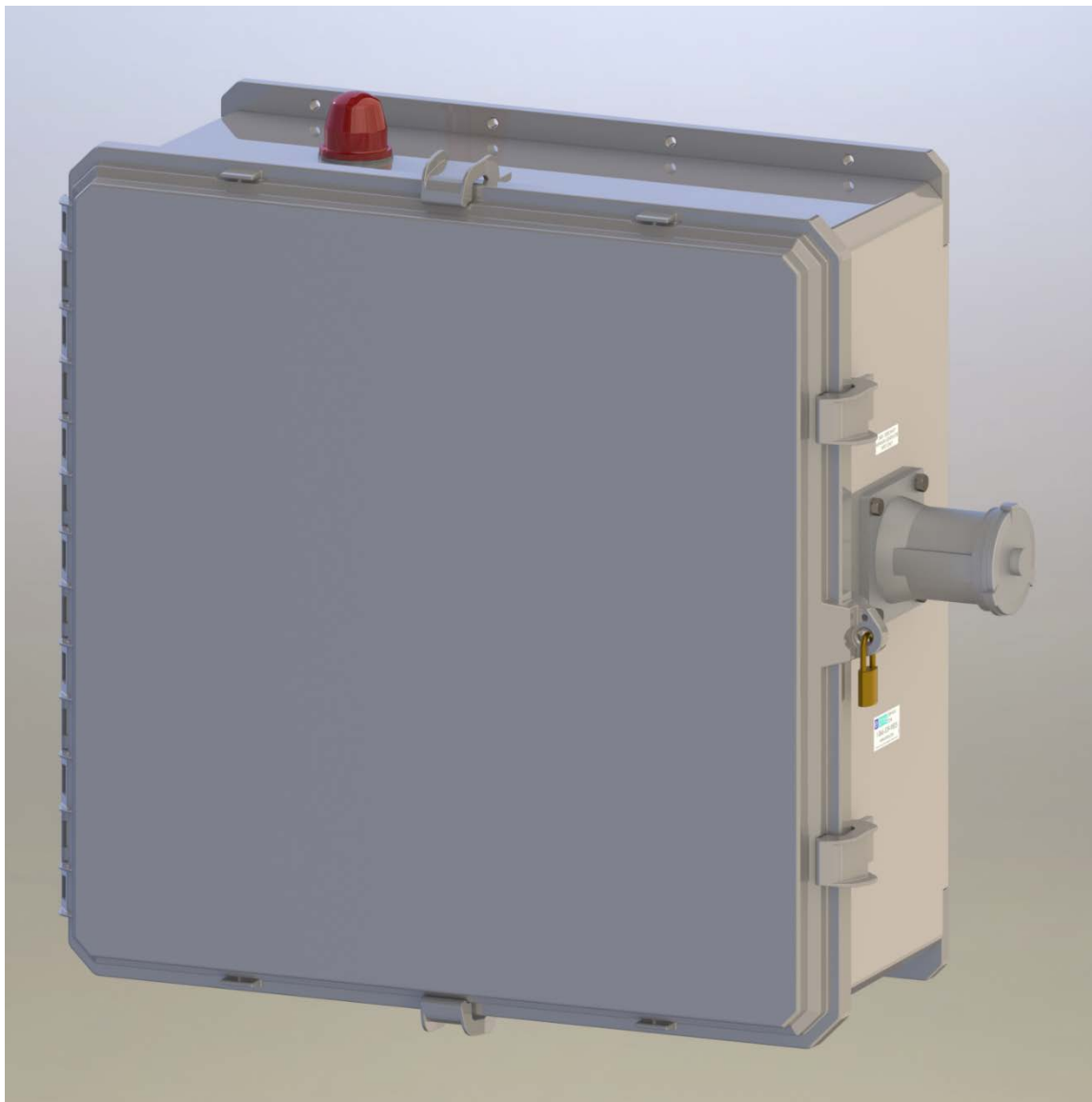


# SENTRY Protect Plus QUADPLEX PANEL

## Installation and Operation Manual For Hardwired Pumps

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*Environment One Corporation*



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# 1 Overview

This manual provides information on the operation and use of Environment One Protect Plus Quadplex Panels. If unsure of the configuration of your panel, contact E/One factory for assistance.

The Sentry Protect Plus Quadplex panel is an Environment One full-featured Alarm/Monitor panel, that is built on a platform of two Protect Plus Duplex panels. Pumps are grouped into two sets of pumps, sets A and B, with pumps referenced as pumps 1A / 2A, and 1B / 2B. The Sentry Protect Plus Quadplex panel monitors for the following operating conditions:

- Pump Run Dry Condition – Pump running out of water
- Pump Overpressure Condition – Pump operating at abnormally high wattage level
- Brownout Condition – Mains voltage under 12% of nameplate rating
- Overvoltage Condition – Mains voltage above 12% of nameplate rating
- High Liquid Level
- Real-time, High, and Low Voltage to the Pump
- Real-time, High, and Low Wattage drawn by the Pump
- Extended Pump Runtime (field programmable limit)

The Sentry Protect Plus Quadplex Panel displays pump status, operating parameters, and user options by means of two separate graphic overlay membrane switch modules, each containing the following indicators:

- LCD Display to show Pump & Panel operating conditions
- Four Status Indicators:
  - Ready (Green LED)
  - Pump Running (Green LED)
  - Trouble (Amber LED)
  - High Level Alarm (Red LED)
- Eight Selectable Modes to view or change panel operation
- Menu Navigation Buttons – Enter, Scroll, Mode, ↑ 'A' and ↓ 'B'

In addition, the following pump operating parameters can be viewed from the Sentry Protect Plus Quadplex Panel:

- Real-time pump Voltage, Amperage, and Wattage (power)
- Cycles & Hours (resettable)
- Minimum, Maximum, Average, and Last Run Cycle in Minutes (resettable)
- Minimum, Maximum and Average Voltage, Amperage, and Wattage (resettable)
- Latched fault conditions

The following features are field programmable:

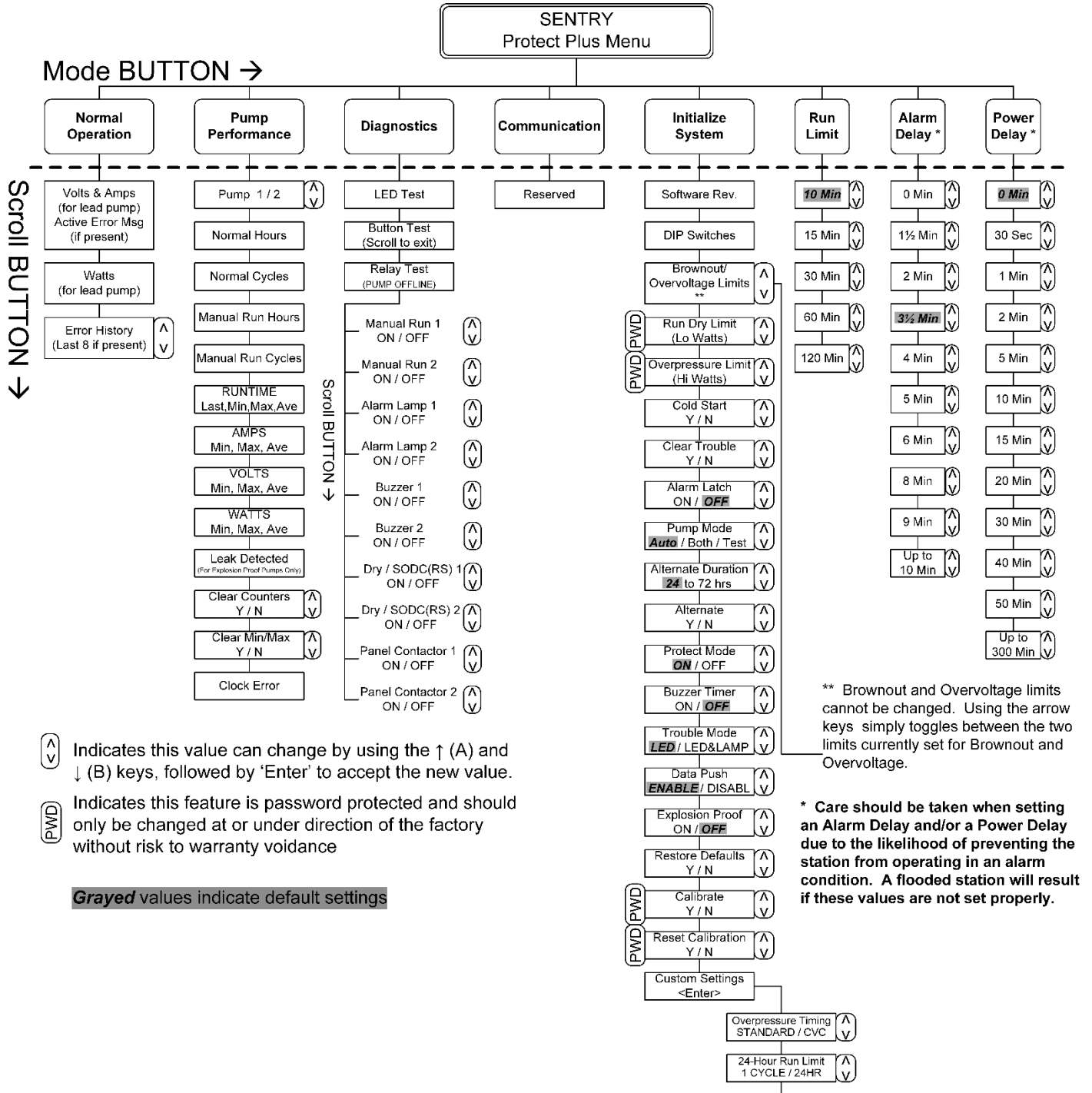
- Excessive Run Time
- Alarm On Delay
- Power On Delay

The following are the hardware features:

- IP65 / NEMA 4X Rated Enclosure
- Enclosure made from Thermoplastic Polyester
- Separate Alarm and Pump Circuit Breakers
- Audible & Visual Alarm indicators (Silence for Audible Alarm)
- Manual Pump Run Button
- Remote Sentry Alarm Dry Contacts – Normally Open, rated for 24VDC, 2A maximum (Can operate with or without power - intended for use with Environment One Remote Sentry, sold separately)
- Alarm Dry Contacts – Normally Open (Requires alarm board to have power)

## 2 Sentry Protect Plus Quadplex Menu Flowchart

Each set of pumps, A and B, is controlled by its own menu. Any setting made within each menu applies only to the pumps controlled by that interface. Labels are used on the overlays and throughout the panel for the purpose of identifying each pumps' related components and control.



Custom Settings - Please refer to the setup instructions shipped with your panel (NA0168P03) for more details on this feature. These are also available at: [http://www.eone.com/sewer\\_systems/catalog/alarm-panels/eone-sentry-protect-panel.htm](http://www.eone.com/sewer_systems/catalog/alarm-panels/eone-sentry-protect-panel.htm)

Figure 1 – Menu Flowchart

## 3 Wiring Instructions

**WARNING** – the E/One Alarm and Control panel is a high voltage system that controls power to an electric motor. Care should be taken whenever performing service on the panel to avoid the risk of electrical shock and/or damage to property. Because power may be supplied by multiple sources, circuit breakers alone may not be sufficient to provide adequate protection.

Due to the many different optional features, the Sentry Protect Plus Quadplex panel wiring can change from one model to another. All wiring shall be done in accordance with the wiring decal on the inside cover of the panel enclosure. Several examples of typical wiring can be found in the Appendix of this manual.

### 3.1 Alarm Dry Contacts

**Warning!** These dry contacts are capable of a maximum of 2A. Connections that exceed this maximum value can cause permanent damage to the printed circuit board within the panel.

The Sentry Protect Plus Quadplex panel is equipped with one set of dry contacts per each set of pumps (see note below), that coincide with the following alarm indications:

**High Water Level**  
**Run Dry (after third failed re-try)**  
**Overpressure (after third failed re-try)**

These dry contacts will close upon detection of any of the above listed events and remain closed until the condition is removed or cleared. If the Alarm Latch option is set to 'ON', these dry contacts will also be latched until the condition is cleared. Refer to the [Alarm Latch](#) section of this manual for more information on this feature.

**Note:** Despite each set of pumps having its own Dry Contact terminals, due to the nature of a high water event within the station it is not necessary to connect to both in order to receive an alert. The terminals on one or the other printed circuit board assembly are sufficient to be used for a Dry Contact connection for the overall panel.

### 3.2 Switch Over Dry Contacts – to be used with an E/One Remote Sentry (optional)

**Warning!** These dry contacts are designed to be used in conjunction with an E/One Remote Sentry device, and are capable of a maximum of +24VDC and 2A. Connections that exceed these maximum values can cause permanent damage to the printed circuit board within the panel.

The Sentry Protect Plus Quadplex panel is equipped with one set of switch over dry contacts per each set of pumps (see note below). If power is applied to the panel these contacts respond just as the Alarm Dry Contacts described above. When connected to an E/One Remote Sentry, that device will respond with an audible and visual alarm in conjunction with above indicated alarm conditions. If power to the panel is lost these contacts are 'switched over' to connect directly to the alarm switch in the pump. In this configuration, the Remote Sentry device will respond with an audible and visual alarm any time the alarm switch closes, allowing the use of water even during a power outage. When power is restored to the panel, these dry contacts will switch back to their normal position. If the Alarm Latch option is set to 'ON', these dry contacts will also be latched until the condition is cleared. Refer to the [Alarm Latch](#) section of this manual for more information on this feature.

**Note:** Despite each set of pumps having its own Switch Over Dry Contact terminals, due to the nature of a high water event within the station it is not necessary to connect to both in order to receive an alert. The terminals on one or the other printed circuit board assembly are sufficient to be used for a Switch Over Dry Contact connection for the overall panel.

## 4 Startup

The Sentry Protect Plus Quadplex Panel should arrive from the factory ready to operate. The panel is properly installed and started by following the steps below.

1. Mount and wire the panel per the instructions on the enclosure door.

2. 'Cold Start' the panel – refer to [Cold Start](#) section of this manual for more information.
3. If other than factory default settings are required, set all limits, delays, and operating modes. Factory default settings can also be restored via the user menu (Refer to the [User Programmable Options](#) section of this manual for more on this feature). Settings for both sets of pumps must be made independently via each of the two graphic overlay membrane user interface modules.

## 5 User Menus and LCD Display

The Quadplex Protect Plus panel includes a text-based user interface membrane switch to navigate the various menus and select the user options (see Figure 2). Each set of pumps, A and B, has an independent user interface membrane switch.

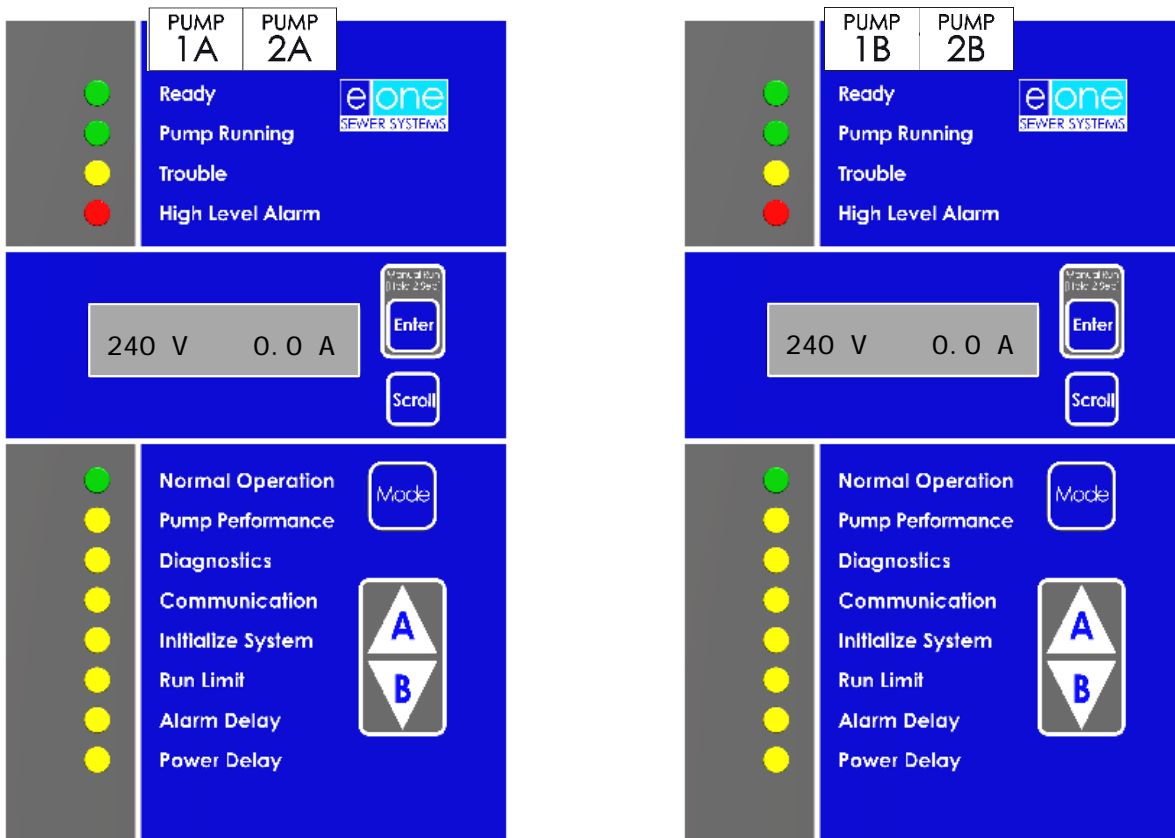


Figure 2 – User Interface Membrane Switch

On each interface, four system status LED’s indicate the current pump status, and are controlled automatically by the system to indicate for monitoring operating parameters and system setup. The Mode button will sequentially select the different modes and the Scroll button will navigate the specific menus under each mode. For user selectable options, the ↑ ‘A’ and ↓ ‘B’ keys can be used to change the current value, and the ‘Enter’ button is used to accept any new setting. The current setting for any option is the value that is displayed when that item is first displayed. For example, if scrolling to Run Limit, and the LCD initially displays “LIMIT= 0 Min”, then 0 minutes is the current Run Limit setting. Any changes must use ‘Enter’ to accept the new value; otherwise the initial value is maintained. The LCD display serves as an output from the panel to allow navigation through the menus and allows observation of real-time operating parameters. While in Normal Mode, the real-time voltage and amperage are simultaneously displayed. Pressing the Scroll button will display the real-time wattage of the pump. Pressing Scroll a second time will display Trouble History Log (see below). If there are no logged messages, the display reverts back to displaying the real-time voltage and amperage. Refer to the flow chart in [Figure 1](#) for an overview of the menu layout. At any time the LCD could display one of several messages to indicate a trouble condition. Refer to the [LCD Messages section](#) in the Appendix for a complete list of these messages and a brief description of what they mean.

### 5.1 Trouble History Log

The Trouble History Log stores the last eight trouble events that have occurred beginning with the most recent. If the list contains at least one trouble message, the beginning of the list is identified by the LCD displaying the “Trouble History” heading for 1 second, followed by the most recent entry in the list. Pressing ‘Scroll’ will then sequence through subsequent items in the list from most recent to oldest. If the end of the list is reached, the display will ‘wrap around’ back to the top of the list which is again identified by the “Trouble History” heading. Within the list, the ↑ ‘A’ and ↓ ‘B’ keys can be used to move up and down the list. Whenever the top of the list is reached, the LCD will display the

“Trouble History” heading. While displaying any trouble message in the list, pressing ‘Enter’ will display the Runtime of the pump that was active at the time the trouble event occurred. This is intended to provide a sort of timestamp of when the event occurred. This information can also indicate how frequently a trouble event is occurring when comparing to other items in the list. Pressing ‘Enter’ a second time will display the Cycles of the pump that was active at the time of the event. Like the Runtime, this is intended to provide information on when and how often a trouble event is occurring. Every item in the list will contain these additional pieces of information to help provide an overview of the chain of events leading up to a particular trouble condition, thus helping to troubleshoot a problem.

## 6 System Initialization

A number of system settings, some of which will be unique to the installation, can be set on-site. Most of these settings can be found within the Initialize System mode, however; Run Limit, Alarm Delay, and Power Delay each have their own mode for configuration. The following sections describe each of the items contained within the Initialize System mode. Settings must be made independently for each set of pumps, A and B.

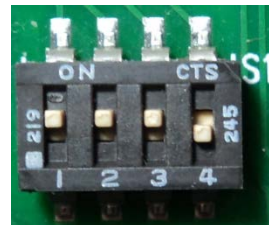
### 6.1 Software Revision

This read only field displays the part number and revision of the software currently loaded into the panel. This information may be required when speaking with E/One service personnel.

### 6.2 DIP Switch

This read only field displays the setting of the four position miniature switch (DIP switch) located on the printed circuit board within the panel (labeled S1). These switches configure the Sentry Protect Plus Quadplex for the operating environment in which the panel is being installed. From left to right, the first three positions configure the voltage setting as shown in the table below. In the following voltage selection table, “U” represents a switch in the Up (ON) position and ‘D’ represents a switch in the Down (OFF) position. The right most position is used to configure the panel for use with a wireless grinder pump; for hardwired pumps this setting shall be ‘D’ (OFF). The DIP switch must be programmed with power to the alarm board off (Alarm Breaker off). **While this setting is typically performed at the factory, it is essential that the DIP switch is properly set for the AC Mains voltage applied for the panel to operate properly.**

<u>Input Voltage</u>	<u>1 2 3 4</u>
240 VAC, 60 Hz	UUUD
240 VAC, 50 Hz	UUDD
230 VAC, 50 Hz	UDUD
120 VAC, 60 Hz	UDDD
200 VAC, 50 Hz	DUUD
RESERVED	DUDD, DDUD
Factory Use Only	DDDD



S1 set to “UUUD”

**Warning! DIP switch position 4 is to be set to ‘D’ for hardwired pumps (factory default).**

### 6.3 Pump Modes

The Pump Mode is a user selectable feature that can be set from the ‘Duplex Mode’ menu within the Initialize System mode. This feature is specific to an alternating systems only and allows selecting between two operational modes and one test mode. The default setting for this option is AUTO. From the Duplex Mode menu, use the ↑ ‘A’ and ↓ ‘B’ keys to change the selection. Once the desired mode is selected, press ‘Enter’ to accept the new value; the LCD will display ‘Writing...’ (pressing ‘Mode’ or ‘Scroll’ will exit without saving the change).

The first and default mode is AUTO which configures the system for a time-based alternating sequence. In this mode only one pump in a set, the lead pump, is powered at any given time, and the other pump, the lag pump, is disabled. After a set time (as determined by the Alternate Duration setting), the lead/lag relationship switches pumps. The lead pump is allowed to run unless a condition exists that would prevent that pump from operating (Brownout, Run Dry, etc.). In these cases, the lead pump would be deactivated until the condition is no longer present. Refer to the [Trouble Operation](#) section of this manual for more information on these scenarios. If a high level occurs at any time, the lag



pump would become active and allowed to operate. Refer to the [High Level Alarm](#) section of this manual for more on this condition.

The second operating mode is BOTH which configures the system to activate both pumps in a set simultaneously to a ready state. In this mode each pump operates independently. Due to the variation in each pumps ON/OFF level, one pump will most likely be activated first, and the second pump will only be activated if the in-flow of the station is more than the first pump can handle. This will likely result in mismatched wear between the two pumps and is not recommended to achieve the full benefit of an alternating station.

The third operating mode is TEST and mimics the time-based alternation of the AUTO mode. This mode is intended to be used only temporarily during station startup to verify that the system alternates between the two pumps properly. The difference the TEST mode provides over AUTO is that the alternating duration is held to 1 minute. The 1 minute alternation will last for a total of 5 minutes, alternating between the two pumps in a set as described in the AUTO section. During these 5 minutes "TEST MODE" will be displayed on the LCD screen, and the Alarm Lamp will flash. After the 5<sup>th</sup> alternation, the system will revert back to the default AUTO mode. While this mode will revert back to AUTO on its own, it is advised that the intended operating mode is selected prior to leaving the station.

## 6.4 Alternate Duration

The Alternate Duration is a user selectable feature that can be set using the 'Alternate Duration' menu within the Initialize System mode. This field allows selecting the time-based alternating duration for the AUTO pump operating mode. Refer to the [Pump Modes](#) section of this manual for more on this setting. The default setting for this option is 24 hours. From the Alternate Duration menu, use the ↑ 'A' and ↓ 'B' keys to change the selection from 24 to 72 hours in 12-hour increments. Once the desired duration is selected, press 'Enter' to accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change).

## 6.5 Alternate

Alternate is a user feature that can be activated by using the 'Alternate' menu within the Initialize System mode. This feature allows manually alternating the lead / lag relationship within a set of pumps from one pump to the other. From the Alternate menu, use the ↑ 'A' and ↓ 'B' keys to choose between 'N' (no) and 'Y' (yes). With 'Y' selected, pressing 'Enter' will immediately alternate the lead / lag relationship of the pumps (pressing 'Mode' or 'Scroll' will exit without clearing). Pressing 'Enter' will continue to alternate the pumps as long as 'Y' is selected.

## 6.6 Brownout / Overvoltage Limits

This read-only field displays the limits that are currently set for both Brownout and Overvoltage. When in this menu, pressing the ↑ 'A' and ↓ 'B' keys will toggle between these two limits. These values cannot be changed.

## 6.7 Run Dry (Low Watts) Limits Setting - password protected

This field displays the limit that is currently set for the Run Dry / Low Watts protection feature. Though it is possible to change this setting, it is not advised unless directed by E/One service personnel, as changing this limit will affect how the protection feature performs. Doing so without proper guidance may void the product warranty and can cause damage to the system.

## 6.8 Overpressure (High Watts) Limits Setting - password protected

This field displays the limit that is currently set for the Overpressure / High Watts protection feature. Though it is possible to change this setting, it is not advised unless directed by E/One service personnel, as changing this limit will affect how the protection feature performs. Doing so without proper guidance may void the product warranty and can cause damage to the system.

## 6.9 User Programmable Options

The following items found within the Initialize System mode can be used for system setup. In a quadplex system all of these parameters are shared between the two pumps within a set, and cannot be set independently for each pump. Each set of pumps must be programmed independently via that sets own user interface membrane menu. Clearing of these values is also universal and affects all pumps simultaneously.

### 6.9.1 Cold Start

The Cold Start option is found within the Initialize System mode. Cold Starting the panel erases all stored operating parameters listed within the Pump Performance mode as well as Trouble History Log messages, and should be done when the panel is first installed. From the Cold Start menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'N' (no) and 'Y' (yes). Once 'Y' is selected, press 'Enter' to accept; the panel asks 'Are You Sure?'. Pressing 'Enter' at this point will initiate a Cold Start of the panel (pressing 'Mode' or 'Scroll' will exit without Cold Starting). The LCD will display 'Cold Starting...', after which the panel will restart. All stored operating parameters will be cleared.

### 6.9.2 Clear Trouble

Clear Trouble is a user selectable feature that can be applied by using the 'Clear Trouble?' menu within the Initialize System mode. This feature allows the user to clear all fault conditions that are currently stored in the Trouble History Log. **Make sure to record all trouble message information for future reference before clearing the trouble history.** From the Clear Trouble menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'N' (no) and 'Y' (yes). Once 'Y' is selected, press 'Enter' to accept; the LCD will display 'Clearing...' (pressing 'Mode' or 'Scroll' will exit without clearing). Clear Trouble has no effect on any output that is active due to a present trouble condition.

### 6.9.3 Alarm Latch Setting

The Alarm Latch is a user selectable feature that can be set using the 'Alarm Latch' menu within the Initialize System mode. A latched Alarm means that, despite the alarm condition no longer being present, the indications associated with that alarm remain active indefinitely, until cleared. The following conditions are considered alarms and can be latched:

- High Water Level**
- Run Dry (after third failed re-try)**
- Overpressure (after third failed re-try)**

The factory default setting for this option is OFF. From the Alarm Latch menu, use the ↑ 'A' and ↓ 'B' keys to change the selection from 'N' (no) to 'Y' (yes). Once 'Y' is selected, press 'Enter' to accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change). If set to 'ON', this feature will cause the panel to latch all Alarm outputs. This includes the Alarm Lamp, High Level Alarm LED, Dry & Remote Sentry Contacts, and the audible alarm (Run Dry does not result in an audible alarm). The audible alarm will auto silence after a set time of 10 minutes or can be silenced manually using the silence switch. All other outputs (contacts, indications, etc.) remain latched indefinitely until cleared. The condition can be cleared by using the 'Clear Trouble' option under the Initialize System menu or if the Alarm Latch Option is turned off and a subsequent Alarm event completes.

### 6.9.4 Protect Mode Setting

**Warning! Setting this option to 'OFF' will revert the panel to a basic non-protection mode and should only be done as a last resort to allow basic station function for a short time until the station can be repaired.**

The Protect option is a user selectable feature that can be cleared using the 'Protect' menu within the Initialize System mode. The factory default setting for this option is ON. From the Protect menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'ON' and 'OFF'. Once the desired setting is selected, press 'Enter' to accept; the panel asks 'Are You Sure?'. Pressing 'Enter' will accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change). In the 'ON' position, the alarm panel will actively monitor Voltage, Amperage and Wattage and react to the following adverse operating conditions: Brownout, Overvoltage, Run Dry and Overpressure. This includes disabling the pump if any of the parameters are outside of the set limits (refer to the [Trouble Operation](#) section of this manual). If set to 'OFF', the panel will continue to monitor Voltage, Amperage & Wattage, however it will take no action if any of these parameters fall outside of their set limits. This option can be used in cases where the protect features are not working properly and are preventing the pump from operating despite no out of limit conditions being present. Setting this option to 'OFF' will revert the panel to a non-protection mode until the panel can be repaired.

### 6.9.5 Buzzer (audible alarm) Timer Setting

The Buzzer Timer allows the audible alarm to automatically silence after a non-configurable time of 10 minutes; all other alarm indications will persist as long as the alarm is active. This option is a user selectable feature that can be set using

the 'Buzzer Timer' menu within the Initialize System mode. The factory default setting for this option is OFF. From the Buzzer Timer menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'ON' and 'OFF'. Once the desired setting is selected, press 'Enter' to accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change). If set to 'ON', this feature will silence the audible alarm after a non-configurable set time of 10 minutes. If the alarm condition terminates or the manual silence is pressed before the buzzer timer has expired, the audible alarm will silence without having reached the end of the 10 minutes. This timer resets to 10 minutes after an alarm has cleared.

### 6.9.6 Trouble Mode Setting

The Trouble Mode is a user selectable feature that can be set using the 'Trouble' menu within the Initialize System mode. The factory default setting for this option is LED ONLY. In this position, any trouble alarm will be indicated only by the Trouble LED. From the Trouble Mode menu, use the ↑ 'A' and ↓ 'B' keys to change the selection from 'LED ONLY' to 'LED/LAMP'. Once the desired setting is selected, press 'Enter' to accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change). In the LED/LAMP position, any trouble alarm will be indicated by the Trouble LED as well as a flashing alarm lamp. Trouble alarms are triggered by the following:

**Brownout**

**Overvoltage**

**Excessive Run Time Limit**

**Run Dry (Trouble for first 3 re-tries, then Alarm)**

**Overpressure (Trouble for first 3 re-tries, then Alarm)**

**Faulty Watt-meter**

For Run Dry and Overpressure, only the first three occurrences are considered trouble events, after which they become alarms. Refer to their respective sections of this manual for how these affect the Trouble LED and Alarm Lamp.

### 6.9.7 Data Push Enable Setting

The Data Push is a feature used only with panels equipped with the Advanced Data option of the E/One Sentry Advisor Remote Monitoring System, or an equivalent SCADA system capable of interpreting the serial data transmitted from the panel. This feature allows all registers stored locally within the panel to be transmitted out over the Sentry Advisor System in response to a pump run cycle. These registers store all information regarding pump performance, system status, as well as user settings to allow viewing these parameters remotely. Refer to the [System Parameters Memory Map](#) section of this manual for more detail on the registers that are transmitted with the Data Push feature. The factory default setting for this option is ENABLE. From the Data Push menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'ENABLE' and 'DISABL'. Once the desired setting is selected, press 'Enter' to accept the new value; the LCD will display 'Writing...' (pressing 'Mode' or 'Scroll' will exit without saving the change). If set to 'ENABLE', this feature will result in all registers being transmitted as a single data packet approximately 10 seconds after the start of each pump run cycle.

### 6.9.8 Explosion Proof Ready – for use with E/One Explosion Proof grinder pumps only

This option does not apply to hardwired pumps and should be left in the default (OFF) setting. Contact E/One for more information.

### 6.9.9 Restore Factory Defaults

The Restore Defaults option is a user selectable feature that can be applied by using the 'Restore?' menu within the Initialize System mode. From the Restore menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'N' and 'Y'. Once 'Y' is selected, press 'Enter' to restore the factory default settings; the LCD will display 'Restoring...' (pressing 'Mode' or 'Scroll' will exit without restoring). Restoring the factory default values returns the following fields to their factory preset conditions [factory default]: Pump Mode [AUTO], Alternating Duration[24 HRS], Run Dry Limit [based on DIP Switch setting], Overpressure Limit [based on DIP Switch setting], Alarm Latch [OFF], Protect Mode [ON], Audible Alarm Timer [OFF], Trouble Mode [LED ONLY], Data Push Enable [ENABLE], Explosion Proof [OFF], Run Limit [10 MINUTES], Alarm Delay [3.5 MIN], and Power Delay [NONE].

### 6.9.10 Calibrate – password protected

Calibrate is a **factory only** feature that is located in the ‘Calibrate?’ menu within the Initialize System mode. Calibration is performed at the factory and is necessary to provide the system with baseline Voltage, Amperage, and Wattage settings. The process uses a special fixture capable of applying highly accurate values to the system. Once applied, a calibration measurement is taken to establish reference values for these operating parameters. Performing a calibration without the proper equipment will cause the system to malfunction and is not to be performed by anyone outside of factory personnel.

### 6.9.11 Reset Calibration – password protected

The Reset Calibration option is a user selectable feature that can be applied by using the ‘Reset Cal?’ menu within the Initialize System mode. ***Reset Calibration should only be performed if it is known that the factory calibration has been compromised. Refer to the troubleshooting guide at the back of this manual for more information on making this determination.*** Performing a reset cal will reset the calibration settings to default values, which may not be precisely correct for a specific panel, but should be adequate to allow the system to function until the panel can be repaired.

**CAUTION: This should only be done as a last resort if the panel is non-operational, until the panel can be repaired. This will allow the panel to perform its protect function, but the limits may not be highly accurate.**

### 6.9.12 Custom Settings

The Custom Settings menu contains features that were not standard on the original release of the Protect Panel, but were either requested by a specific job or suggested generally as being a useful feature to add. This allows the addition of newer options that may arise as the product matures with minimal changes to other product documentation. This sub-menu is available via the ‘Custom Settings’ menu within the Initialize System mode. Pressing ‘Enter’ from the ‘Custom Settings’ menu will open a new list of additional features that may be added to from time to time by Environment One. This menu can be navigated using the ‘Enter’, ‘Scroll’, ↑ ‘A’ and ↓ ‘B’ keys just as any other menu. Pressing ‘Mode’ will return to the Initialize System mode.

While this manual is intended to be updated periodically to reflect all such additions to the Custom Settings menu, it is possible that items have been added that are not reflected herein. Check the website for the latest version of this manual for the most up to date information.

#### 6.9.12.1 OP (Overpressure) Timing Mode

**This option provides an alternate method for retrying to start the motor after an Overpressure Lockout. Refer to the paragraph on [Overpressure](#) in the Trouble Operation section of this manual for more on this feature.**

The OP Timing Mode is a user selectable feature that can be set using the ‘OP Mode:’ menu within the Custom Settings section of the Initialize System mode. The factory default setting for this option is Standard. From the OP Mode menu, use the ↑ ‘A’ and ↓ ‘B’ keys to alternate the selection between ‘Standard’ and ‘CVC’. Once the desired setting is selected, press ‘Enter’ to accept the new value; the LCD will display ‘Writing...’ (pressing ‘Mode’ or ‘Scroll’ will exit without saving the change). If set to ‘Standard’, the lockout / re-try timing for an Overpressure event consists of 3, 20-minute lockout cycles with a re-try of the pump after each lockout. ‘CVC’ is a custom setting where the lockout / re-try timing consists of 4, 30-minute, followed by 6, 60 minute lockout cycles with a re-try of the pump after each lockout. In either case, after the final failed attempt, the pump is disabled indefinitely until power is reset.

#### 6.9.12.2 24-hour Run Limit

**This setting works in conjunction with the Run Limit Mode and provides an alternate method for determining a Run Time Alarm based on the duration set for that feature. Refer to the [Run Limit](#) section of this manual for more on this feature.**

The 24-hour Run Limit is a user selectable feature that can be set using the ‘Run Limit:’ menu within the Custom Settings section of the Initialize System mode (separate from the Run Limit Mode which is explained in the following section). The factory default setting for this option is 1 Cyc (1 pump run cycle). From the Run Limit menu, use the ↑ ‘A’ and ↓ ‘B’ keys to change the selection from ‘1 Cyc’ to ‘24Hr’. Once the desired setting is selected, press ‘Enter’ to accept the new value; the LCD will display ‘Writing...’ (pressing ‘Mode’ or ‘Scroll’ will exit without saving the change). If

set to '1Cyc', this feature will issue a trouble alarm for an excessive runtime based on the duration of a single pump cycle. If set to '24Hr', the trouble alarm for a Run Time Alarm will be based on the accumulated runtime of all pump cycles over a 24-hour period, beginning with when the option is first set.

### 6.10 Run Limit Setting

The Run Limit option is a user selectable feature that can be set from the Run Limit mode. The factory default setting for this feature is 10 minutes. This feature will cause a trouble alarm to be initiated if an individual run cycle of either pump within the corresponding set exceeds the set value (assumes 24-hour Run Limit is set to 1 cyc). For an alternate way to configure this feature, refer to the [24-hour Run Limit](#) section of this manual. ***This feature only indicates a trouble alarm; it does not disable the pump.***

Using the 'Enter', 'Scroll', ↑ 'A' and ↓ 'B' keys, the Run Limit can be set to any value between 10 and 120 minutes. For convenience, the following presets have been programmed:

- 10 minutes
- 15 minutes
- 30 minutes
- 40 minutes
- 50 minutes
- 60 minutes
- 120 minutes

'Scroll' will step through this list of preset values, while ↑ 'A' and ↓ 'B' will increase or decrease the current value in 1 minute increments. Once the desired value is reached, pressing 'Enter' will commit the value to memory (pressing 'Mode' or 'Scroll' will exit without saving the change).

### 6.11 Alarm Delay Setting

**Caution should be exercised when setting this feature as flooding of the station can occur if water is used after an alarm has occurred and no alarm indications are present to warn the user of a high level. The table below should be used to ensure that the proper delay time is selected for the size of the station. While these times are recommended and based on average pump-down times of the corresponding tank size, variables such as inflow and system pressure can influence the time it takes to pump down the station. It is better to set this low and have an occasional nuisance alarm than to set it high and have an overflow.**

Station	Tank Size / Diameter			
	WH484	48"	60"	72"
Recommended Alarm Delay	1.5 min	2 min	3 min	4 min

The Alarm Delay is a user selectable feature that can be set from the Alarm Delay mode. This allows for the delaying of ALL trouble indications from the station for the corresponding set of pumps for a period of time to allow all pumps to pump down the station before activating the Alarm Lamp, Audible Alarm, and Dry & Remote Sentry contacts. The default setting for this delay is 3.5 minutes. When a High Level Alarm is detected, the Lag pump's contactor is energized to allow it to assist in pumping down the station. During the delay all indications associated with a High Level Alarm are delayed except for the High Level Alarm LED and an LCD message indicating 'Delayed Alarm'. If the high level is cleared during the delay, the lag pump will be de-energized and the panel will return to normal operation. If the alarm switch remains closed after the delay time has expired the station will activate all high level alarm indications. Refer to the [High Level Alarm](#) section of this document for more information.

Using the 'Enter', 'Scroll', ↑ (A), and ↓ (B) keys, the Alarm Delay can be set to any value between 0 and 10 minutes. 'Scroll' will step through the list of preset values, while ↑ 'A' and ↓ 'B' will increase or decrease the current value in 30 second increments. Once the desired value is selected, press 'Enter' to accept the change. The panel asks 'Are You

Sure?’ at which time pressing ‘Enter’ will commit the value to memory (pressing ‘Mode’ or ‘Scroll’ will exit without saving the change).

## 6.12 Power Delay Setting

A power delay can be set to stagger the startup times within a group of pumps after power is restored following a power outage. This setting must be made independently for each set of pumps in the system.

**Caution should be exercised when setting this option as power to the pump will be delayed for the duration selected. Flooding of the station can occur if this option is not set properly. Use of this option is only recommended in cases where sufficient capacity will prevent flooding!**

The Power Delay option is a user selectable feature that can be set from the Power Delay mode. The factory default setting for this feature is 0 minutes (No Delay). This feature will cause power to the pump to be disabled after application of power to the panel for the duration determined by the set value.

Using the ‘Enter’, ‘Scroll’, ↑ ‘A’ and ↓ ‘B’ keys, the Power Delay can be set to any value between 0 and 120 minutes. For convenience, the following presets have been programmed:

- 0 minutes (No Delay)
- 30 seconds
- 1 minute
- 2 minutes
- 5 minutes
- 10 minutes
- 15 minutes
- 20 minutes
- 30 minutes
- 40 minutes
- 50 minutes

‘Scroll’ will step through this list of preset values, while ↑ ‘A’ and ↓ ‘B’ will increase or decrease the current value in 1 minute increments. Once the desired value is selected, press ‘Enter’ to accept the change. The panel asks ‘Are You Sure?’ at which time pressing ‘Enter’ will commit the value to memory (pressing ‘Mode’ or ‘Scroll’ will exit without saving the change). If a Power Delay is active, the LCD will display “POWER DELAY” alternating with the remaining delay time and the Ready LED will blink. If during a power delay a high level alarm is detected, the alarm will be indicated by the Alarm Lamp, Dry & Remote Sentry Contacts, High Level Alarm LED indicator, and the Ready LED will continue to blink indicating that a Power Delay is still active. For service, a Power Delay can be over-ridden by pressing the Manual Run (‘Enter’) button.

## 7 Normal Operation

Under normal operating conditions, the Sentry Protect Plus Quadplex panel will perform as follows when power is applied. Note that each set of pumps indications and outputs will perform independently of each other:

1. During the boot-up period, all panel indications and outputs will be OFF except for the Alarm Lamp, the Panel Contactor, and the Normal Operation Mode LED. The LCD will display “ENVIRONMENT ONE!” followed by the part number and revision level of the installed software for approximately 2 seconds. During this boot up sequence, all operating parameters are recovered from non-volatile memory. If this is the first time the panel has been started, these will be the factory defaults and all operating parameters will be 0. Otherwise, these values will be what they were the last time the panel operated. If the panel requires a reset to restore factory defaults, refer to the [Restore Factory Defaults](#) feature in the Initialize System section of this manual. In addition, a Cold Start may be needed to clear out the Pump Performance operating parameters; refer to the [Cold Start](#) feature within the Initialize System section of this manual.
2. When the boot-up sequence is complete and the voltage has settled to an acceptable level, the Alarm Lamp will turn off.

If a Power Delay has been set, that delay must expire before power will be provided to the pump. In this case, the LCD will display "POWER DELAY", alternating with a countdown of the remaining delay time and the green Ready LED will blink for the duration of the delay.

Once the boot-up sequence is complete and the power delay has expired (if applicable), the green Ready LED will light steady and the panel is in a normal operating mode and ready for operation.

3. Under normal conditions, the LCD will display the real-time Volts and Amps of the lead pump at all times. Pressing the 'Scroll' button will display the pumps operating Wattage. Pressing 'Scroll' a second time will display the trouble history log (refer to the [Trouble History Log](#) section for more on this feature). If there are no logged trouble events, the display reverts back to displaying the real-time voltage and amperage of the lead pump.
4. The green Pump Running LED will light any time the pump is operating (a delay of approximately 1-2 seconds will occur from the time the motor actually starts/stops, until the LED reacts; this is the time the panel takes to confirm the state of the motor).
5. After each completed pump run cycle, the Pump Performance parameters are updated to reflect the most current data. Refer to the [Pump Performance](#) section of this manual for more on this feature.

## 7.1 Manual Run Operation

The lead pump in each set of pumps can be operated manually (provided there are no detected trouble conditions that would prevent it from running) by pressing and holding the Manual Run ('Enter') button on the corresponding membrane overlay. The corresponding Pump Running LED will light and the pump voltage, amperage and wattage will be available on the LCD.

**Note that it may take a few seconds for the Manual Run button to turn on the pump and Pump Running LED.**

Releasing the button will stop the pump. Each pump can be operated individually by using Test Mode and waiting for each pump to become active. Alternatively, choosing the BOTH mode will cause all pumps to run simultaneously (BOTH mode will only allow viewing Voltage, Current and Wattage for the Lead pump).

**It is possible to manually alternate the lead / lag relationship from one pump to the other. Refer to the [Alternate](#) section of this manual for more on this feature.**

## 7.2 High Level Alarm Operation

A High Level Alarm is initiated if the liquid level in the tank reaches the high level as determined by the Alarm pressure switch for **either** of the Lead or Lag pumps (in a wireless pump, only the alarm switch for the active pump is recognized). If a High Level is detected on either set of pumps, the panel will energize the contactor for that sets Lag pump, turn on the corresponding High Level Alarm LED and the LCD will display 'Delayed Alarm'. This condition will remain for the duration determined by the Alarm Delay setting to allow time for all pumps to collectively pump down the station.

**Note: There is no Redundant Run feature with the Quadplex Protect Plus Panel; redundancy is achieved by the lag pump in either set of pumps being allowed to run when a High Level Alarm is detected.**

If the High Level condition for a given set of pumps is cleared within the delay time, the contactor for that sets Lag pump will be de-energized, the corresponding High Level Alarm LED will go out and the LCD message will clear and the "DELAYED ALARM" message will also be recorded in the Trouble History Log. If after the Alarm Delay time has expired and the High Level condition is still present, the panel will indicate an alarm, including the Alarm Lamp, Buzzer, High Level Alarm LED, High Level Alarm LCD message and Dry and Remote Sentry Contacts. All indications will self-clear once the level in the tank falls below the preset limit of the Alarm pressure switch, unless the Alarm Latch option is set to ON. The LCD message will clear and the event will be recorded in the Trouble History Log.

## 7.3 Trouble Alarm Indication

In addition to a High Level Alarm, the E/One Sentry Protect Plus Quadplex panel can detect several conditions that do not warrant immediate attention but that could eventually lead to a high level alarm or indicate other system problems. These are shown in the table below along with the indications that accompany each. For each condition, the state of the Ready LED, Trouble LED, Alarm Lamp, Audible Alarm, LCD Display, Panel Contactor (used to disable the pump) and Dry and Remote Sentry (switchover dry contacts) are shown. Refer to the [Trouble Operation Section](#) of this manual for a

complete description of these conditions. Whether or not the condition can be latched is also indicated (refer to the [Alarm Latch Setting](#) in the Initialize System section of this manual for more on this option).

Trouble Condition	Ready LED	Trouble LED	Lamp	Audible Alarm	LCD Message	Pump Disabled	Dry and Remote (SODC) contacts	Can be latched?
Alarm Protect	Blinks	On	Flash	Off	P1/2 ALARM PROTECT	No	Open	No
Faulty Wattmeter	On	On	Flash if set	Off	P1/2 FAILED WM COM	No	Open	No
Comm Lost	On	On	Flash	Off	COMM LOST	No	Open	No
Brownout	Blinks	On	Flash if set	On if both pumps	P1/2 BROWNOUT	Yes	Open	No
Overvoltage	Blinks	On	Flash if set	On if both pumps	P1/2 OVER VOLTAGE	Yes	Open	No
Run Dry (1st 3)	Blinks	On	Flash if set	On if both pumps	P1/2 RUN DRY	20 minutes at a time	Open	No
Overpressure (1st 3)	Blinks	On	Flash if set	On if both pumps	P1/2 OVERPRESSURE	20 minutes at a time	Open	No
Run Dry (after 3rd)	Blinks	On	On	On if both pumps	P1/2 RUN DRY	20 minutes at a time	Closed	Yes
Overpressure (after 3rd)	Blinks	On	On	On	P1/2 OVERPRESSURE	Yes - until cleared	Closed	Yes
Run Limit	On	On	Flash if set	Off	P1/2 RUN LIMIT	No	Open	No
Leak Detect	On	On	Flash	Off	P1/2 LEAK DETECTED	No	Open	No

Table 1 – Trouble Alarm Indications

## 7.4 Audible Alarm Manual Silence

Anytime the audible alarm / buzzer is activated by the system, it can be silenced by pressing the 'SILENCE' button located on the exterior underside of the enclosure.



## 7.5 Pump Performance

**Note: The following information applies independently to each set of pumps within the station, and is viewed and managed by that sets own user interface membrane.**

When power is first applied to the panel, the Normal Operation is the default mode, as indicated by the green LED adjacent to Normal Operation being illuminated. While in the Normal Operation Mode the real-time operating voltage and amperage of the lead pump will be displayed on the LCD screen simultaneously. Pressing the 'Scroll' button one time will display the real-time operating wattage. After each completed Pump Run cycle, all operating parameters are updated with the most recent data. If power is lost during a Pump Run cycle, only data for that cycle will be lost, all other data is maintained in non-volatile memory.

Pressing the 'Mode' button until the LED adjacent to Pump Performance is illuminated will display several other system operating parameters. The following are displayed under Pump Performance:

### 7.5.1 Pump 1 / 2

This field allows choosing which pumps operating parameters will be displayed. From the Display: Pump 1/2? screen, use the ↑ 'A' and ↓ 'B' keys to change the selection from 'PUMP 1?' to 'PUMP 2?'. Once the desired pump is selected, press 'Enter' to accept. By default the parameters for Pump 1 will be displayed. The LCD will display 'Retrieving...', after which the following parameters for the chosen pump will be displayed.

### 7.5.2 Normal Hour Meter

Accumulated runtime - The time is displayed as **Run: HH:MM:SS**, where HH are the total hours, MM minutes, and SS seconds since the last reset. The maximum runtime value that can be stored is 999999:59:59 (> 114 years). Beyond this limit the value automatically resets to 00:00:00.

### 7.5.3 Normal Cycle Counter

Accumulated cycles - The value is displayed as **Cycles: XX**, where XX are the total accumulated pump cycles since the last reset. The maximum cycle value that can be stored is 1 billion. Beyond this limit the value automatically resets to 0.

### 7.5.4 Manual Run Hour Meter

Accumulated Manual Run runtime - For service and troubleshooting purposes, the Manual Run hours are tracked separately from normal hours. This value is displayed as **MR: HH:MM:SS** and has the same limits as the normal hours.

### 7.5.5 Manual Run Cycle Counter

Accumulated Manual Run cycles - For service and troubleshooting purposes, the Manual Run cycles are tracked separately from normal cycles. This value is displayed as **MR Cycles: XX** and has the same limits as the normal cycles.

### 7.5.6 Last Runtime

Last runtime represents the duration of the previous completed pump cycle. This value is displayed as **Last Run: XXXs**, where XXX is the last runtime duration in seconds.

### 7.5.7 Minimum Runtime

The minimum runtime represents the duration of the shortest completed pump cycle since the last reset. This value is displayed as **Min Run: XXXs**, where XXX is the minimum runtime duration in seconds.

### 7.5.8 Maximum Runtime

The maximum runtime represents the duration of the longest completed pump cycle since the last reset. This value is displayed as **Max Run:HH:MM:SS** and has the same limits as the normal hours.

### 7.5.9 Average Runtime

The average runtime represents the duration of the average completed pump cycle since the last reset. This value is displayed as **Ave Run: XXXs** where XXX is the average runtime duration in seconds.

### 7.5.10 Minimum Amps

The minimum Amperage reading represents the minimum amperage draw the motor has experienced while running since the last reset. This value is displayed as **Min Amps: X.XA** where X.X is the minimum Amperage to the nearest tenth.

### 7.5.11 Maximum Amps

The maximum Amperage reading represents the maximum amperage draw the motor has experienced while running since the last reset. This value is displayed as **Max Amps: X.XA** where X.X is the maximum Amperage to the nearest tenth.

### 7.5.12 Average Amps

The average Amperage reading represents the average amperage draw the motor has experienced while running since the last reset. This value is displayed as **Ave Amps: X.XA** where X.X is the average Amperage to the nearest tenth.

### 7.5.13 Minimum Volts

The minimum Voltage reading represents the minimum voltage the motor has experienced while running since the last reset. This value is displayed as **Min Volts: XV** where X is the minimum Voltage to the nearest volt.

### 7.5.14 Maximum Volts

The maximum Voltage reading represents the maximum voltage the motor has experienced while running since the last reset. This value is displayed as **Max Volts: XV** where X is the maximum Voltage to the nearest volt.

### 7.5.15 Average Volts

The average Voltage reading represents the average voltage the motor has experienced while running since the last reset. This value is displayed as **Ave Volts: XV** where X is the average Voltage to the nearest volt.

### 7.5.16 Minimum Watts

The minimum Wattage reading represents the minimum Wattage the motor has experienced while running since the last reset. This value is displayed as **Min Watts: XW** where X is the minimum Wattage to the nearest watt.

### 7.5.17 Maximum Watts

The next maximum Wattage reading represents the maximum Wattage the motor has experienced while running since the last reset. This value is displayed as **Max Watts: XW** where X is the maximum Wattage to the nearest watt.

### 7.5.18 Average Watts

The average Wattage reading represents the average Wattage the motor has experienced while running since the last reset. This value is displayed as **Ave Watts: XW** where X is the average Wattage to the nearest watt.

### 7.5.19 Leak Detected (read-only leak indication field, E/One explosion proof pumps only)

This option does not apply to hardwired pumps. Contact E/One for more information.

### 7.5.20 Clear Counters (cycles, hour meters, averages)

The clear counters option can be used to clear the following pump parameters: Normal Hours, Normal Cycle Counter, Manual Run Hours, Manual Run Cycle Counter, Last Run Time, Average Volts, Average Amps and Average Watts. From the Clear Counters menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'N' (no) and 'Y' (yes). Once 'Y' is selected, pressing 'Enter' will clear the stored values.

### 7.5.21 Clear Minimums and Maximums

The clear minimum and maximum option can be used to clear the following pump parameters: Minimum and Maximum Volts, Minimum and Maximum Amps, Minimum and Maximum Watts, and Minimum and Maximum Run Time. From the Clear Min/Max menu, use the ↑ 'A' and ↓ 'B' keys to alternate the selection between 'N' (no) and 'Y' (yes). Once 'Y' is selected, pressing 'Enter' will clear the stored values.

### 7.5.22 Clock Error

The clock error field indicates that there is a problem with the board's microprocessor timing. If this is the case, this field will display 'Clock Error: 1', otherwise it will show 'Clock Error: 0'. This is a self-clearing error. If this field is set to a '1', factory service should be contacted. This condition does **not** result in a trouble indication or LCD message and can only be verified by navigating to the Clock Error field within the Pump Performance mode.

## 8 Trouble Operation

Several less serious operating conditions can be detected and indicated to warn of pending, more serious faults. These conditions do not warrant an immediate response and may clear themselves given time. Refer to [Table 1](#) in the Trouble Alarm Indication section of this manual for a list of these conditions and the indications that result from each. As indicated, the Alarm Lamp can be set to flash for some of these cases by setting the Trouble Mode option (refer to the [Trouble Mode](#) option under the User Programmable Options section of this manual for more on this feature).

### 8.1 Excessive Runtime Operation

Excessive Runtime is an alarm that is initiated if an individual pump run cycle exceeds the set Run Limit value. If the Run Limit is exceeded, the panel will indicate a trouble alarm as determined by the Alarm Mode setting. In addition, the amber Trouble LED will light and a corresponding error message will be displayed on the LCD screen for the individual pump (P1/P2) which experienced the excessive run time. This alarm serves only as a visual indicator that this limit has been exceeded; operation of the pump is not affected.

### 8.2 Brownout Operation

Brownout is a motor protection feature that will disable power to the motor if the incoming AC Mains Voltage is below a predefined limit, typically 12% of the nominal nameplate rating. In the brownout mode, the pump is prevented from starting (if the pump is off) or is shut off (if the pump is running) until the voltage returns to within the desired range of operation, typically 10% of the nominal nameplate rating. When in the Brownout Protection mode, the panel will disable power to the pump, whether the motor is running or not and indicate a trouble alarm as determined by the Alarm Mode setting. In addition, the amber Trouble LED will light and a corresponding error message will be displayed on the LCD screen.

### 8.3 Overvoltage Operation

Overvoltage is a motor protection feature that will disable power to the motor if the incoming AC Mains Voltage is above a predefined limit, typically 12% of the nominal nameplate rating. In the Overvoltage mode, the pump is prevented from starting (if the pump is off), or is shut off (if the pump is running) until the voltage returns to within the desired range of operation, typically 10% of the nominal nameplate rating. When in the Overvoltage Protection mode, the panel will disable power to the pump, whether the motor is running or not and indicate a trouble alarm as determined by the Alarm Mode setting. In addition, the amber Trouble LED will light and a corresponding error message will be displayed on the LCD screen.

### 8.4 Run Dry Operation

Run Dry is a motor protection feature that will disable power to the motor if the power consumption falls below a predefined limit. The factory default limit is based on the DIP switch settings and may vary for different locations. Refer to the [Run Dry](#) (Low Watts) menu within the Initialize System mode to see what the current value for this setting is. Contact E/One if you require more information on this setting. This limit is affected by the incoming AC Mains Voltage; as the Voltage fluctuates from nominal, this limit is automatically adjusted in order to obtain the same perceived pump power as would be seen at nominal Voltage. In addition, this value can be changed **under direction of the factory** to accommodate various system variables. When a Run Dry condition is detected, the pump is shut off and a 20 minute lockout period begins. During this time, the Trouble LED is illuminated, the Run Dry error message is displayed on the LCD and the pump is not allowed to run. After the 20 minute lockout, the pump is allowed to run; if the Run Dry condition is still present, a second lockout period begins and the cycle will repeat. During the first three lockout periods, the panel will indicate a Trouble Alarm (refer to the [Trouble Alarm](#) option within the Normal Operation section of this manual for more information on this feature). If after the third lockout period (60 minutes) the condition has not been removed and the pump attempts to start, the panel will indicate an alarm condition including the Alarm Lamp, Trouble

LED, Dry and Remote Sentry contacts, but no Audible Alarm. The pump is retested every 20 minutes indefinitely and will self-clear if a full pump cycle completes under normal conditions. If a High Level Alarm is detected at any time during the lockout sequence, the panel will respond by issuing a Delayed high level alarm, energizing BOTH pumps contactors and allowing all pumps to run. Refer to the Delayed Alarm section for more information. It is assumed that if a high level alarm is present, despite the Run Dry condition there is liquid in the tank and a high level alarm is necessary.

In a Run Dry condition, the 20 minute lockout period can be bypassed by pressing the Manual Run button ('Enter'). This should only be performed by E/One Certified Service Personnel.

## 8.5 Overpressure Operation

Overpressure is a motor protection feature that will disable power to the motor if the power consumption rises above a predefined limit. The factory default limit is based on the DIP switch settings and may vary for different locations. Refer to the [Overpressure](#) (Hi Watts) menu within the Initialize System mode to see what the current value for this setting is. This limit can be changed **under direction of the factory** to accommodate various system variables. When an Overpressure condition is detected, the pump is shut off and a 20 minute lockout period begins. During this time, the Trouble LED is illuminated, the Overpressure error message is displayed on the LCD and the pump is not allowed to run regardless of the liquid level in the tank. After the 20 minute lockout, the pump is allowed to run; if the Overpressure condition is still present a second lockout period begins and the cycle will repeat. During the first three lockout periods, the panel will indicate a Trouble Alarm (refer to the [Trouble Alarm](#) option within the Normal Operation section of this manual for more information on this feature). If after the third lockout period (60 minutes) the condition has not been removed and the pump attempts to start, the panel will indicate an alarm condition including the Alarm Lamp, Trouble LED, Dry and Remote Sentry contacts, and Audible Alarm. In addition, unlike for a Run Dry condition, in Overpressure the pump will not be retested every 20 minutes indefinitely because of the buildup of pressure that occurs during each retest. After the third failed retry, the pump is disabled indefinitely until it can be serviced. If a High Level Alarm is detected at any time during the lockout sequence, the panel will respond by issuing a Delayed high level alarm, energizing BOTH pumps contactors and allowing all pumps to run. Refer to the [High Level Alarm](#) section for more information.

In an Overpressure condition, the 20 minute lockout period can be bypassed by pressing the Manual Run button ('Enter'). This should only be performed by E/One Certified Service Personnel.

## 8.6 Alarm Circuit Protection Active

Each printed circuit board contains circuitry to help limit any permanent damage due to a mis-wire or short within the alarm pressure switch circuit. While this does not guarantee protection in all cases, if activated, this feature acts as a resettable fuse and will temporarily open the circuit to help prevent damage to the circuit board itself. If conditions warrant and this circuit has been activated, the panel will be unable to detect if the alarm pressure switch is closed. This condition will be indicated by a blinking Ready LED, steady Trouble LED, flashing alarm lamp and a corresponding message displayed on the LCD screen.

## 8.7 Faulty Watt-meter Operation

A faulty watt-meter indicates that the Protect Plus Panel has lost its ability to detect any of the following conditions: Brownout, Overvoltage, Run Dry, and Overpressure. This will be indicated with the amber Trouble LED and a corresponding error message displayed on the LCD screen. If this condition is present, contact E/One service personnel. While the pumps will still operate in this mode, there is no ability to detect if any of these conditions are present; damage to the pump and/or system could occur.

## 8.8 Comm Lost Indication

This error indicates that the communication link between the two individual circuit boards that correspond to each set of pumps is not functioning properly. In this situation, the affected set of boards will revert to two individual Simplex circuit boards and operate their respective pumps as such. If this condition is present, contact E/One service personnel. While the pumps will still operate in this mode, the system will not operate efficiently for a Quadplex application.

## 8.9 Leak Detect Operation (E/One explosion proof pumps only)

This option does not apply to hardwired pumps and should be left in the default (OFF) setting. Contact E/One for more information.

## 9 Diagnostics

Each set of printed circuit boards within the panel is equipped with a diagnostic tool to verify that all related outputs are operational. These tests are available from the Diagnostic Mode and are divided into 3 categories. These categories can be selected using the 'Scroll' button.

### 9.1 LED Test

The first diagnostic test verifies operation of all LED's on the dead front overlay. The top four LED's will light in sequence and remain lit. The bottom 8 LED's will sequence one after the other and repeat. If any LED does not light during this test, consider having the dead front or panel serviced. Press 'Scroll' to move to the next test.

### 9.2 Button Test

The next diagnostic test verifies that all of the buttons on the dead front overlay work and can be detected by the panel. Pressing each button should result in that buttons name / function being displayed on the LCD screen. If any button does not register on the LCD display, consider having the dead front or panel serviced. For this test, pressing 'Scroll' will move to the next test, so it is suggested to verify this button last.

### 9.3 Relay Test

**Warning! The system is taken off-line during the relay test and will be unable to respond to a high level alarm and may prevent the pump from running. Be sure to exit this feature and ensure the Ready LED is lit prior to leaving the station.**

The last diagnostic test verifies the operation of all control relays relative to the corresponding set of pumps. This includes the Manual Run relay, Alarm Lamp relay, Audible Alarm relay, Dry and Remote Sentry Contacts relay, and the Panel Contactor Coil relay. The test allows each board to independently cycle the associated relays to verify both circuit boards are operational. Use the 'Scroll' button to select each relay individually, then the ↑ 'A' and ↓ 'B' buttons can be used to alternate the state of the selected output. Each output can then be verified for proper operation individually. If any relay does not operate as expected the panel should be serviced. Press 'Scroll' to repeat the diagnostic test, or 'Mode' to exit.

## 10 Sentry Advisor Option

Panels can be configured to allow communication using the optional Sentry Advisor Remote Monitoring System. With the proper board configuration and operating software, the panel can be remotely monitored for various system operating parameters. Refer to E/One document NA0451P01 – 'Sentry Advisor Remote Monitoring System Operation Manual' for a complete description of the features of this system. Contact E/One Customer Service for more information on compatibility of this option with existing panels.

## 11 Trouble Shooting

The following chart is meant to address some common panel related issues. For more detailed information or pump specific troubleshooting, please refer to the appropriate Service Manual or contact E/One service personnel.

### 11.1 Troubleshooting Chart

Fault	Symptom	Possible Cause	Test
		Low incoming voltage	<ul style="list-style-type: none"> <li>This testing may need to be done by qualified personal</li> <li>Check voltage at panel per manual</li> </ul>
		Blown fuse or circuit breaker	<ul style="list-style-type: none"> <li>Verify all fuses or breakers feeding the panel are on (closed)</li> </ul>
		DIP switches incorrect	<ul style="list-style-type: none"> <li>Verify DIP switches are correct and being read correctly by the PCB (Initialize System menu)</li> </ul>
		Board out of Calibration	<ul style="list-style-type: none"> <li>Verify incoming mains voltage and current match the LCD readout</li> </ul>
		High incoming voltage	<ul style="list-style-type: none"> <li>This testing may need to be done by qualified personal</li> <li>Check voltage at panel per manual</li> </ul>
		DIP switches incorrect	<ul style="list-style-type: none"> <li>Verify DIP switches are correct and being read correctly by the PCB (Initialize System menu)</li> </ul>
		Board out of Calibration	<ul style="list-style-type: none"> <li>Verify incoming mains voltage and current match the LCD readout</li> </ul>
RUN DRY	Pump runs continuously	Short in cable, manual run circuit shorted, Equalizer/on-off switch malfunction, short in pump, alarm switch malfunction	<ul style="list-style-type: none"> <li>Refer to Service Manual and perform continuity test</li> <li>If wireless or explosion proof refer to appropriate Service Manual</li> <li>Refer to Service Manual and perform Megger insulation test</li> </ul>
OVERPRESSURE	Excessive pump pressure	Discharge valve closed, check valve malfunction, line restriction, grinder restriction, bad motor	<ul style="list-style-type: none"> <li>Remove pump from discharge and retest with no discharge. i.e. pump back into station (wet well only)</li> <li>If problem is still present then refer to Service Manual for more testing</li> </ul>
RUN LIMIT	Pump running longer then set time	Tank size too large, stator worn, high in-flow	<ul style="list-style-type: none"> <li>Check amperage, wattage</li> <li>Change Excessive Run Time Limit</li> </ul>
No pump via ON/OFF switch	Pump will not run on own but will run in manual run	ON/OFF switch not working, tank ventilation blocked, trouble condition present	<ul style="list-style-type: none"> <li>Perform continuity test per Service Manual to determine if the switch is faulty</li> <li>Verify that the tank ventilation is clear</li> </ul>
Panel will not power up	LCD Display and/or LED's do not power up	Overlay or display not plugged in or properly, no power to the board, faulty LCD, faulty LED's	<ul style="list-style-type: none"> <li>Check to see that the display and overlay are plugged in properly, if this still does not fix try another display</li> <li>Check that wiring is correct per wiring schematic</li> <li>Check between neutral and both sides of the alarm breaker for 120v to determine if it is bad</li> <li>Check voltage at alarm feed, if no power at this location, replace board</li> <li>Perform self-tests via Diagnostic Menu</li> </ul>
Contactors in panel will not engage	Pump will not run	No power to contactor coil, contactor bad	<ul style="list-style-type: none"> <li>Check voltage at A1 to A2 coil on contractor</li> <li>Check continuity on contactor coil</li> <li>Perform self-tests via Diagnostic Menu</li> </ul>
Contactors in panel engages but pump will not run	Pump will not run	No power coming out of contactor, loose wires, pump not working	<ul style="list-style-type: none"> <li>Check for power across L1 &amp; L2 (L1 &amp; N) to see if power is going into the contactor, if no power then check incoming power and breaker</li> <li>Then check T1 &amp; T2 to see if it is going through the contactor, if not then replace the contactor</li> <li>Check voltage at the terminal block to see if power is there</li> <li>If all this is ok then refer to Service Manual for trouble shooting the pump</li> </ul>

<b>Fault</b>	<b>Symptom</b>	<b>Possible Cause</b>	<b>Test</b>
Panel does not protect against fault conditions	No trouble faults, pump is not disabled for Brownout, Overvoltage, Run Dry, Overpressure, etc...	Protection mode turned off, panel contactor not functioning, panel contactor mis-wired, faulty PCB, DIP switches not set properly	<ul style="list-style-type: none"> <li>• Verify Protect Mode is set to 'ON' (Initialize System Menu)</li> <li>• Verify board can command contactor to open using the Relay Diagnostic menu</li> <li>• Verify DIP switches are set properly, and that the panel is reading them correctly (Initialize System Menu)</li> </ul>
Manual run not working	Manual run does not make pump run	Panel mis-wired, faulty manual run button, faulty PCB, trouble condition present	<ul style="list-style-type: none"> <li>• Check wiring of panel, all wires need to be per wiring instruction</li> <li>• Verify Manual Run is possible via Diagnostic menu</li> </ul>
Watt-meter Failure	LCD displays WM COMM FAILURE	Brown wires from PCB are loose or mis-wired, faulty PCB, pump breaker off or tripped (open)	<ul style="list-style-type: none"> <li>• Verify wires are connected as per decal inside panel cover</li> <li>• Replace PCB if necessary</li> </ul>

## 12 Appendix

### 12.1 LCD Messages

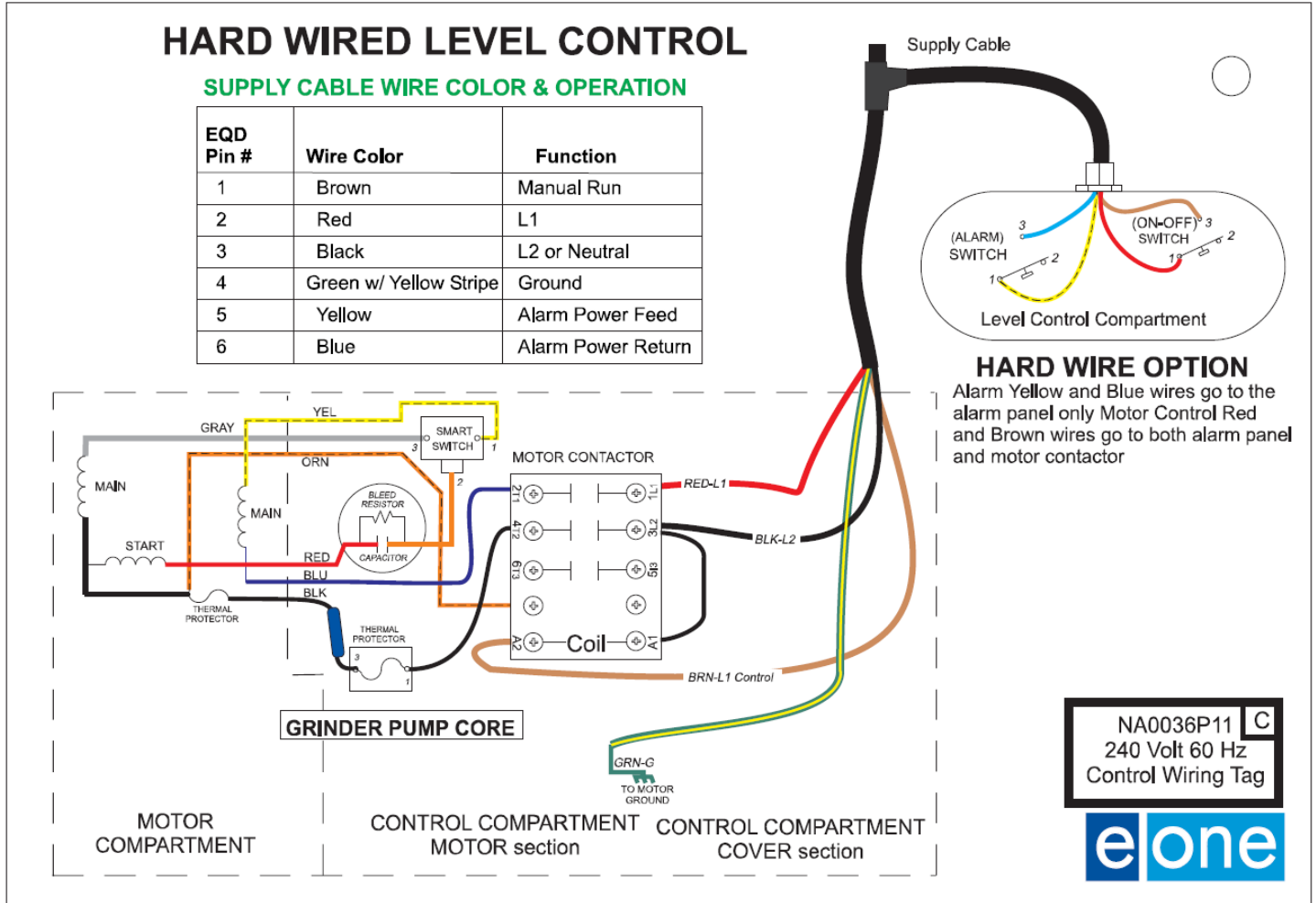
The following messages may be displayed on either of the two LCD readouts to indicate various system conditions. Each display corresponds to one set of two pumps within the system.

- P1/2 ALARM PROTECT – indicates a short or mis-wire in the alarm circuit causing the circuit board to open the circuit to prevent permanent damage to the printed circuit board - the system is unable to detect an alarm for a pump when this message is displayed
- P1/2 HIGH LEVEL – indicates a High Level is still present even after enabling all pumps
- P1/2 DELAYED ALARM – indicates a High Level is present but all pumps are enabled and pumping together
- P1/2 FAILED WM COM – indicates a circuit board is unable to read a pumps voltage, amperage, or wattage
- P1/2 OSC FAIL – indicates there is a problem with the microprocessor timing and that certain external communication may be unavailable
- P1/2 DIP SW ERROR – indicates that the DIP switches are set to an invalid setting, or that there is a hardware problem with the switches themselves
- P1/2 BROWNOUT – indicates the AC mains voltage feeding a pump is below the minimum limit
- P1/2 OVER VOLTAGE – indicates the AC mains voltage feeding a pump is above the maximum limit
- P1/2 RUN DRY – indicates a pumps wattage draw is below the minimum limit
- P1/2 OVERPRESSURE – indicates a pumps wattage draw is above the maximum limit
- P1/2 RUN LIMIT – indicates a pump runtime has exceeded the limit set under the Run Limit setting
- P1/2 LEAK DETECTED – This message does not apply to hardwired pumps - contact E/One for more information
- WIRELESS ALARM – This message does not apply to hardwired pumps - contact E/One for more information
- COMM LOST – indicates that the communication between the two circuit boards making up the quadplex system is not functioning
- LATCHED ALARM – indicates that a High Level Alarm has occurred and is latched, but is not currently present
- LATCHED RD/OP – indicates that a Run Dry or Overpressure has occurred and is latched, but is not currently present
- QUADPLEX TEST MODE – indicates that the panel is in the test mode which should be cleared prior to leaving the station
- PUMP 2 NOT AVAIL – from the pump performance menu, if attempting to look at the data for pump 2, this message indicates that pump 2 data is unable to be retrieved

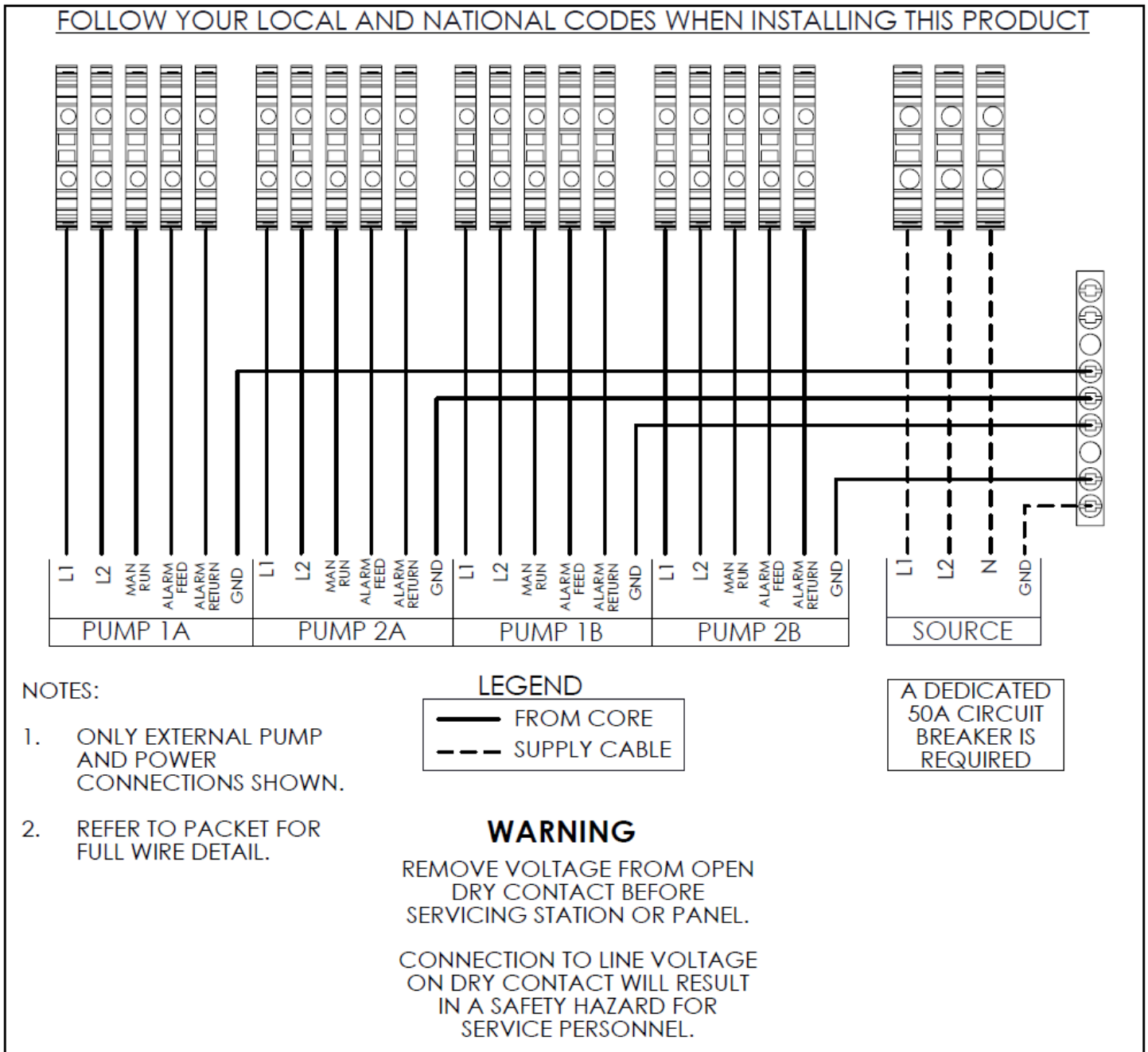


## 12.2 Wiring Diagrams

### 12.2.1 Typical Pump Wiring Diagram - 240V 2-Leg (Extreme Hardwired)



12.2.2 240V, 2-leg panel - External Pump and Power Connections



Refer to the wire reference sheet attached to the inside front cover of the panel for a more detailed wiring diagram.



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