpoint), or act as an Alarm relay. When selected, an **Events** choice is added to the main relay menu.

Other refers to Alarm or Sensor Wash. See [10.6 Configuring an Event-Other Relay](#)

Each of these relay types have special control functions available.

10.5 Configuring a Feed Relay

If you have not enabled the relay, see section [10.1 Determine if the Relay is Enabled](#) and/or [10.3 Enable and configure a Relay](#). If you have not named the relay, see section [10.3 Naming the Output](#).

There are three types of **Feed Relay** choices;

- Feed based on any analog sensor (pH, ORP, Free Chlorine, or Temperature).
- Using a percent timer (very rare in Aquatics).
- Feed based on a water meter (also very rare in Aquatics).

Sections 10.5.1 through 10.5.3 show how to set up these types of feed. Meter control is not shown.

10.5.1 Feed Based on a Sensor

A sensor-based relay will energize a pump or valve depending on the Setpoint and the deadband. The Setpoint is the value that represents the ideal sensor reading, and where the feeder stops feeding.

Prior to these program steps, you need to enable an analog sensor input. See [9.1.1 Enabling an Analog Input](#) and [10.2 Enable a Relay](#).

- 1- Press **MENU**.
- 2- Scroll down to **Set Feed Mode** and press **OK**
- 3- Scroll down to the relay you wish to use and press **OK**.
- 4- Scroll down to **Sensor Control** and press **OK**.
- 5- Scroll down to the sensor you wish to use to control this relay and press **OK** or **F1 SELECT**.
- 6- Use the arrows to edit the Setpoint. Press **F1 DEDBND** to toggle between the SETPNT (OFF Setpoint) and DEDBND (Deadband) values.
- 7- Press **OK** to save and return to the main menu.

10.5.2 Percent Time Feed (Rarely used)

This method applies to all 5 relays.

The Percent Time program is based on a fixed 5 minute time frame. The setpoint is in a percentage. The controller calculates the percent of 300 seconds (5 minutes) and will turn on the feed relay for that calculated time. Each 5 minutes, the calculated time is again applied to the feed relay.

If you have not enabled the Feed relay, see section [10.5 Configuring a Feed Relay](#).

- 1- Press **MENU**
- 2- Scroll down to **Set Feed Mode** and press **OK**.
- 3- Scroll down to your feed relay and press **OK**.
- 4- Scroll down to **Percent Time** and press **OK**.
- 5- Use the arrows to edit the percentage and press **OK** to save and exit.

10.6 Configuring an Event-Other Relay

10.6.1 Schedules

Events are used to energize a relay for a set amount of time repeating at a particular time and day. Any of the 5 relays can be set up for event feeding. Choose from three cycle types; 24 hour, 7 day or 28 day. Events will repeat every hour, day, week or every 4 weeks. See [10.6.2 Add, Remove Edit Events](#)

If you have not enabled the Feed relay, see section [10.5 Configuring a Feed Relay](#)

To set up an event schedule on a relay, you will need to choose a cycle. The cycle choice will depend on the frequency of the events desired. If you want the output energized more than once per hour, choose the daily cycle. If your events happen multiple times a week, choose Weekly. If less frequently, choose the 28 day cycle. You can only choose one cycle per relay with a maximum of 28 events in the cycle.

Choosing a cycle;

- 1- Press **MENU**
- 2- Scroll down to **Events** and press **OK**
- 3- Scroll down your relay. Press **OK**
- 4- You should show 0 Events Weekly. Weekly is the default cycle. If you wish to change the cycle, press **F3 CONFIG**. Use the right and left arrows to select another cycle. Press **F1 SELECT**.

Now that you have picked a cycle, we will show a common example of how to program events on your On/Off relays. This example can apply to Daily, Weekly and 28 Day cycles.

10.6.2 Add, Remove, Edit Events

10.6.2.1 Adding an Alternate Setpoint Event

For this example, we will create an alternate Oxidant Setpoint on R2, the default Oxidant feeder output. Once a relay is enabled as a dedicated Event output, (the Oxidant control relay is a special case), the

Interlocks

cycle time can be chosen. To choose the cycle time, follow these steps:

- Press the **MENU** key
- Scroll down to **Events** and press **OK**.
- Scroll down to the Oxidant relay R2 and press **OK** again.
- To configure the cycle time press **F3 CONFIG**



```
2:Oxidant Feed
0 Events weekly
No Event
ADD          CONFIG
F1          F2          F3
```

- Press **UP** to choose the Event cycle



```
2:Oxidant Feed
Configure Events
Event Control:OFF
SELECT      BACK
```



```
2:Oxidant Feed
Configure Events
Event Cycle:7Day
SELECT      BACK
```

- Then press **OK** to choose a different cycle time
- Use the arrow keys to select **Daily** to be able to turn down the oxidant setpoint every night.



```
2:Oxidant Feed
Event Cycle
Daily Weekly 28Day
SELECT      BACK
```

- Press **F1 SELECT** to save the choice.

Display screen will return to Oxidant Feed Events, and show 0 Events daily.



```
2:Oxidant Feed
Event Cycle
Daily Weekly 28Day
SELECT      BACK
```

Depending on the cycle chosen, you will then see slightly different screens.



```
2:Oxidant Feed
0 Events daily
No Event
ADD          CONFIG
F1          F2          F3
```

To create an event for this output, Press **F1 ADD**. The Add screen presents a default day, start time and feeder ON time.

- Using the arrow keys, change the values for time of day and event duration. We chose 22:00



```
2:Oxidant Feed
Edit Events
07:30 30min
SAVE REMOVE BACK
```



```
2:Oxidant Feed
Edit Events
22:00 480min
SAVE REMOVE BACK
```

(10:PM) and 480 minutes (8 Hours) so a lower oxidant setpoint will be in effect until 6AM when it reverts to the normal setpoint.

- Then push **F1 SAVE** to save the changes.



```
2:Oxidant Feed
1 Events daily
22:00 480min
ADD ADJUST CONFIG
```


- To proceed to the alternate setpoint setting Press **F3 CONFIG**.
- Use the arrow keys to change the setpoint to the desired overnight setpoint and press **F1 SAVE**.
- To change the Deadband, press **F2 SWITCH**. And follow the same instructions to change and save the Deadband.

```

2:Oxidant Feed
Events Setpoint
600mV
SAVE SWITCH BACK
Event Control:OFF
SELECT BACK
  
```

- Press **F3 BACK** to return to the Events menu.

The overnight setpoint event has been created. Press **F1, ADD** to create another event, **F2, ADJUST** to make changes to the current events or **F3, CONFIG** to make changes to the cycle type.

10.6.2.2 Remove or Edit Events

If you have event(s) you wish to remove or edit, follow these steps;

- 1- Press **MENU** and scroll down to **Events**. Press **OK**.
- 2- Scroll down to your relay and press **OK**
- 3- Use the up and down arrows to find an event you wish to edit or delete.
- 4- Press **F2 ADJUST** to edit or delete or remove an event or **F3 CONFIG** to re-configure the relay. See [10.6 Configuring an Event-Other Relay](#)
- 5- If you pressed **F2 ADJUST**, Press **F2** again to **REMOVE** or delete the event. Otherwise, use the arrows to make changes to the start time and duration of the current event. Press **F1** to **SAVE** the changes, if any, and exit to the previous menu.

This process works for all relays.



Display choices

The Boolean 'OR' and 'AND' choices described below are selectable with the F2 key. *Please remember that the text associated with the F2 key is a choice if you press that key, not the current status of that key.* Thus, if you see OR, you are in the AND mode. At this point, if you choose OR by pressing the F2 key, you will then be in the OR mode. Now the F2 key shows a new choice, AND. The F2 key will toggle between these two choices.

IMPORTANT NOTE: *Additional safety interlocks should ALWAYS be set to AND to be sure that either safety switch will disable chemical feed.*

10.7 Interlocks

Interlocks are digital inputs that temporarily prevent an output (Relays 1 to 5) from operating.

For example, a digital (dry contact) signal from a flow switch can be connected to the controller and used as an interlock to prevent chemicals from being fed during no-flow events like a filter backwash or "bump".

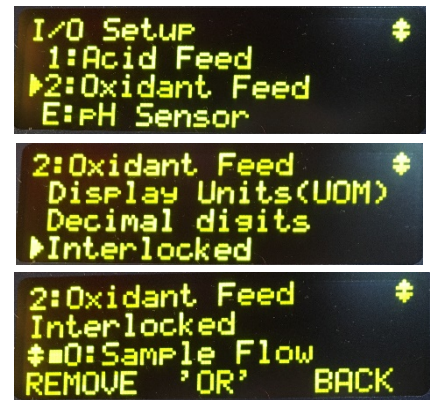
10.7.1 Setting/Removing Interlocks

- 1- From the **MENU** page, scroll down to **I/O Setup** and press **OK**.

```

MENU
MENU
Water Meter Setup
Set Feed Mode
I/O Setup
  
```

- 2- Scroll down to the relay you wish to edit and press **OK**
- 3- Scroll down to 'Interlocked' and press **OK**
- 4- Scroll up and down to see all available interlocks (digital inputs configured as Contact Set) Press **F1** to **SELECT** or **REMOVE** interlock input choices.
- 5- The solid square symbol ■ indicates that this input is currently selected.



From this screen, you can choose multiple interlocks or remove them. The **F1** key will toggle between selection and removal.

Notice the F2 key says 'OR'. This means if you press F2, you will choose a Boolean OR for the interlocks (NOT Recommended). Thus, if any one of the interlocks are 'ON', (closed) the relay will be allowed to feed. If you do not press F2, the Boolean AND will rule the interlocks. AND means all interlocks chosen must be ON to enable the relay. Multiple Interlocks are not typical, but if they are used AND is the logic to assure the most safety (all interlocks must give permission to feed).

Any one input can be used to interlock multiple outputs. This is easily seen with both the 1:Acid Feed and 2:Oxidant Feed relays interlocked by the O:Sample Flow switch by default.

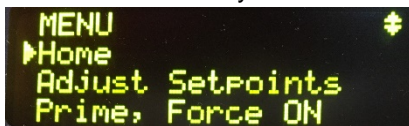
NOTE: The **O:Sample Flow** input is a special input that cannot be deleted or removed. It is a safety device used to interlock and prevent all chemical feed if the flow to the sensors stops.

10.8 Blocks

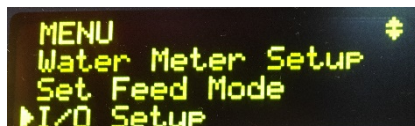
Blocks are used to ensure that two or more relays (Relays 1 to 9) are not on together should their chemistry be incompatible or need special treatment. In aquatic applications it is sometimes used to prevent chlorine from feeding when acid is feeding, so the pH can take priority if the alkalinity is low. The example below will use that choice, "Oxidant blocked by Acid".

Setting blocks – all relays 1 to 5.

- 1- Press the **MENU** key

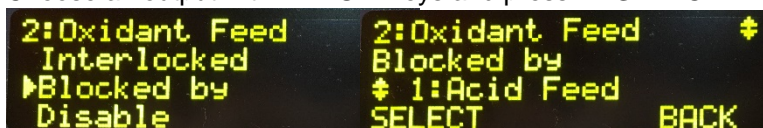


- 2- Use the **ARROW** keys to select **I/O Setup**, then press **OK**
- 3- Use the **ARROW** keys to select a relay that will be turned off by another relay, then press **OK**



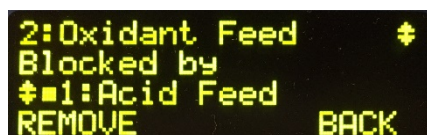
- 4- Use the **ARROW** keys to select **Blocked by** then press **OK**

- 5- Choose an output with **ARROW** keys and press **F1 SELECT**.




A solid square ■ will appear to the left of any and all output(s) selected.

- 6- Press **F1 REMOVE** to deselect an output. Once the blocking output selections are correct, press **OK** to save your selections.



You could have up to 4 relays blocking any output. To prevent impossible circumstances, do not block in both directions! (i.e. R1 blocked by R2 and R2 blocked by R1).

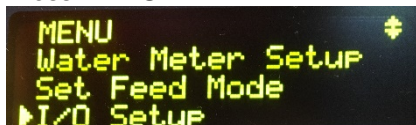
10.9 Control Action (ON Decreases/ON Increases Sensor):

Note: Used for R1-R5. Not available with Oxidant feed relays.

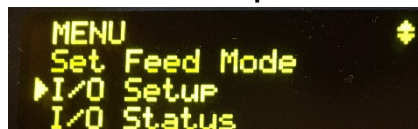
Control Action tells the controller what direction to expect the sensor value to take if the relay is turned on. Since Acid will drive a pH downward, this would be set for 'ON Decreases'. Most other chemicals used in aquatics drive the sensor upwards. That would be an 'ON Increases' setting.

The Control Action choice allows the output control to be inverted. If you need to switch from acid to caustic on a pH control application you can reverse control direction using these steps.

- 1- Press **MENU**.



- 2- Scroll to the **I/O Setup** selection and press **OK**.



- 3- Scroll to select the relay desired and press **OK**.



- 4- Scroll to **Control Action** and press **OK**.



- 5- Screen shows "**ON decreases sensor**" which is normal for Acid Feed applications.




Special Control Functions

- 6- To invert the output to Caustic or Base feed "**ON increases sensor**" press the **F1 SWITCH** key, then press **OK**.



1:Acid Feed
Adjust Setpoint
2.55pH
DEDBND

Since the basic control has changed, the display changes to the relay Adjust Set-points screen to allow you to edit the new set-points. You may notice that the setpoint value has changed.

- 7- Use the **ARROW** keys to change the setpoint if needed, then press **OK** to accept and use these new values.

To avoid operator confusion, be sure to change the relay descriptor to something like *Caustic Feed* to fit the new chemical treatment.

10.10 Special Control Functions:

Special controls are additional types of control that can improve on simple ON/OFF control under many situations. The three general control types have the following special controls:

Feed: None (Nothing special, simple ON/OFF type control), Time Cycling, and Time Modulate.

Events-Other: Timed events, Alarm output, and Sensor Wash.



SPECIAL CONTROL TIP:

When using Timed Cycling, or Time Modulate control, best results for tuning the loop are achieved if you only change one variable at a time and wait for two or three cycles to observe the effect of this change. This would include changing the feed rate at the feeder and any setting in the special control program.

10.10.1 Timed Cycling

Note: Special Control for Feed type relay. These instructions work with all 5 relays.

Often there is a time delay between adding a chemical and measuring its effect at a sensor. This can cause set-point overshoot and could result in unacceptable control.

One possible solution is **Timed Cycling**. Timed Cycling feeds for a user defined **ON Time** then waits for a user defined **OFF** time (OFF time = Period – ON time) before feeding again, allowing the system time to respond to the fed chemical. During the **ON Time**, feeders and pumps feed on set-point control. Setpoints are edited from the Adjust Setpoint menu.

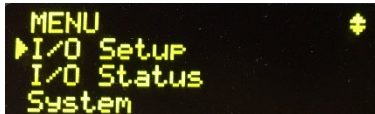
The **On Time** and **Period** are adjustable. The Off Time is the difference between the two. *EXAMPLE:* If the **Period** is 60 seconds and the **On Time** is 10 seconds, the Off Time will be 50 seconds.

The relay Diagnostic display counts down the time in the **ON Time** and **OFF Period**, and the **Relay Status** counts up during feeds.

Selecting a **Special Control** automatically sets typical default times or sensor values.

Adjust the default values for your site's application.

1. To Set and adjust the Timed Cycling press **MENU**
2. Scroll to the **I/O Setup** selection and press **OK**



```

MENU
▶I/O Setup
I/O Status
System
    
```

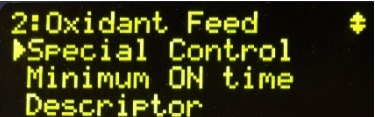
3. Scroll to select the desired relay (R2:Oxidant Feed) and press **OK**



```

I/O Setup
1:Acid Feed
▶2:Oxidant Feed
E: pH Sensor
    
```

4. Scroll to **Special Control** and press **OK**



```

2:Oxidant Feed
▶Special Control
Minimum ON time
Descriptor
    
```

5. Scroll to **Timed Cycling** and press **F1 SELECT**



```

2:Oxidant Feed
Special Control
▶Timed Cycling
SELECT      BACK
    
```


6. Use Up/Down and Left/Right Arrow keys to Edit the **Period** value then press **F1 NEXT**.



```

2:Oxidant Feed
Timed Cycling
60 Period sec
NEXT      BACK
    
```

7. Use Up/Down and Left/Right Arrow keys to Edit the **ON Time** then press **OK**.

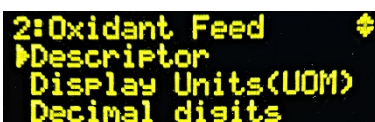


```

2:Oxidant Feed
Timed Cycling
10 ON Time sec
NEXT      BACK
    
```

8. Relay 2 is now ON for 10 seconds and OFF for 50 seconds in each 60 second Period.

9. Press **OK** to save before exiting and **ESC** to exit.



```

2:Oxidant Feed
▶Descriptor
Display Units(UOM)
Decimal digits
    
```

10.10.2 Time Modulate

Note1: Time Modulate is a Special Controls selection for Feed relays.

Note2: Relays must be set to **FEED** Mode to access the Time Modulate option.

Time modulate is a simple form of proportional control using an on/off output. Time modulate control has 3 components that work together to change the feed rate of chemical. Those components are Setpoint, Deadband (Proportional Band), and Period.

Special Control Functions

As the sensor deviates from the desired setpoint, the output of the feeder will increase as the sensor indicates more chemical is needed. It does this by changing the feeder's on time per minute.

When using Time Modulate on a "feed increases sensor" loop, like chlorine control, the Setpoint will be the ideal chlorine concentration in ppm or ORP mV. We will use ppm chlorine for our example.

When the ppm is above the Setpoint, the output relay is OFF. When ppm is just below Setpoint, the output relay will come on for a short amount of time. That time is determined by how far below the set-point the sensor is. This is where the Period and Deadband come into play. The Period is the time frame over which the controller proportions the feeder. The Deadband is what we call the range between fully on and fully off. It is also referred to as the Proportional Band, because it is the range or band where the output changes in "proportion" to the deviation.

Example: Period = 60 seconds

ppm set-point = 2.0 ppm and

Deadband = 0.5 ppm.

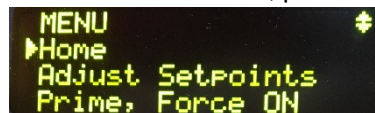
1.75 ppm is half way between setpoint of 2.0 and dead band lower limit of 1.5 ppm (2.0 ppm set-point – 0.5 ppm Deadband = 1.5 ppm lower limit).

At 1.75 ppm the pump will be on for 50% of the period time (30 Seconds) $60 \text{ sec} \times 50\% = 30 \text{ seconds on}$, and off for 50% or 30 seconds.

If the ppm only drops to 1.95 ppm, the pump will be on for $(2.00 - 1.95 = 0.05)$ or 10% of the 0.5 ppm Deadband, and off for the other 90% of the 60 second period. That works out to 6 seconds on and 54 seconds off.

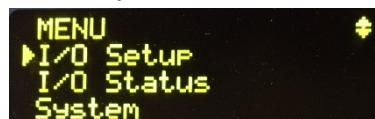
Time Modulate works for both increasing and decreasing feed on control loops.

1. To Setup and/or adjust the Time Modulate feature, press **MENU**



```
MENU
▶Home
Adjust Setpoints
Prime, Force ON
```

2. Scroll to the **I/O Setup** selection and press **OK**




```
MENU
▶I/O Setup
I/O Status
System
```

3. Scroll to select the desired relay and press **OK**



```
I/O Setup
1:Acid Feed
▶2:Oxidant Feed
E:pH Sensor
```

4. Scroll to **Special Control** and press **OK**



```
2:Oxidant Feed
▶Special Control
Minimum ON time
Descriptor
```

5. Scroll to **Time Modulate** and press **F1**



```
2:Oxidant Feed
Special Control
▶Time Modulate
SELECT BACK
```

6. Use Up/Down and Left/Right Arrow keys to Edit the **Period** value then press **OK** to save the setting. Use **ESC** key to exit to the previous menus or the F1 RESET button to revert the settings to their previous value before pressing OK.

```

2:Oxidant Feed
Time Modulate
  60 Period sec
RESET          BACK

```

The Setpoint and Deadband are adjusted in the Setpoint menu, just as they are for On/Off control (Special Control=none).

This method works the same on relays 1 – 5 when configured for FEED.



SPECIAL CONTROL TIP:

When using Time Modulate a 60 second period is good for most aquatic applications from spas to Olympic sized pools. For pools with extra-long lag times, a larger Period may work better. For very small bodies of water with a short lag time, like fountains and splash features, a 30 second Period may work best.

10.11 How to Setup a Relay as an Alarm Output:

A relay configured as an Alarm output change states whenever the controller posts an alarm condition.

Note: R1-R5 relays are Form C (SPDT) and if using contact for Alarm, NC contact is not held closed so losing power won't open the contact. If an alarm output is needed for loss of power as well as a controller generated alarm, we recommend the "Open on Alarm" selection for the NO output. The output would then be held closed during normal operation and will open up in case of an alarm or power loss. To configure the alarm output relay this way, follow the instructions below.

- 1- To configure an output relay to "Alarm Output" assure you have an enabled and unused output relay, then press **MENU**
- 2- Use Up/Down Arrows to navigate to **I/O Setup**
- 3- Scroll to select the desired relay (for our example 5:unused) and press **OK**.
- 4- Use Up/Down Arrow keys to select **Special Control** then Press **OK**
- 5- Use Up/Down Arrow keys to Scroll to **Alarm Output** Press **F1 SELECT**
- 6- Choose the alarm's active state as Open on Alarm or Close on alarm, by pushing **F2 SWITCH**
- 7- Then press either **OK** or **F1 SAVE** to save the selection.
- 8- Use **F3 BACK** or the **ESC** key to Exit to the previous menus

Note: See [9.2 Changing a Descriptor](#) to rename the relay. For example it could be changed to "General Alarm".

10.12 Sensor Wash:

Sensor Wash is special control function that allows pH and ORP sensors to be washed in-line with acid-based solution, on an event timer. This feature is only fully configurable using the embedded web browser. Refer to the Browser manual for more details.

10.13 Prime a Feeder (Force On)



WARNING!

For what should be obvious safety reasons, priming or forcing a feeder ON should never be tried remotely.

All output relays can be forced on temporarily, provided they are not disabled, blocked or interlocked. If disabled, see [10.2 Enable a Relay](#). If blocked, see [10.8 Blocks](#). If Interlocked, see [10.7 Interlocks](#).

- 1- To “prime” or force any relay ON, press **MENU**.
- 2- Scroll down to **Prime, Force ON** and press **OK**.
- 3- Scroll down to the relay of your choice and press **OK**.
- 4- The timer defaults to 5 minutes to allow time to prime a pump. The control of the relay will revert to automatic or sensor control after that time has elapsed. Use the arrows to adjust as needed. The underline is the cursor.
- 5- Press **F3 START** to begin the PRIME cycle
- 6- If you wish to stop the relay prior to the timer ending, press **F3 Cancel**.
- 7- Conversely, if the relay is on by any means, you can stop it temporarily using **F1 STOP**. Unlike the PRIME function, the STOP function will force the pump or feeder off until it is manually “UnStopped”. This is a safety feature to prevent feeders from feeding unexpectedly.

10.14 Auto-Fill

There is no special function called Auto-Fill, but a simple configuration of a float switch and an output relay is a common configuration for a DCM controller in aquatics facilities. When the float switch closes on low level, the solenoid is turned on until the float switch opens to turn off the valve and control the pool level.

This is how it is configured:

- Enable a relay to control a water solenoid valve, and set it for **FEED**. Relays 3,4 and 5 are typically used for this function. See [10.2 Enable a Relay](#)
- Enable any unused digital input between P and T and configure it for **Contact Set**. See [9.1.1 Enable an Analog or Digital Input](#). For this example, we are using Input P and Relay 4.

- 1- To configure these two to work together press **MENU**.
- 2- Using the arrow keys scroll down to **Set Feed Mode** and press **OK**
- 3- Using the arrow keys scroll down to **4: Relay4** and press **OK**.
- 4- Scroll down to **Sensor Control**, then press **OK**.
- 5- Then select **P: Contact Set**, then press **F1 SELECT**, then press **OK**
- 6- The last thing to adjust is the **Deadtime**. The Deadtime is the time the bouncing float switch must remain in either the open or closed mode to change the output of the relay or valve. 60 Seconds is the default, but 30 or 45 seconds, or less, may be adequate for your application. Adjust the time with the arrow keys then press **OK**.

System Menu

The System Menu is accessed by pressing the **MENU** key followed by the up arrow twice to **System** and the **OK** key. The following sections discuss the options available and how to edit the information. The options below appear in the order they are in the display if you use the down arrow to scroll.

The choices are:

- | | |
|-------------------|------------------|
| ▼ Communications | ▼ User setup |
| ▼ System Setup | ▼ Activity Log |
| ▼ Time and Date | ▼ Diagnostic |
| ▼ Set Sensor Type | ▼ Configurations |
| ▼ Enable I/O | ▼ Display Setup |

11.1 Communications

The Communications menu has the IP addresses for the Local Area Network (LAN - Ethernet) and WiFi connections. Scroll down through LAN IP Address, WiFi Netmask Address, WiFi IP Address, LAN Gateway, MAC Address and LAN Netmask.

* = not adjustable

Address Type	Default Setting
LAN IP Address	10.10.6.106
WiFi Controls	WiFi Always ON
HTTP Port	80
DHCP	No
WiFi Netmask Address*	255.255.255.0
WiFi IP Address*	192.168.1.1
LAN Gateway	192.168.100.1
Mac Address*	nn.nn.nn.nn.nn.nn
LAN Netmask	255.255.255.0

Table 15 IP Addresses

The LAN address and Netmask can be changed if the controller will be on a network. Your network administrator must provide a LAN address and other settings for this device. Edit them here.

WLAN or WiFi is how to connect to the DCM3 wirelessly. Enable WiFi on your PC, Notebook or Smartphone.

The MAC address is assigned to the controller from the factory and cannot be changed. It is unique in the world.

11.1.1 How to Change the IP Address:

The factory default Ethernet IP Address of the controller is: **10.10.6.106**.

You can connect any PC device with an Ethernet port to the controller using a CAT5 Ethernet cable.

Set up your device with a static IP address of 10.10.6.nnn, where, 'nnn' is a 3 digit number from 000 to 255 but

not 106. The unique address of the controller is 10.10.6.106 and cannot be the same as any other address on the network.

Open a network browser and enter 10.10.6.106 into the search box to make an HTTP connection to the controller.

Refer to the Browser manual for more details.

If your controller is attached to an Ethernet Local Area Network (LAN), the IP address of the controller will need to be changed to match the building's networking scheme. This address is assigned by the site IT staff.

Enter the desired LAN IP address using the steps below:

- 1- To Edit IP Address press **MENU**
- 2- Use Up/Down Arrows to navigate to **System** then press **OK**
- 3- Scroll to **Communication** then press **OK**
- 4- Use **F1 ADJUST** to go to Edit Mode.
- 5- Use Up/Down and Left/Right Arrow keys to Edit the IP Address then Press **F1** to **SAVE** the changes.
- 6- Press **F3 NEXT** to go to Netmask setting
- 7- Use **F1 ADJUST** to go to Edit Mode if necessary and change the LAN Netmask in the same manner.
- 8- Use Up/Down and Left/Right Arrow keys to Edit the Netmask then Press **F1** to **SAVE** the changes.
- 9- Use **ESC** key to exit to the System menu.

11.1.2 Local Interface Wi-Fi

PC's, laptops, tablets and phones that are WiFi enabled can connect directly to the DCM3 via Wi-Fi. Connections are limited to the Wireless Local Area Network (WLAN) range of about 50 feet, and this WiFi hotspot cannot be connected to a network. Network connection of the controller is reserved for the ethernet port.

The IP Address and Netmask for Wi-Fi is fixed (hard coded). That means the only way to differentiate the connection between different controllers in the same area is the Wi-Fi SSID being broadcast by each controller.

The **Service Set Identifier** (SSID) is the 'WiFi Hotspot' name you will see/connect to when using WiFi. From the factory, the last 3 digits of the SSID name will be the same as the last 3 digits of the controller serial number. Yours should look something like this: **_DCM3_101**. Should you be in a room that has multiple controllers, you need this to know which unit you are choosing to connect. The SSID cannot be edited from the local HMI keypad. A web browser connection must be used.

Once you are connected via WiFi or Ethernet, and logged in as "admin", you can change the SSID to anything you wish, like "Lap Pool" or "Women's Spa". Any SSID name change will take place only after you cycle power to the controller.

See chart above to find the fixed IP Address and Netmask for Wi-Fi.

11.2 System Setup

System Setup has 11 choices;

Site Name	Controller Name	Keypad Passwords	Metric Units	This week = week 1
System Type	Flow Switches	Flow on Delay	Alarm on Stops	System Restart
Factory Reset				

11.2.1 Site Name/Controller Name

You can label this device with two separate names. These names appear in any data file downloaded to help describe and identify these documents. The controller name also shows on the browser tab when connecting with a smart device.

To edit these names using the keypad:

NOTE The F2 key represents the word 'alpha'. You have three choices, **ALPHA** (upper case letters), **alpha**, (lower case letters), and **NUMBERS**, 0 through 9 and some special characters. Since the lower case 'alpha' is seen, please note that this is a choice, not the current selection.

The default choice is upper case so use the up and down arrows to change the first digit. You will see the uppercase letters scroll by. Hold the key down for faster scroll, or use a momentary press in order to move one letter at a time. Once you have rested on the letter you choose, press the right arrow to move to the next position.

Press the **F2** key to choose **alpha**, lower case letters. Notice that the **F2** choice now shows **NUMBERS**. That will be the next choice.

The "space" character is at the beginning of the NUMBERS group. When finished, press **OK** to save.

11.2.2 Keypad Passwords

Use this page to turn password protection ON/OFF.

There are 4 Operator level, 3 Configure level and one Admin login.

The passwords allowed are the same on the keypad as those created/edited via a browser. You can edit your password from either place.

Public level users (No Passwords entered) can only view sensor values and I/O status.

Operator level users can adjust setpoints, calibration, alarms, and Prime/force off. They can also see the other program

Username	Default Password
Operator 1	1
Operator 2	2
Operator 3	3
Operator 4	4
Configure 5	5
Configure 6	6
Configure 7	7
Admin (Administrator)	AAAA

Table 16 Default Users Passwords

parameters but not edit them.

Configure level users can change almost all programming but cannot edit System parameters.

The **Admin** user can edit all user parameters including user name, password and access level. Many of these admin functions cannot be performed from the keypad. A browser connection is required.

There is no factory "Back Door" password. If you forget your "admin" password, ProMinent can only reset the entire password list. All users would then have to recreate their unique passwords.

11.2.2.1 To enable Keypad Passwords from the Keypad

- 1- Press **MENU**
- 2- Scroll to **System** then press **OK**
- 3- Scroll to **System Setup** then press **OK**
- 4- Scroll to **Keypad Password** then press **OK**
- 5- Press **F2 SWITCH** to toggle between **Keypad Password = YES** or **NO**
- 6- Press **F3 BACK** to return to the previous menu.

11.2.3 Metric Units

Toggles engineering units between US Imperial standards and Metric.

11.2.4 This week = week 1

Use this if you are setting up timers with a 28 day cycle. Since a 28 day cycle has 4 weeks of timers, setting today as week 1 lets you know that what you set up in week 1 will occur before Sunday. (Every week is week 1 in a 7 day cycle.) See more in section [10.6.7 Choosing a Cycle](#)

Press **F1 NOW** to reset the week to Week 1 if desired. Press **F3 BACK** or **ESC** to return to the menus.

11.2.5 Flowswitches

These are System Flowswitches for the outputs. They are safety devices that interlock the chemical feeders to prevent chemical feed during low flow.

NOTE: *Because system flow switches are important safety devices, once selected and assigned as a System Flowswitch, you cannot de-select it! The “O” input is factory designated as the primary System Flow Switch and cannot be altered.*


NOTE: *Inputs can be configured to operate as an additional flow switch or interlock that are not configured as a System flow switch.*

11.2.6 Flow on Delay

This delay after a no-flow condition holds output relays off for the delay time in seconds. This allows sensors to recover from static sample conditions before feeding chemicals.

Default Flow ON delay is 45 seconds for DCM300 controllers and DCM3-CI controllers have a 120 second delay due to the longer recovery time for the CLB3 sensor.

11.2.7 Alarm on Stops

Pressing the  **STOP/START** button at any time will stop all feeder outputs. By default, it will also create a “User STOPS” alarm, to alert all operators of the abnormal condition.

11.2.8 System Restart and Factory Reset

System Restart will reboot the controller as if you turned off the power and turned it back on.

Factory Reset should be invoked with caution as it will return all programming to a very basic configuration and then perform a System Restart. It is strongly recommended that you have a configuration file saved so that you can restore the configuration after the factory reset to prevent the need of programming all parameters erased during the reset. Neither Restart nor Reset will alter user names, passwords nor change IP addresses.

11.3 Time and Date

To Set Time and Date:

- 1- Press **MENU**
- 2- Use Up/Down Arrows to navigate to System then press **OK**
- 3- Scroll to Time & Date then press **OK**
- 4- Use Up/Down and Left/Right Arrow keys to set the Time
- 5- Use **F3**, Up/Down and Left/Right Arrow keys to set the Date
- 6- Use **F2 Wk-Day**, Up/Down and Left/Right Arrow keys to set Week day then press **OK**
- 7- The screen will momentarily show that the clock has been reset and the screen will go back to the System menus.

11.4 Set Sensor Type

This function is used for configuring virtual inputs between analog and digital types. Once a sensor is configured to assist another I/O, its type cannot be changed. See [9.1.1 Enable an Analog or Digital Input](#)

11.5 Enable I/O

This function will allow the Admin user to enable Inputs and Outputs and perform minor configuration of those I/O's.

- 1- To enable an I/O press **MENU**
- 2- Scroll to **System** and press **OK**
- 3- Scroll down to **Enable I/O**, and press **OK**
- 4- Scroll through the disabled I/O in the list and select the one you desire by pressing **OK**.
- 5- If one of the relays was selected an additional choice between **FEED** and **Events-Other** needs to be made, then press **OK**
- 6- If a digital input was selected, then a choice between **Contact set** and **Water meter** needs to be made, then press **OK**.

See [9.1 Analog and Digital Inputs](#)

11.6 User Setup

Use this section to change your password if the password option is enabled. If not enabled, See 11.2.2 **Keypad Passwords** to turn protection on/off.

With keypad passwords turned on, login using your current password. Once you are logged in, you can change your password, if you choose. If the keypad passwords are to be used, it is most advisable that the password be changed from the default. Edit the password and save the change.

- 1- To set keypad password, press **MENU**
- 2- Use Up/Down Arrow keys to navigate to **SYSTEM** then press **OK**
- 3- Use Up/Down Arrow keys to navigate to **User Setup** then press **OK**
- 4- Use Up/Down and Left/right Arrow keys to enter your current password.

For added network security you only get 5 tries to authenticate using your current password. After that the system is locked down and no password will allow access. After a lockout, the controller will allow 5 more try's the next day @ 7:00 AM, or after a power reset.

Keep in mind that the choice just before the button is pushed is the selected character type. Example: if the text above **F2** says "alpha" pressing the **F2** key once changes to lowercase.

- 5- Once you have password access the next screen is to enter a new password.
- 6- Enter a new password and press **F1 SAVE** to save.

Forgotten "admin" passwords can only be reset by a factory representative. The factory reset will set **all** passwords back to factory default.

Other forgotten passwords can be reset by the admin user. The admin password reset will set the password back to its factory default.

11.7 Activity Log

The activity log is a listing of significant events and changes to the configuration of the controller.

Note: Activities are shown in chronological order, oldest first.

- 1- To see the Activity Log, Press **MENU**
- 2- Use Up/Down Arrow keys to navigate to **SYSTEM** then press **OK**
- 3- Use Up/Down Arrow keys to navigate to **Activity Log** then press **OK**
- 4- Use **F3 DATE** to enter the Date for which you would like to investigate logged activities
- 5- Set the date using Navigation keys and then press **F1 SELECT**
- 6- The activities will be shown based on the Letters (for inputs) and digits (for outputs), or System (for other activities).
- 7- Use **F1 NEXT** key to go to Next activity and hold the Down arrow key to momentarily see the USER ID and the stamped time for that activity.
- 8- Use **ESC** key to Exit.

11.8 System Diagnostics

Diagnostic menu can be found by pressing **MENU**, then **System**, then **Diagnostic**

Serial #: serial number of the controller

Fan Speed: Displays internal power supply fan speed. Fan speed is monitored and if it fails, controller will alarm.

O-T wiring: Status of power supplying digital inputs O through T.

Admin Password: Shows **Default** if it has not been modified from 'AAAA'. If modified, it will display '**Changed**'.

Watchdog Reset: A **Watchdog Reset** should always display something very small like **0, 1 or 2**. An increasing number of **Resets** indicates corrupted firmware or possible controller electrical interference.

Relay Fuse: Displays the state of the AC Relays' power fuse. Displays OK if the fuse is good or "Load fuse open" if AC fuse has been blown. The Board Fuse does not have an alarm. If it fails, the controller is without power and all the status lights and display LEDs are dark.

HMI Firmware: Hood **Firmware Version** indicates the version of firmware operating the keypad and display (19.07.24.00 means 2019-July-24th)

Firmware: Mother board **Firmware Version** indicates the date of issue of the firmware operating the controller (19.10.25.00 means 2019-October-25th).

11.9 Configurations

Like using the USB drive to load and save the controller configurations externally, you can also save and load configurations using the internal memory of the controller. This is very helpful in situations where something has been changed, and the controller is not operating as it used to. If you have a saved configuration, then you can restore the controller settings to the way it was configured on the day the configuration was saved. It can be very helpful to save a configuration after each setting adjustment, so that you have a fallback configuration to re-load in case the next adjustment causes a problem.

- 1- To save the current configuration press **MENU**
- 2- Use the arrow keys to scroll to **System**
- 3- Use the arrow keys to scroll to **Configurations**
- 4- To save all the settings of the way the controller is currently arranged, press **F1 SAVE**
- 5- The next screen will show the file name and a line of description text you can save with the file.
The description can have up to 16 characters to describe the configuration being saved like "Startup 3-30-2020" or "pH setpoint chng".
- 6- Note the file name and what makes it special, then Change the description text to whatever you choose and then press **F1 SAVE**

The file name will have the format AX###_YY_DDD.cfg where

AX is the controller type (AX=DCM3 series),

is the last 3 digits of the controller's serial number,

YY is the 2 digit year, and

DDD is the day of the year, where 001 is New Year's Day, and 365 or 366 is New Year's Eve.

EXAMPLE: A DCM3 controller Serial number 787 saving a file on July 4th of 2020 would have a file name of

AX787_20_186.cfg. This name cannot be changed in the controller.

- 7- When **F1 SAVE** is pressed, the configuration will be saved to an internal file with the file name shown on the display.

See section [14.2 USB – Save or Load the Controller's Configuration](#)

11.10 Display Setup

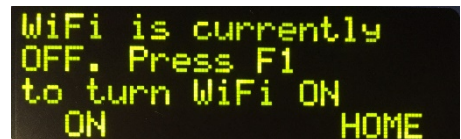
Choose how and what is shown on the display.

See section [2.2 Modifying the 'Home' Screen](#)

12 WiFi Status

12.1 WiFi Status Description

The WiFi Status choice is a quick link to turn the WiFi hotspot transmitter on and off, for security or other reasons. From the **HOME** screen, press **MENU** then the **UP** arrow then **OK** to see the **WiFi Status** screen. This menu is also available from the Home screen by pressing **OK**.



When in WiFi Status, you can use **F1** to toggle the WiFi transponder to OFF or ON. Additional options are available under **Section 11.1.2 Local interface WiFi**. The WiFi transponder is always ON by default.

13 Controller Technical Data:

13.1 Fuse Specification

The power relay fuse is 6.3 amps at 250 volts AC. This fuse is similar to the relay fuse used on the DCM500 and identical to the ones found in DCM51x controllers.

Component	Rating/type	vendor	Part#
Controller, Complete	120VAC, 50/60 Hz, 0.5A - No External Load	PFC	N/A
Controller, Complete	120VAC, 50/60 Hz, 7.8A - with External Load	PFC	N/A
Power relay R1, R2 and Power Out terminals	6.3AT @ 250VAC 5x20mm, Slow-Blow, Glass Fuse	PFC	732379
Main Power Fuse	1.6AT 250VAC 5x20, 1.5 kA at 250 VAC , Ceramic Fuse	PFC	732411
Inrush Current	Maximum inrush current 8.0Amps	PFC	N/A
Enclosure	Rated for IP65	PFC	N/A

Table 17 Fuse Specifications



Fusing Relays R3, R4, and R5 for external power usage

Relays R3, 4 and 5 can be wired using on-board power as shown in section [6.3.5.4 Wiring Relays R3 – R5 Using On-board Power](#) or powered from an external source as shown in section [6.3.5.5 Wiring Relays R3 – R5 Using an External Power Source](#). When using external power, **fusing must also be provided by customer.**

These relays are rated for a maximum of 5 amps each when using external power.

13.2 Controller Specifications

Description	Technical Data
Control characteristic:	ON/OFF control
Control:	5 Relays (see below)
Signal current output:	No current inputs or outputs on the DCM3 platform
Control output:	5 relays ON/OFF, for control of metering pumps
	2 Form C Relays AC Line Power 3 Form C Relays, dry (unpowered) contact or AC Line Power
Alarm relay:	Any relay can be programmed as an alarm
Electrical connection:	120 V, 50/60 Hz, 30 Watts
Ambient temperature:	Ambient temperature 0 ... 50 °C (for indoor use or with a protective enclosure)
Degree of protection:	Wall mounted: Rated for IP 65, NEMA 4X (Water, Dust and Corrosive environment leak-tightness)
Tests and certification:	CE, MET (corresponding to UL61010 and CSA 22.2-61010 as per IEC 61010)
Material:	Housing PC with flame proofing configuration
Dimensions:	356 x 235 x 105 mm (WxHxD) 14.01 x 9.25 x 4.13"
Weight:	net 2.1 kg (4.6 lb.)
Wire sizes	Power: 14 to 18 gauge. Outputs R3, R4 & R5 up to 12 gauge. Sensor and digital inputs: 14 to 24 gauge.

13.3 Sensor Specifications

Measuring Range/Measured value	
Measuring range connection type mV:	pH: 2.00 ... 12.00 ORP voltage: -1000 ... +1000 mV
Measuring range connection type μ A:	Free Chlorine 0.05 to 5.00 ppm (mg/l) Note: In accordance with testing and approval by NSF, please consider an operating range of 0.5 to 3.25 ppm (mg/l)
Connection type mV (potentiometric measured variables):	pH
Connection type mV (potentiometric measured variables)	ORP millivoltage
Conductivity (measuring ranges according to the sensor):	0 – 5,000 μ S in a digital signal
Temperature:	via Pt 1000, measuring range 0 ... 150 °C
Temperature resolution:	0.1 °C
pH resolution:	0.01
ORP millivoltage resolution:	1 mV
CLB sensor analysis	(Chlorine 0.05 to 5.00 ppm)
Measured variable	(hypochlorous acid HOCl, OCl-)
Measuring principle	Amperometric, 3 electrodes, no membrane
Measuring range:	Free chlorine 0.05 to 5.00 ppm (mg/l) can be used for transient shock chlorine levels of up to about 10ppm. Note: In accordance with testing and approval by NSF, please consider an operating range of 0.5 to 3.25 ppm (mg/l)
Reference method	DPD1
pH range	5.0 ... 9.0
Temperature range	5 ... 45 °C (41 – 113 °F)
Maximum pressure	3.0 bar (43.5 psig)
Flow	60 ... 80 l/h (16-21 g/h) [in the DGMA], constant flow required, as the signal is flow-dependent
Run-in period	30 ... 60 minutes.
Typical application	Drinking water and swimming pool/spa water
Sensor cable	Fixed cable, 1 meter
Electrical connection	You must not extend the fixed cable at the sensor. When connecting the sensor to the controller, you must observe the controller's terminal diagram.

Table 19 Sensor Specifications

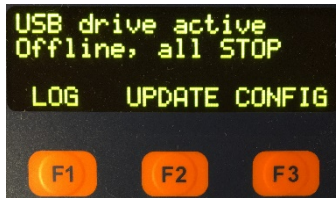
14 Using the USB Port

14.1 Capturing Data

The DCM3 logs all sensor values, flow switch status, flow meter values, relay ON times, and status every 5 minutes. This data is easily captured from the USB port located behind the communication status light cover.

NOTE: Not all USB drives are compatible. Be sure you use the USB drive provided, or a USB drive no larger than 8GB, formatted in FAT or FAT32 protocol.

- 1- Insert a USB flash drive into the USB port shown. The OLED screen will acknowledge the drive with a screen that looks like this:



NOTE: The Controller will stop all external LAN communications and will turn off all chemical feeders while the USB flash drive is inserted.

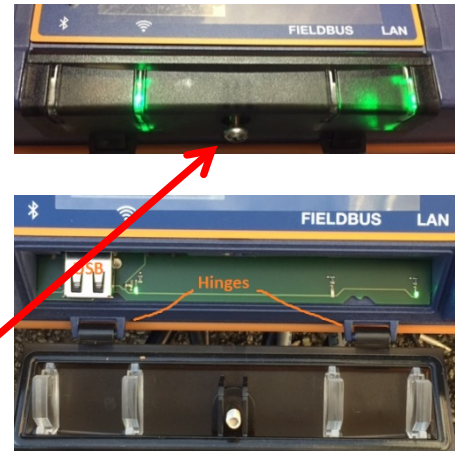
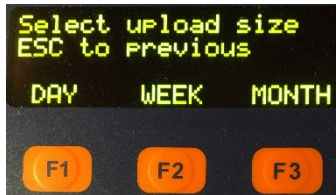


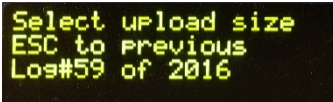
Figure 65 USB Access Door Closed [Top] and Open [Bottom]

- 2- Choose **F1 LOG** to select the log download.



- 3- When you choose the period, the download starts. Choose the amount of history, **F1 DAY**, **F2 WEEK**, or **F3 MONTH**. During the download, the keypad and browser connection are locked.

At 5 minute resolution, there are 288 log entries per day, 2016 logs per week and 8928 logs per 31 day month. Each log entry contains the value or status of all the inputs and outputs. The display will show the progress of the download. For the example shown, the **F2 WEEK** was chosen.



- 4- 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.



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

No special conversion program or Excel add-in is needed to import the CSV formatted data (CSV = **C**omma **S**eparated **V**ariable) into Microsoft Excel® or similar spreadsheet programs. Refer to your spreadsheet or graphing software product to learn how to import CSV data. The I/O data is stored in 5 minute intervals, (Not adjustable) with newest logs first. Values saved are as taken, not averaged over the 5-minute period. Relays show ON time in seconds per 300 second period. Date is in Day/Month/Year format. The first example below is the raw data CSV format, and the next example is the same file after being imported into Microsoft® Excel®.

AL937_19_280.csv - Notepad

File Edit Format View Help

DCM3,,,,,,,,

Serial number,Site name,Controller name,,Firmware,,,,,

2018256937,Facility Name_,Pool Name,,19.09.10.00,,,,,

Log records,,,,,,,,

I/O,Location,E,F,K,O,Q,1,2,3,

I/O,Units,pH,mV,F,sec,sec,sec,sec,sec,

Date,Time,pH Sensor,ORP Sensor,Temperature,Sample Flow,Contact set,Acid Feed,Oxidant Feed,Relay3,

07/10/19,09:45:00,6.750,0.000,75.920,300.000,0.000,0,0,0,

07/10/19,09:40:00,6.760,0.000,75.920,300.000,0.000,0,0,0,

07/10/19,09:35:00,6.760,0.000,75.920,300.000,0.000,0,0,0,

07/10/19,09:30:00,6.750,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:25:00,6.750,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:20:00,6.750,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:15:00,6.760,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:10:00,6.760,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:05:00,6.760,0.000,75.740,300.000,0.000,0,0,0,

07/10/19,09:00:00,6.760,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:55:00,6.750,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:50:00,6.760,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:45:00,6.750,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:40:00,6.750,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:35:00,6.750,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:30:00,6.760,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:25:00,6.750,0.000,75.560,300.000,0.000,0,0,0,

07/10/19,08:20:00,6.750,0.000,75.380,300.000,0.000,0,0,0,

Table 20 Partial example of raw captured CSV data

File	Home	Insert	Page Layout	Formulas	Data	Review	View	ProMinent Fluid Controls	Help	Tell me what you want to do
From Access	From Web	From Other Sources	Existing Connections	New Query	Show Queries	Refresh All	Connections	Sort	Filter	Text to Columns
From Text	From Other Sources	Existing Connections	New Query	From Table	Recent Sources	Refresh All	Properties	Sort	Filter	Flash Fill
Get External Data	Get & Transform	Connections	Sort & Filter							
A1										
1	DCM3									
2	Serial number	Site name	Controller name		Firmware					
3	2018256937	Facility Name_	Pool Name		19.09.10.00					
4	Log records									
5	I/O	Location	E	F	K	O	Q	1	2	3
6	I/O	Units	pH	mV	F	sec	sec	sec	sec	sec
7	Date	Time	pH Sensor	ORP Sensor	Temperature	Sample Flow	Contact set	Acid Feed	Oxidant Feed	Relay3
8	10/7/2019	9:45:00	6.75	0	75.92	300	0	0	0	0
9	10/7/2019	9:40:00	6.76	0	75.92	300	0	0	0	0
10	10/7/2019	9:35:00	6.76	0	75.92	300	0	0	0	0
11	10/7/2019	9:30:00	6.75	0	75.74	300	0	0	0	0
12	10/7/2019	9:25:00	6.75	0	75.74	300	0	0	0	0
13	10/7/2019	9:20:00	6.75	0	75.74	300	0	0	0	0
14	10/7/2019	9:15:00	6.76	0	75.74	300	0	0	0	0
15	10/7/2019	9:10:00	6.76	0	75.74	300	0	0	0	0
16	10/7/2019	9:05:00	6.76	0	75.74	300	0	0	0	0
17	10/7/2019	9:00:00	6.76	0	75.56	300	0	0	0	0
18	10/7/2019	8:55:00	6.75	0	75.56	300	0	0	0	0
19	10/7/2019	8:50:00	6.76	0	75.56	300	0	0	0	0
20	10/7/2019	8:45:00	6.75	0	75.56	300	0	0	0	0
21	10/7/2019	8:40:00	6.75	0	75.56	300	0	0	0	0
22	10/7/2019	8:35:00	6.75	0	75.56	300	0	0	0	0
23	10/7/2019	8:30:00	6.76	0	75.56	300	0	0	0	0
24	10/7/2019	8:25:00	6.75	0	75.56	300	0	0	0	0
25	10/7/2019	8:20:00	6.75	0	75.38	300	0	0	0	0

Table 20a Partial example of CSV data in Excel®

14.2 Save or Load the Controller's Configuration

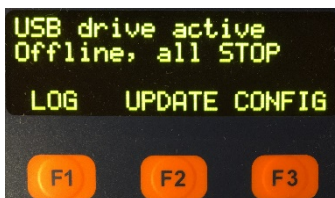
THESE ARE NOT THE SOFTWARE / FIRMWARE UPGRADE INSTRUCTIONS. See [14.3 Firmware Upgrade](#)

A controller configuration is a file with a list of all the settings that make the controller operate properly on this particular pool or spa. This includes set-points, calibrations, names of the facility and body of water, enabled and disabled sensors, relays, switches and meters, and their relationship with other I/O's are all saved in the configuration file. You can save the configuration to the internal memory of the controller, to a USB drive for backup/archive purposes or to clone another controller to be just like this one. (Save from one controller and Load the configuration onto another.)

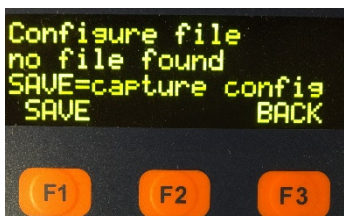
To see how to access the USB port, see section [14.1 Capturing Data](#).

14.2.1 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 light cover. See Figure 65 above.



- 2- Press **F3 CONFIG**



- 3- If you have not previously saved a program on this USB you can only **F1 SAVE** a copy to the USB. After the file is saved the file name is shown on the screen with the notation that the save is complete and the USB drive is ready to be removed.



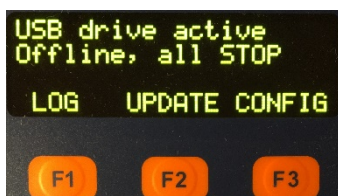
- 4- If you have a previously saved program, you have the choice of saving using **F1 SAVE** or uploading, using **F3 LOAD**.

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.

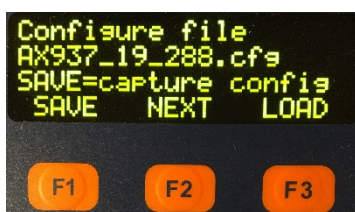


14.2.2 Loading from the USB

- 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 **F2 NEXT** to select the configuration file to upload into the controller.
The 3 digits following the AX are the last 3 of the serial number of the controller from where they were saved, the 2 digit number in the middle is the year and the 3 digit number to the right is the day of the year where 001 is January 1st
- 4- Once the file chosen is shown on the screen, Press **F3 LOAD**.



- 5- The controller loads the program from your USB and when it is finished, it notifies you that it is complete, and that it will cause the controller to reboot (restart). To continue, remove the USB flash drive as directed.
- 6- Sometimes referred to as "Cloning", this saved program file can be loaded onto a different (or several) DCM3 controller(s). The two different controllers will then have the same configuration. Afterwards, you can fine-tune (edit) either controller via the keypad or with a browser connection to complete your configuration. Don't forget to save the configuration after each significant change.

14.3 Firmware Upgrade

If necessary, the DCM3 controller firmware (internal programming) can be upgraded in the field. This is not the *configuration* of the controller that determines the sensor calibrations and which relay to turn off. This is more like the DCM3's operating system, the same sort of upgrade that your computer or smart phone may need on occasion for bug fixes or enhancements. Contact your ProMinent distributor for more information.

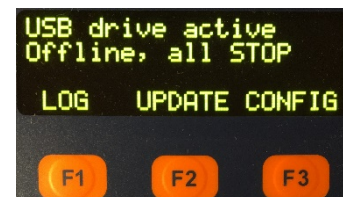
For configuration changes, see section, [14.2 Save or Load the Controller's Configuration](#)



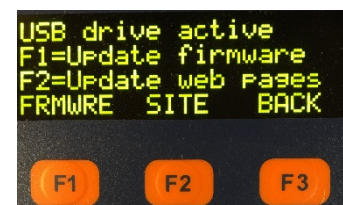
One File Only, Please

To avoid accidents and confusion with this important process, please remove all files from your USB flash drive prior to adding the .hex file. The controller will only allow you to view one file. Be sure you copy only the correct file to the USB. If you have more than one hex file on the flash drive, the wrong file will likely be loaded and could corrupt the controller firmware enough to need a return to the factory.

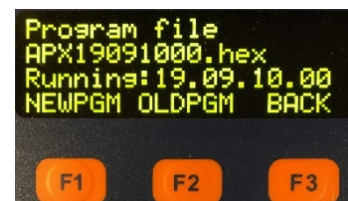
- 1- Obtain the upgrade hex file from ProMinent and make sure the hex file is in the root directory and is the only file with the **.hex** file suffix.
- 2- Insert USB flash drive with the new file into the USB port located behind the Communication status panel. See section [14.1 Capturing Data](#).
- 3- Once the screen changes and the controller stops, press **F2 UPDATE**



- 4- The next screen shows a choice to update the firmware (.hex file) or the website. Press **F1 FRMWRE** to choose the firmware upgrade.
- 5- The display shows the one file from the USB drive; "APX19091000.hex" on the second line, and the current hex file in use; "Running:19.07.26.00" on the 3rd line.



NOTE: These numbers are date codes, year, month and day. '00' indicates they were uploaded from the USB drive.

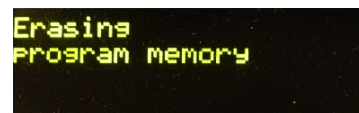
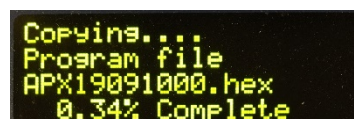


F2 “OLDPGM” is a list of other hex programs on the controller. If OLDPGM is not a choice, there are no other backup hex files in the controller memory. You can load a previous program from this list if you need to revert to an older firmware version.

- 6- The file shown on line 2 should be the new firmware file on the USB Flash drive. Press **F1 NEWPGM** to select the new hex file shown on line 2.
- 7- The next screen is kind of an “Are You Sure?” screen before you upload a whole new program. Press **F1 LOAD** to install the new hex file or **F3 BACK** to abort.



- 8- The screen will show the progress of transferring the hex file to the internal memory. When it is finished, it will prompt to remove the USB drive to continue the upgrade
- 9- Remove the USB drive when prompted.
- 10- After you remove the drive, the controller will erase the existing firmware and install the new one.
- 11- Once the new firmware is loaded (installed), the controller will restart (reboot) and return to the HOME screen showing the sensor readings.



14.4 E-mail Reports and Alarms

The E-mail function is explained in the DCM3 Browser manual. You cannot access adjustments for this feature through the keypad as email requires an ethernet access. The following explanation is for informational purposes only.

The E-mail tool can send three types of information: Alarms, Status and Log data. Setup is via a PC, Laptop, WiFi Tablet or smart phone browser using the ethernet or WiFi ports and is reserved for the Admin user. *During controller initial start-up or after factory reset, E-mail initializes as disabled.*

14.4.1 E-mail Types:

14.4.1.1 E-mail on ALARM:

Sent once when an alarm first occurs.

Lists all active alarms. Includes enabled sensors, meters & contact values for alarm context. User Enabled/Disabled.



DCM3-2018256937@prominent.us via smtpcorp.com
to datastream, rickd, dennis.rick, h2o_rick, me ▾

New Facility Pool Name

Active Alarms			
ID	Descriptor	Info	DateTime
E	pH Sensor	Alarmed Low	10:12 2019-Oct-18
F	ORP Sensor	Alarmed Low	10:12 2019-Oct-18

Status			
ID	Descriptor	Value	Status
1	Acid Feed	0sec	Setpoint
2	Oxidant Feed	\$9.2min	ON: \$9.2min
4	Relay4	\$9.2min	ON: \$9.2min
5	Relay5	0sec	No sensor
A	Conductivity	438uS	ok
C	CLB Chlorine	2.74ppm	ok
E	pH Sensor	6.75pH	alarm
F	ORP Sensor	0mV	alarm
K	Temperature	76.1F	ok
O	Sample Flow	10.68hrs	on
P	Contact set	10.68hrs	on

14.4.1.2 E-mail status:

Sent @ Noon, or Midnight, or Both every day (@12:00). Verifies that the controller is running and is active on the network.

Includes enabled sensor, meter & contact values.

Sent @ midday so that commercial systems will have some run time and some of the business day is left to respond to operating or network issues.
User is able to Enable/Disable or pause emails.

Status,09:47:03 Inbox x



DCM3-2018256937@prominent.us via smtpcorp.com
to datastream, rickd, dennis.rick, h2o_rick, me ▾

New Facility Pool Name

Status			
ID	Descriptor	Value	Status
1	Acid Feed	0sec	Setpoint
2	Oxidant Feed	5.1min	ON: 5.1min
4	Relay4	5.1min	ON: 5.1min
5	Relay5	0sec	No sensor
A	Conductivity	437uS	ok
C	CLB Chlorine	2.74ppm	ok
E	pH Sensor	7.49pH	ok
F	ORP Sensor	701mV	ok
K	Temperature	75.7F	ok
O	Sample Flow	9.78hrs	on
P	Contact set	9.78hrs	on

14.4.1.3 E-mail log as .csv file:

Sent @ Midnight (23:59) or hourly every day. Verifies that the controller is running and active on the network, and includes an attached CSV file of the past hour or 24 hours of data logged by the controller.

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

All DCM3 types send comma separated values (CSV); one line per I/O or Alarm so that both the subject & body can be easily parsed into a logging app, like Microsoft® Excel or Access, a typical use for the DAILY type E-mail.



DCM3-2018256937@ProMinent.us <DCM3-2018256937@ProMinent.us>
To: datastream@prominent.us
Cc: Tester@prominent.us,

DCM3, s/n:2018256937 New Facility.Pool Name



log_2018256... .csv
1.8kB

An excerpt of a data file shown below:

```
DCM3,,,,,,,,,
Serial number,Site name,Controller name,,Firmware,,,,,
2018256937,DCM3-Cl_Pool Name,,19.10.25.00,,,,,
Log records,,,,,,,,,
I/O,Location,C,E,K,O,1,2,5,
I/O,Units,ppm,pH,F,sec,sec,sec,sec,
Date ,Time ,Free Chlorine,pH Sensor,Temperature,Sample Flow,Acid Feed,Oxidant Feed,Alarm
Contact,
09/12/19,00:00:00, 2.594, 6.750, 71.060, 300.000, 0, 0, 300,
09/12/19,00:05:00, 2.617, 6.760, 71.060, 300.000, 0, 0, 300,
09/12/19,00:10:00, 2.587, 6.750, 71.060, 300.000, 0, 0, 300,
09/12/19,00:15:00, 2.625, 6.750, 70.880, 300.000, 0, 0, 300,
09/12/19,00:20:00, 2.608, 6.750, 70.880, 300.000, 0, 0, 300,
09/12/19,00:25:00, 2.479, 6.750, 70.700, 300.000, 0, 0, 300,
09/12/19,00:30:00, 2.483, 6.750, 70.700, 300.000, 0, 0, 300,
09/12/19,00:35:00, 2.484, 6.750, 70.520, 300.000, 0, 0, 300,
09/12/19,00:40:00, 2.489, 6.760, 70.520, 300.000, 0, 0, 300,
09/12/19,00:45:00, 2.473, 6.750, 70.520, 300.000, 0, 0, 300,
09/12/19,00:50:00, 2.463, 6.750, 70.520, 300.000, 0, 0, 300,
09/12/19,00:55:00, 2.469, 6.750, 70.700, 300.000, 0, 0, 300,
09/12/19,01:00:00, 2.474, 6.750, 70.700, 300.000, 0, 0, 300,
```

15 Spare Parts and Accessories

15.1 DCM3 Controller – base and components

Lower Enclosure section RAL5003 blue No electronics	1020595
PC-board DCM3/SF5, no batt, no fan, no P/Supply	Ask
A2 WLAN assy. (WiFi module)	734211
Battery BR2032	732829
Power supply module 100-230V 5V 55W RPS-60-5	734526
Power supply cable 230V EPS-65-5	1050744
Power supply cable 5V EPS-65-5	1050745
Fan 5VDC 50*50*10mm tachom.outp.	733328
Female plug 3ckt 1R SA for power relays	733768
Single terminal block double pin for digital or analog I/Os	Ask
Socket Block 3 ckt 1R SA – 3 port for digital inputs	Ask
A2 Fuse – Main Power 1.6A Ceramic 5x20mm	732411
A2 Fuse – Relays 6.3A slow blow 5x20glas	732379

15.2 DCM3 Controller – Driver PC cards

DCM300 and DCM3-CI	
Assy.El. module 2x mV/Temp input (pH & ORP driver with temp Input)	734131
DCM3-CI only	
Assy.El. module CLB (Chlorine Sensor driver)	734169

15.3 DCM3 Controller – Hood

Complete hood assembly (includes * items)	1081473
* Upper part RAL5003 blue hood enclosure	1059533
* Assy.Electrical HMI (Display PCB)	734260
* Keypad DCM3	1105055
* Ribbon cable 10P 2 socket 185mm	1050827
* USB 2.0 cable conn. A and Mini-B for hood	1058522
* LCD module 100x40 OLED 5V YE with cable	734486
Form Seal – Orange RAL2003 DXC	1020680
DCM3 Pocket Insert	1107678
DCM3 Pocket Insert w/ CO2	1107679

15.4 Sensors and Accessories

Conductivity/Temp/Flow Sensor Serial Assembly (includes ** items)	1095087
** Conductivity/Temperature/flow Serial Sensor only	1094802
** Various DGMA adaptors and parts	

15.4.1 Potentiometric Sensors and Accessories

Coax cable, SN6 x Clamp, 32"	1024105
Coax cable, SN6 x Clamp, 6'	1024106
Coax cable, SN6 x Clamp, 30'	1024107
RHEP-Au-Se Gold pin ORP electrode (Salt pools)	1003875
ORP sensor – Aquatics / Industrial	7500442

pH sensor – Aquatics / Industrial	7500441
Conductivity Temperature - Serial (CTFS) (Salt Pools)	1094802
Temp sensor Assembly** PT1000 & adapter for DGMA (includes ** items)	1082254
**Resistance Temperature sensor Pt-1000-SE	1080101
**Temp sensor adapter for SGT or Pt-1000 to DGMA	1051504

15.4.2 Amperometric Sensors and Accessories

Chlorine sensor CLB 3- μ A- 5 ppm	1041696
---------------------------------------	---------

Note: In accordance with testing and approval by NSF,
please consider an operating range of 0.5 to 3.25 ppm (mg/l)

15.4.3 Cables

Ethernet Adaptor - DCM2/DCM3/DCM5	7500607
Cable, 2 conductor 22ga w/shield Quantity in feet	7760527

Use this cable to lengthen low voltage sensors.

15.4.4 DGMA Modular Sensor Header

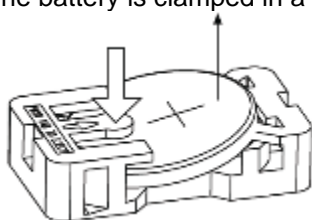
Please consult the DGMA manual, available on the ProMinent.us website for parts and maintenance instruction:

http://prominent.us/promx/pdf/ba_dtz_020_10_11_4spr.pdf

16 Maintenance

The DCM3 Controller electronics are maintenance free. Replace the battery after 10 years as a precautionary measure. The primary function of the battery is to keep the internal clock/calendar running during power outages. If the controller does not retain the time and date during power outages, the battery may need replacement.

Battery type: BR2032, 3 V approx. 190 mAh ProMinent Part No. 732829
The battery is clamped in a holder on the Top center of the main PC board.



NOTICE!

Hazardous waste


The battery is hazardous waste. It must be disposed of separately. Observe the conditions which apply on your site.

Figure 67 AG1b battery

Removing the battery

1. Turn off power to the controller
2. Unscrew the four retaining screws at the front of the DCM3 enclosure (hood) and take the hood off the enclosure's lower section. This will require removal of a small ribbon cable and a USB cable at the top of the motherboard. Set the hood aside for reinstallation later.
3. Press on the holder lug to release the battery from the holder, see Fig. 67, and note the polarity.
4. Insert a new battery in the holder, avoiding pressing with the bare fingers on the battery poles. This can result in poor contacts.
5. Replace the hood on the housing lower section, and remember to reconnect the two cables in the process.

Manually tighten the four retaining screws while assuring the seal is in place around the entire circumference.



CAUTION!
Solvent

Do not under any circumstances use solvent to clean the surfaces. Solvent can attack the surfaces.

Clean the housing with a damp cloth. Then rub dry.

17 Certifications

The Aegis II/DCM5/SF5/DCM3 Controller is built to conform to UL/CSA/IEC 61010-1 for safety. Additional information can be found on our website www.prominent.us.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.



18 Necessary formalities

18.1 Disposal of used parts

Users' qualification: instructed persons, see Section 4.5 Users' qualifications.

NOTICE!

Regulations governing disposal of used parts

– Note the current national and local regulations and legal standards which apply in your area

18.2 Agency Approvals

Safety: UL 61010-1, 3rd Edition
CSA C22.2 No. 61010-1-12, 3rd Edition
IEC 61010-1, 3rd Edition
EN 61010-1, 3rd Edition

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