



FilterMinder

Users's Manual

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FilterMinder Capabilities

A Pool's filter system is often the most overlooked part of a pool, yet a poorly maintained filter can cause water purity problems, increased energy usage and premature pump failure.

The FilterMinder is designed to monitor filters for proper operation and then clean these filters as needed to assure proper filter system performance. The FilterMinder does this by measuring either the time since the filters were last washed or inlet pressure to the filters (if equipped with the optional pressure sensor) and then automatically sequencing valves and relays as necessary to perform a complete backwash of single or multiple filter systems. Initiation and execution of this backwash sequence can be totally automatic, requiring no operator intervention.

If fully automatic operation is not desirable, the FilterMinder can be configured to only monitor the filter system and display its status. The bar graph indicator on the FilterMinder can then be used as a visual indication of when a backwash is required and pool maintenance personnel can initiate the backwash sequence from the keypad (semi-automatic operation). Once initiated, the backwash will advance automatically to assure that all valves and relays are sequenced correctly and proper timing is executed to assure a complete backwash of all filters. This frees maintenance personnel to perform other pool maintenance tasks while the filter system is backwashing.

Backwash Sequence

Once a backwash operation is initiated, FilterMinder first turns off the heater and any other device such as a chemical feeder that is attached to the Heat relay. The controller waits for the heater to cool off and all chemicals to flush into the pool and then shuts off the Pump relay. The Multiport valve is now rotated to the Filter 1 position and the Auxiliary relay is energized for possible use with a pressure boost pump or electrically actuated priority valve. The controller then waits for all diaphragm valves fed from the Filter 1 position to fill. The Pump is then turned on and backwash of the first filter begins. When this filter is clean, the Pump relay and the Auxiliary relay are turned off and the Multiport valve is rotated to the Interfilter position. The controller again waits for the diaphragm valves to move back into normal operating position. If a settling pond is being used or if time is needed to allow effluent to drain, the controller will turn the Pump relay back on and resume filtering while the Multiport valve is in the Interfilter position. When it is time to advance to Filter 2, the Pump relay is again turned off, the Multiport valve is advanced to Filter 2 and the backwash sequence continues as it did for Filter 1. Filter systems containing up to 6 filters can be backwashed in this manner. After the last filter in the system is backwashed, the Multiport valve is returned to the home position. The controller then waits for all diaphragm valves to return to their normal operating positions and finally the Pump and Heat relays are energized to resume normal pool operation until the next backwash is required.

In addition to the above standard sequence, FilterMinder can be configured to leave the pump and heater on through the backwash operation. Many operators feel that this modified sequence reduces wear on the pump associated with starting and stopping. In fact, the easy to navigate System Setup Menu allows almost any filter configuration or backwash sequence to be accommodated.

Front Panel Features

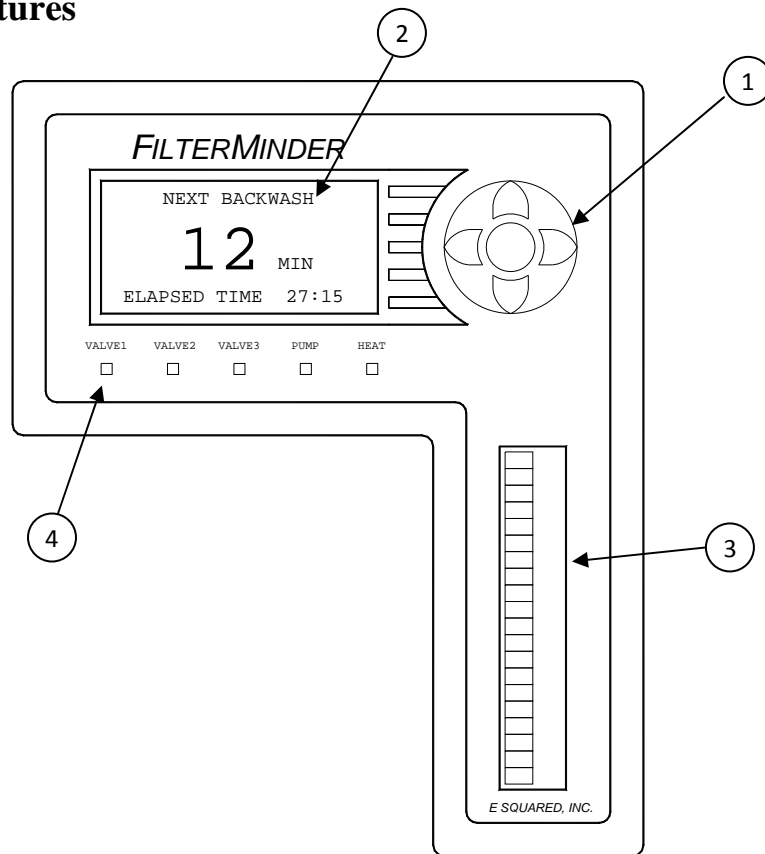


Figure 1

- ① The key pad contains five keys for navigating the menu system and modifying system parameters. Press the center “Select” key to enter the menu system. The “Up” and “Down” keys can now be used to scroll through the menu to the desired function. Then the Select key can be pressed again to select this function. Once selected, the parameters of interest can be modified using the Up and Down keys. On numeric parameters, these keys can be held down to increase or decrease automatically. Once the desired value is reached, the Select key can be used to save the new value and return to the menu. Similarly, the “Left” and “Right” keys can be used to navigate the menu system. The Right key will take you forward one level in the menu system and the Left key will take you back.
- ② The 128 x 64 pixel LCD display provides easy to read information about the current system status and provides a helpful interface for changing system parameters. Important values are displayed in large characters for easy viewing from a distance. Where appropriate, brief instructions are presented to the user. The display is transreflective for easy viewing in bright sunlight and contains a backlight for viewing in dim ambient lighting.
- ③ The bright 20 element LED bar graph provides a graphical representation of filter system capacity. A new, clean filter will show as empty (no bars lit). As the filter accumulates particulates, the bar graph display increases until the filter reaches capacity (all bars lit). The first 16 bars are green to show normal operation. The last four bars are red to indicate that the filter needs to be backwashed, or will soon be backwashed if automatic backwash is selected.
- ④ These Five Status LEDs provide information on the state of the Pump, Heater, Multiport Valve and any other valve or device connected to the Valve3 relay.

Access Control

The FilterMinder enclosure contains relays that can switch high currents at up to 250 volts. The latches on this enclosure are designed to accept a padlock to prevent unauthorized access.

WARNING

It is expected that some form of lock be used for safety as well as security and that access to the wiring inside the enclosure be limited to qualified service personnel.

Since the FilterMinder display and keypad are accessible from the outside of the case, some further means of preventing inadvertent or unauthorized operations of the controller is required. Three different levels of security have been provided. These security levels are set via two switches inside the case. These switches are located on the back side of the enclosure door just above the wiring connector.

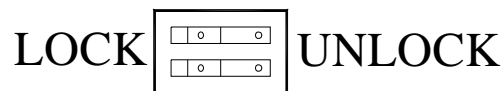


Figure 2

The first level of access allows all operations to be performed from the keypad. All parameters can be viewed and changed and backwash cycles can be initiated as desired. This level of access is selected by placing both switches in the UNLOCK position.

The second level of access allows backwash operations to be performed from the keypad and allows all parameters to be viewed, but does not allow the operator to change any of these parameters. Attempts to save altered parameters will result in the message “MEMORY IS LOCKED”. This level of access is selected by placing the top switch in the UNLOCK position and the bottom switch in the LOCK position.

The third level of access does not allow any operations from the keypad. The parameters can be viewed, but attempts to save will result in the message “MEMORY IS LOCKED” and attempts to execute a backwash or manipulate the pump or heater will result in the message “FRONT PANEL OPERATIONS ARE CURRENTLY LOCKED OUT”. This level of access is selected by placing both switches in the LOCK position.

If a Remote Access package has been installed, all functions can be accessed remotely regardless of security switch settings. Remote access relies on Password protection to prevent unauthorized access from the web interface. See the Remote Access Package documentation for details of this capability.

Operation

Press the center of the keypad to enter the operations menu.

BACKWASH NOW

This selection allows you to start a backwash from the keypad. The lower line on the display tells you that the FilterMinder is currently **FILTERING** pool water. Press the Select key once to start the backwash cycle. The system will now advance through the backwash cycle automatically, displaying the current stage of the backwash at the top of the display and counting down the seconds until the next stage at the bottom of the display. If you wish to abort this stage and move on to the next, press the Select key to advance. If you wish to terminate the backwash cycle and return to **FILTERING**, press the Down key to point to **CANCEL** and then the Select key to execute this request.

VIEW COUNT

FilterMinder keeps a log of the number of backwash cycles that have been completed. This count is useful to verify that a unit that is configured to backwash based on pressure settings is not backwashing too frequently. Excessive backwash operations could indicate a problem with the filter system or could be an indication that the trip pressure is set too low or that the surge delay needs to be increased. The log can be cleared to zero from this screen if desired.

VIEW ALARMS

The controller has two safeguards built in to prevent excessive discharge of pool water.

If the internal microcontroller energizes the motor to rotate the Multiport valve and the valve does not make it to the desired port within 120 seconds, FilterMinder de-energizes the Multiport valve motor and turns off the Pump and Heat outputs. A message is displayed on the LCD display indicating why the pool has been shut down.

When backwash is initiated by pressure sensors, if the setpoint is set too close to the normal operating pressure or if there is a problem with an obstruction somewhere in the effluent line, the FilterMinder will perform one backwash cycle after another. This situation has the potential to empty large quantities of pool water out of the waste line while never addressing the actual problem. In situations like this where less than five minutes elapse between subsequent backwash operations, after three backwash cycles the Pump and Heat outputs are turned off and a message is displayed indicating why the pool was shut down.

In both cases, navigate the menu system to the **VIEW ALARMS** screen. The current alarm status will be displayed. Select **YES** to clear the alarm flags. The Pool will then re-start automatically.

CONTRAST ADJUST

The LCD display used in the FilterMinder is designed to provide excellent readability in both dim and bright ambient light situations and over all specified operating temperatures. The user has the ability to maximize this readability by adjusting the bias voltage of the LCD for maximum contrast in their particular installation. Use the Left and Right keys to adjust the display for the best viewing, then press the center Select key to save this new bias voltage in nonvolatile memory.

PUMP/HEAT CONTROL

The Pump and Heat output relays can be turned on and off as desired from this screen. Interlocks are provided to prevent thermal stress on the Heater. The Heater cannot be turned on unless the Pump is running. The Pump cannot be turned off if the Heater is running. After the Heater is turned off, a sufficient "Cool Down" interval must elapse before the Pump can be turned off. Messages indicating these interlocks are displayed if a disallowed operation is attempted.

SET AUTO MODE

Four different choices are available for backwash cycle initiation:

MANUAL ONLY With this selection, backwash operations will only commence if initiated from the BACKWASH NOW screen.

TIME INTERVAL With this selection, filters will be backwashed periodically based on a user selected period of time. Selection of this mode will automatically advance you to the INTERVAL SETPOINT screen so that the currently configured backwash interval can be viewed and adjusted. The interval selected is the number of seconds from the start of one backwash cycle to the start of the next backwash cycle. When in this mode of operation, the bar graph indicates the amount of time remaining until the start of the next backwash. Each illuminated bar indicates that 5% of the time remaining until the next backwash has elapsed. When all bars are lit, a new backwash operation will be initiated automatically.

INLET PRESSURE If a pressure sensor is installed at the inlet to the filter bed, it is possible to backwash only when needed. As the filter bed becomes clogged with debris from the pool, the pressure at the inlet of the filter increases. This decreases the flow through the filter and puts additional strain on the pump motor. By setting a trip pressure slightly above the normal operating inlet pressure of a clean filter system, the filters will be cleaned automatically as needed to maintain this normal operating inlet pressure. Selection of this mode will automatically advance you to the PRESSURE SETPOINT screen so that the currently configured trip pressure can be viewed and adjusted. Be careful to select a trip pressure sufficiently above the normal operating inlet pressure to balance water usage with the desire for a clean filter system. When in this mode of operation, the bar graph indicates the current inlet pressure of the filter system as a percentage of the difference in pressure between a clean new filter and the configured trip pressure. A quick glance at the bar graph will let you know how dirty the filter system currently is.

EXTERNAL SWITCH It is also possible to install a less expensive pressure differential switch across the filter system. This arrangement has the advantage of being immune to restrictions between the outlet of the filters and the pool. The disadvantage is that there is no visible indication of what the differential pressure currently is. Output from the differential pressure switch is simply an open or closed switch. Alternately, any external switch such as a set of relay contacts controlled by a facility monitor or SCADA system

can be used to trigger a backwash using this mode of operation. When EXTERNAL SWITCH is selected, the bar graph display is inactive.

In any mode of operation, backwash can still be manually triggered from the Remote Access package, if installed. Also, backwash operations can always be initiated from the keypad unless front panel operation is locked out by the LOCK/UNLOCK switches inside the enclosure.

SYSTEM SETUP

All time intervals and many other operating modes and parameters can be configured using this sub-menu. These parameters have been grouped here because once the system is configured, it is not generally necessary to access these parameters in the course of normal pool operations.

INTERVAL SETPOINT This parameter is also available from the SET AUTO MODE menu if TIME INTERVAL is selected. The value selected is the number of minutes from the start of one backwash cycle to the start of the next. Valid values range from 5 to 9999 minutes (6.9 days). The interval should not be too short or it will trip the WE ARE BACKWASHING TOO OFTEN alarm message. To select an appropriate value, perform a backwash cycle. Then, using some means of measuring filter system inlet pressure, measure the amount of normal pool operation time required to increase this pressure by about 10 PSI. This should provide a reasonable starting place to set the interval setpoint.

PRESSURE SETPOINT This parameter is also available from the SET AUTO MODE menu if INLET PRESSURE is selected. The value selected is the filter system inlet pressure that must be met or exceeded for a SURGE DELAY period of time to cause a backwash cycle to be initiated. Valid values range from 0 to 50 PSI. The trip point should not be too close to normal operating pressure or it will trip the WE ARE BACKWASHING TOO OFTEN alarm message. A value between 5 and 10 PSI above the pressure observed on a clean filter is usually acceptable.

BASELINE PRESSURE When a pressure sensor is present in the inlet to the filter system, the bar graph is used to indicate the current health of the filter system. To provide an accurate indication, FilterMinder must be told what minimum inlet pressure to use as a reference or baseline. Valid values range from 0 to 50 PSI. This parameter should be set at the lowest pressure achieved with clean, new media in the filter system. As the media ages and gets contaminated or ground down from usage, the pressure observed just after a backwash operation will be found to increase, indicating that the media is starting to wear out. Observing the bar graph immediately after a backwash cycle will provide a visual indication of the health of the media. If five or more of the bars are still lit even when the filters have just been cleaned, the media should be evaluated to determine if replacement is in order.

BACKWASH DURATION This is the amount of time in seconds that each filter will be flushed once the valves have moved fully into the backwash position. Valid values range from 0 to 1800 seconds (30 minutes). To select an appropriate value, start a backwash operation and if possible, view the water being discharged out of the waste line. When the waste water starts to flow clear, sufficient time has been allowed for the backwash. If waste water cannot be observed, 180 seconds is a reasonable starting value for this parameter. Try experimenting with shorter values until the filter inlet pressure no longer returns to the base pressure after a backwash operation.

INTERFILTER DELAY If the waste water system is not able to handle large flows continuously, the FilterMinder can be configured to delay between backwashing of subsequent filters in a multiple filter system by return to normal filtering of pool water between backwashing of individual filters. The duration of this inter filter dwell time can be set via the Interfilter Delay. Valid values range from 0 to 9999 seconds (6.9 days). Since the heater is not operational during this inter filter dwell time, the delay should be kept to a minimum and for most systems can be left at 0.

VALVE SHIFT DELAY When a backwash operation is initiated, the Multiport valve is moved to the port associated with the filter being backwashed. Water starts to flow into the diaphragm actuated valves that must be shifted to accomplish the backwash. Some time is required for the control sections of these valves to fill up before the flow through the filter is reversed for backwash. We call this the Valve Shift Delay. This delay varies depending on the size of the valves used and the supply pressure of the control water. Values range from 0 to 180 seconds. A typical value would be 60 seconds for a single 8 inch valve. This value can usually be determined by listening to the sound of the valves. They tend to be rather noisy while shifting positions.

COOL DOWN DELAY Pool heaters rely on the flow of pool water past the heat exchanger to keep temperatures from becoming too great. Thermal safeties are employed to automatically turn off the heater when the internal temperatures become too high, but use of these safeties results in unnecessary thermal stress on the heat exchanger. The best approach is to turn off the heater in advance of shutting off the water flow and then allowing sufficient time for the heater to cool off before shutting off the water. FilterMinder takes this latter approach. Values range from 0 to 600 seconds (10 minutes). This same delay can be used to disable chemical feed systems to allow all dispensed chemicals to be flushed into the pool before backwash operations divert flows to the waste line.

SURGE DELAY In many installations, events other than backwash operations can cause momentary fluctuations in the pressure at the inlet to the filter system. It is undesirable to have these fluctuations inadvertently initiate a backwash operation. If a pressure sensor is used, the FilterMinder averages readings from this sensor over a 10 second interval to prevent wild fluctuation of the displayed value. In addition to this averaging, the system can be configured to verify that the inlet pressure remains above the selected backwash trip

pressure for an extended period of time before the decision to backwash is made. This period of time is called the SURGE DELAY and has values ranging from 0 to 180 seconds.

NUMBER OF FILTERS The FilterMinder can be configured to manage systems containing from 1 to 6 filters.

VALVE SHIFT MODE Most diaphragm actuated valves can be shifted while the circulation pumps are running but many operators prefer to shut the pump off while shifting valves to reduce stresses on the system (and noise). Other operators don't like to cycle the pumps any more than necessary and wish to leave them on while shifting valves. The VALVE SHIFT MODE allows the user to configure FilterMinder to do either. If the TURN PUMP OFF mode is selected, the pump relay is de-energized each time a valve is moved and remains off for the duration of the VALVE SHIFT DELAY before coming back on. If the LEAVE PUMP ON mode is selected, the pump relay remains energized all of the time. Regardless of which VALVE SHIFT MODE is selected, the heater relay is always de-energized and the system waits for a COOL DOWN period before moving any valves at the start of a backwash cycle and the heater relay remains off until the Multiport valve is returned home and all valves have returned to their normal Filter position.

SYSTEM STATUS

This screen allows the user to manipulate the state of the output relays and to see the states of the Multiport valve microswitches and the LOCK/UNLOCK switches. Relay 1 is used to energize/de-energize the Multiport valve motor. When energized, you should be able to see the states of the CAM and HOME microswitches change as the motor rotates. Relay 3 is usually configured to operate a Priority valve if required. This valve can be opened and closed from this screen. Relay 2 is generally not installed. The pump and heater relays can be manipulated from the PUMP/HEAT CONTROL screen and are not included here.

FIELD WIRING DETAILS

All field wiring connections to the FilterMinder are made to screw terminals inside the enclosure. Wires should be routed through the two cable glands on the back of the enclosure and the clamping nuts should be tightened to effect a water tight seal around the wires. If possible, run all low voltage wiring through one gland (24VAC power, pressure sensor and remote interface cable, if used) and all high voltage wiring through the other (pump, heat and aux).

POWER

The FilterMinder is supplied with a cube style plug-in transformer that is rated at 120VAC 60 Hz input at 0.50A maximum. The output of this transformer is rated at 24VAC with 50VA maximum. If desired, an alternate supply may be substituted, but the supply must be U.L. Class 2 rated. The output terminals of this transformer should be connected to the two euro style clamping terminal contacts identified as 1 and 2 in Figure 3. Polarity is not important. If wire other than that supplied with the FilterMinder is used, strip the wire 5/16". Loosen the terminal screw until some resistance is felt indicating that the clamping mechanism is completely open. Install the stripped wire end into the terminal until it stops. The terminal should then be tightened to a torque of 56 in-oz. to secure the wire.

FUSE

The electronic circuitry of the FilterMinder is protected by a fuse identified as 3 in Figure 3. This fuse is a glass tube 5mm x 20mm 1A 250V fast acting type. To extract the fuse, pull out on the tab at the bottom of the fuse holder.

PRESSURE SENSOR

The terminals identified as 4, 5 and 6 in Figure 3 provide connections for the optional pressure sensor or differential pressure switch. Either a differential pressure switch or a pressure sensor can be used, but both cannot be connected at the same time. Attempts to do so will permanently damage the pressure sensor.

If a differential pressure switch is used, connect it between terminals 5 and 6. Polarity is not important.

If a pressure sensor is used, connect the white, black and shield leads to terminal 4, the green lead to terminal 5 and the red lead to terminal 6.

Tighten all terminals to 56 in-oz.

PUMP , HEATER AND PRIORITY VALVE

The relay identified as 7 in Figure 3 is for controlling the pool Heater. The relay identified as 8 is for controlling the main circulation Pump. The relay identified as 9 is for controlling a priority valve (if required). These relays are energized when the controller wishes to have the attached device running. Select the NO or NC relay contacts as appropriate for your particular installation

requirements. For example, when the FilterMinder wishes to have the pool's main circulation pump running, it will energize the Pump relay 8 and an electrical connection will be made between the Common terminal and the Normally Open terminal of both sections of this relay (see section on RELAY CONTACTS).

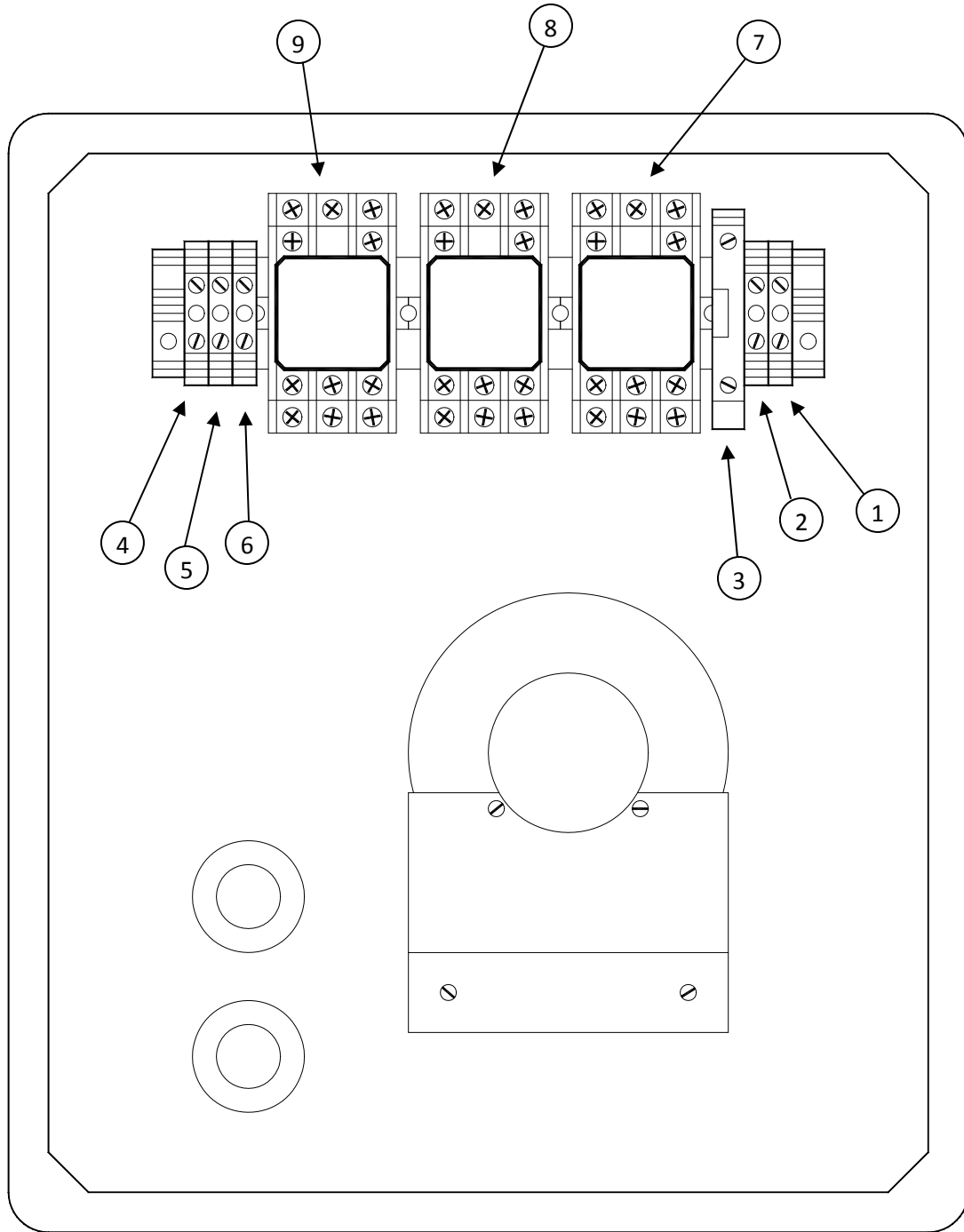


Figure 3

RELAY CONTACTS

Each relay contains two Form C contacts (both NO and NC poles available) rated at 10A 240VAC each contact.

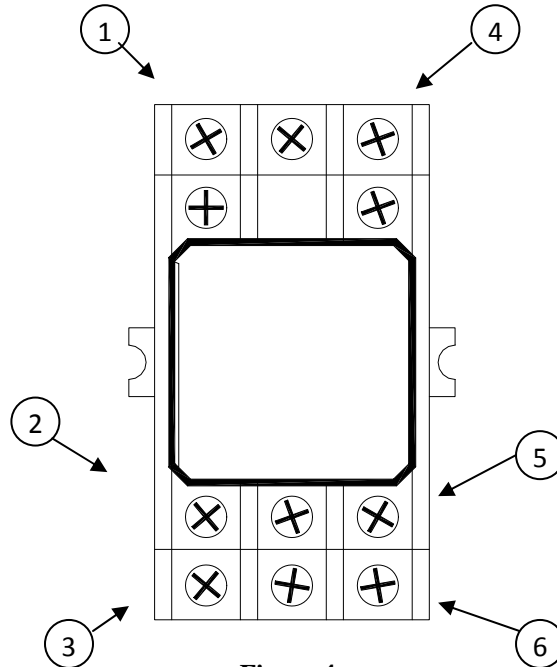


Figure 4

For section A of this relay, the terminal identified as item 1 in figure 4 is the Common contact, the terminal identified as item 2 is the Normally Closed (NC) contact and the terminal identified as item 3 is the Normally Open (NO) contact.

For section B of this relay, the terminal identified as item 4 is the Common contact, the terminal identified as item 5 is the Normally Closed (NC) contact and the terminal identified as item 6 is the Normally Open (NO) contact.

These terminals are clamping style connectors. Strip the wire 5/16". Loosen the terminal screw sufficiently to open the clamping mechanism and provide clearance for the wire. Insert the wire until it stops against the back of the terminal. Clamp the wire by tightening the terminal screw.

System Hardware Specifications

Electrical Specifications

Input Power: Outlet Mounted Transformer
Input: 120 VAC 60 Hz 0.50 Watts Max.
Output: 24VAC 50VA UL Class 2 rated

Field Replaceable Fuse inside enclosure
5mm x 20mm Glass
1A 250V Fast Acting

Relay Outputs: 10A 250 VAC or 1/3 HP at 120VAC
2 Form C contacts available per relay
(NO,NC,COM)

Environmental Specifications

Temperature: 0 to 50 Degrees C
(32 to 122 Degrees F)
Operating.

Humidity: 0% to 90% Relative Humidity
(non-condensing)

Enclosure Sealing: NEMA 4 (Hose Down)
with access with door closed.