



**ORIVAL**  
*Automatic Self-Cleaning*  
**WATER FILTERS**

***OPERATION AND MAINTENANCE MANUAL***  
***OMNITROL 2000 CONTROL SYSTEM SUPPLEMENT***

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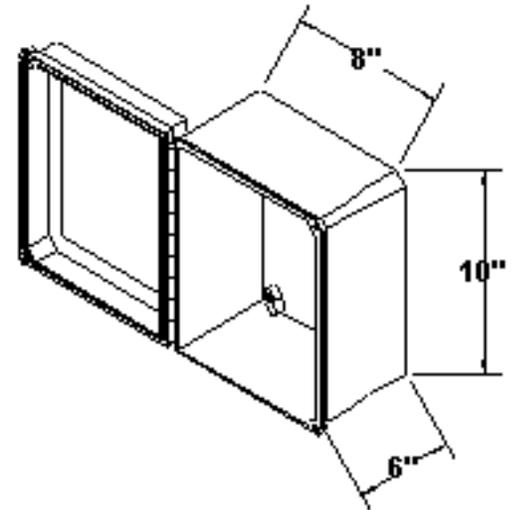
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## I. Introduction

The **OMNITROL 2000** is a powerful controller, which allows the user flexibility in controlling an ORIVAL filter while maintaining simplicity and reliability.

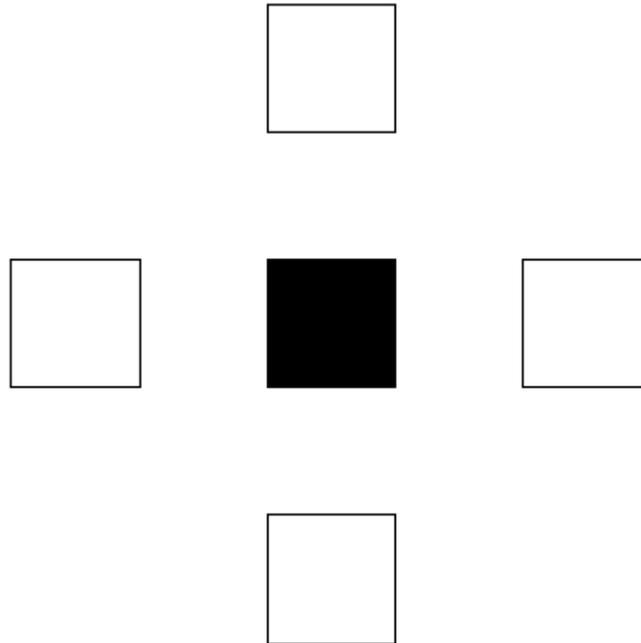
Designed specifically for filter flushing control, the **OMNITROL 2000** incorporates some very useful and unique features.



- Rinse cycle activated manually, by differential pressure (DP), timer or volumetric flow.
- Manual pause of flushing cycle.
- Solenoid test mode.
- Display of status, during rinse cycle and during normal operation. Includes DP status (ON or OFF) and time to next timer based automatic rinse.
- Powered by either 120 or 240 Vac, 50/60 Hz, single phase @ < 0.5 amp
- Inputs include:
  - Differential Pressure Switch (normally attached).
  - Rinse cycle activation from remote signal.
  - Rinse cycle lockout signal.
- Outputs include:
  - Connection for up to 10 filters in a parallel configuration.
  - Connection for Controlled Outlet Valve.
  - Local alarm indication.
  - Automatic built-in by-pass actuation when the filter attempts to undergo an adjustable number of consecutive rinse cycles (based on the DP switch remaining closed).
  - Optional Alarm Relay for connection to central DCS, horn, flashing light, etc.
- Adjustable parameters include:
  - Duration of rinse cycle (per filter).
  - Duration of delay between rinsing successive filters.
  - Differential pressure switch delay.
  - Number of consecutive rinse cycles to activate alarm.
  - Duration of delay for Controlled Outlet Valve actuation.
  - Timer to activate automatic rinse cycles.
- Resettable counter to display number of rinse cycles activated by each of the four methods; manually, by timer, by DP or volumetric flow.

## II. Using the Keypad and Display

The *OMNITROL 2000* is equipped with a keypad of 5 buttons as shown below:



The black center key is used as an <ENTER> key, with the remaining keys serving as directional arrows.

The <ENTER> key is used for:

- Selecting values to be modified,
- Confirming values when entered,
- Answering positively to Yes/No questions.

The left and right directional arrows are used to cycle between display screens. When modifying values, the arrow keys operate as follows:

- The up arrow increases the value by 1,
- The down arrow decreases the value by 1,
- The right arrow shifts the digits to the right,
- The left arrow shifts the digits to the left.

In addition, pushing the left and right arrows simultaneously will allow the system to enter PLC display mode, in which the various inputs and outputs are defined. For more on this, see Section III.

### III. Start-Up

The start-up process consists of the following steps:

1. Power source connection.
2. System configuration (PLC configuration).
3. Connection of inputs/outputs.
4. Testing solenoids and adjusting parameters.

#### 1. Power Source Connection

The **OMNITROL 2000** must first be connected to a suitable power source. A Terminal Block (TB1) is provided inside the controller enclosure for this purpose. The system is supplied with customer selectable printed circuit board jumper terminals, and is supplied preset for 120 VAC, 50/60 Hz but can be changed to 240 VAC, single phase, 50/60 Hz. See the wiring diagram on page 7 for more jumper information. This enclosure has a NEMA 4X rating making it water-tight and corrosion-resistant. To maintain this standard, appropriate entry fittings are recommended. Also, use care not to damage any internal components when drilling the appropriately sized entry hole.

With the power source properly connected, depress the main **Control Power Off-On** switch located on the front panel to the "ON" position. The red window on the switch should light to indicate power is present. The display should show the following:

```

OMNITROL 1000
ORIVAL INC.
```

Failure to obtain this screen may indicate improper connection of either the power supply or the display cable.

#### 2. System Configuration

Prior to operation, the controller must be configured. To begin this process, depress the left and right arrow keys simultaneously. Note that attempting to enter the configuration mode while the system is in a rinsing cycle will cause the following error message:

```

FLUSHING ACTIVE
PLEASE WAIT !!
```

The first screen of the configuration process may appear as follows:

```

PLC  F:1- 5  W.M
COV: 6  V: 7  A: 8
    
```

The PLC in the upper left corner designates that the controller is in PLC configuration display mode and current values are displayed. The numbers following **F:** indicate the number of filters installed, and correspond to the output terminals to be used for each filter. The **W.M** in the upper right indicates that a Water Meter or remote rinse command signal is connected.

**COV:**, **V:** and **A:** represent the Controlled Outlet Valve, Delay Valve and Alarm and/or automatic built-in by-pass valve, respectively. The number following **COV:**, **V:** or **A:** designates the corresponding output terminals to be used for connection to each. A zero following **COV:**, **V:** or **A:** designates that the valve or alarm and/or automatic built-in by-pass valve is not present.

To begin the configuration process from this screen, depress the right arrow. The display will show the following:

```

FOR NEW PLC
PRESS < ENTER >
    
```

Depressing the <ENTER> key will begin the configuration process.

The first step in configuring the control system is to input the number of filters present. To modify the current value, first press the <ENTER> key to select the value, then use the up and down arrows to modify the value as necessary. Press the <ENTER> key again to confirm the selection.

```

NO. OF FILTERS
      5
    
```

**NOTE: Only enter values from 1 to 10 based on the number of filters present.**

Once the number of filters has been adjusted, the next screen will question the existence of a Controlled Outlet Valve (COV). To confirm the existence of the valve, press the <ENTER> key. If a COV does not exist, press the right arrow to proceed to the next screen.

```

FOR C.O.V.
PRESS < ENTER >
    
```

The next screen refers to the existence of a delay valve. The delay valve is activated during the rinse cycle of each filter, and is not present in the majority of installations. Press <ENTER> to confirm, or the right arrow to skip, and proceed to the next screen.

```
FOR DELAY VALVE  
PRESS < ENTER >
```

The next screen questions the presence of an optional alarm relay and/or automatic built-in by-pass valve to be actuated should the system attempt to undergo a preset number of consecutive rinse cycles based on differential pressure. The optional alarm relay and/or automatic built-in by-pass valve actuation is based on the D. P. switch remaining closed after several rinse cycles have failed to reduce a high differential pressure. Press <ENTER> to confirm, or the right arrow to skip, and proceed to the next screen.

```
FOR ALARM  
PRESS < ENTER >
```

Next you will be asked to confirm the existence of a water meter, to be used for automatic rinse cycles based on volumetric flow of water through the filter. To confirm that a water meter is installed, press <ENTER>. If not, press the right arrow to skip, and proceed to the next screen. Pressing <ENTER> will also allow rinsing by remote signal.

```
FOR WATER METER  
PRESS < ENTER >
```

Completion of this step will return you to the first screen of the configuration process. Using this screen, confirm that the system is configured properly and note the correct terminals to be used for each output. Press <ENTER> when finished.

## IV. Connection of Inputs and Outputs

The control system recognizes three inputs:

Terminals 1 and G: Used for connection of a differential pressure switch to activate automatic rinse cycles based on differential pressure. (If the system is to be rinsed based only on timer, i.e., no DP switch is present, then these terminals can be used for activation of rinse cycles by an external source. Note that these are not dry contacts; power is present in these terminals.)

Terminals 2 and G: Used for connection of a device to prevent the activation of a rinse cycle such as a low-pressure switch or level control system. The delay between the presence of the external signal and the system shutdown is adjustable between 0 and 99 seconds.

Terminals 3 and G: Used for connection of a water meter to activate rinse cycles based on volumetric flow. (Note: These terminals can also be used for activation of rinse cycles by an external signal by setting the Meter Ratio to 100/100 gal. and the Water Volume to 1 gal. See Section V for details on adjusting parameters.)

The outputs to be used are determined by the configuration, i.e., number of filters, existence of controlled outlet valve, delay valve, alarm, etc. The order of connection is always as follows:

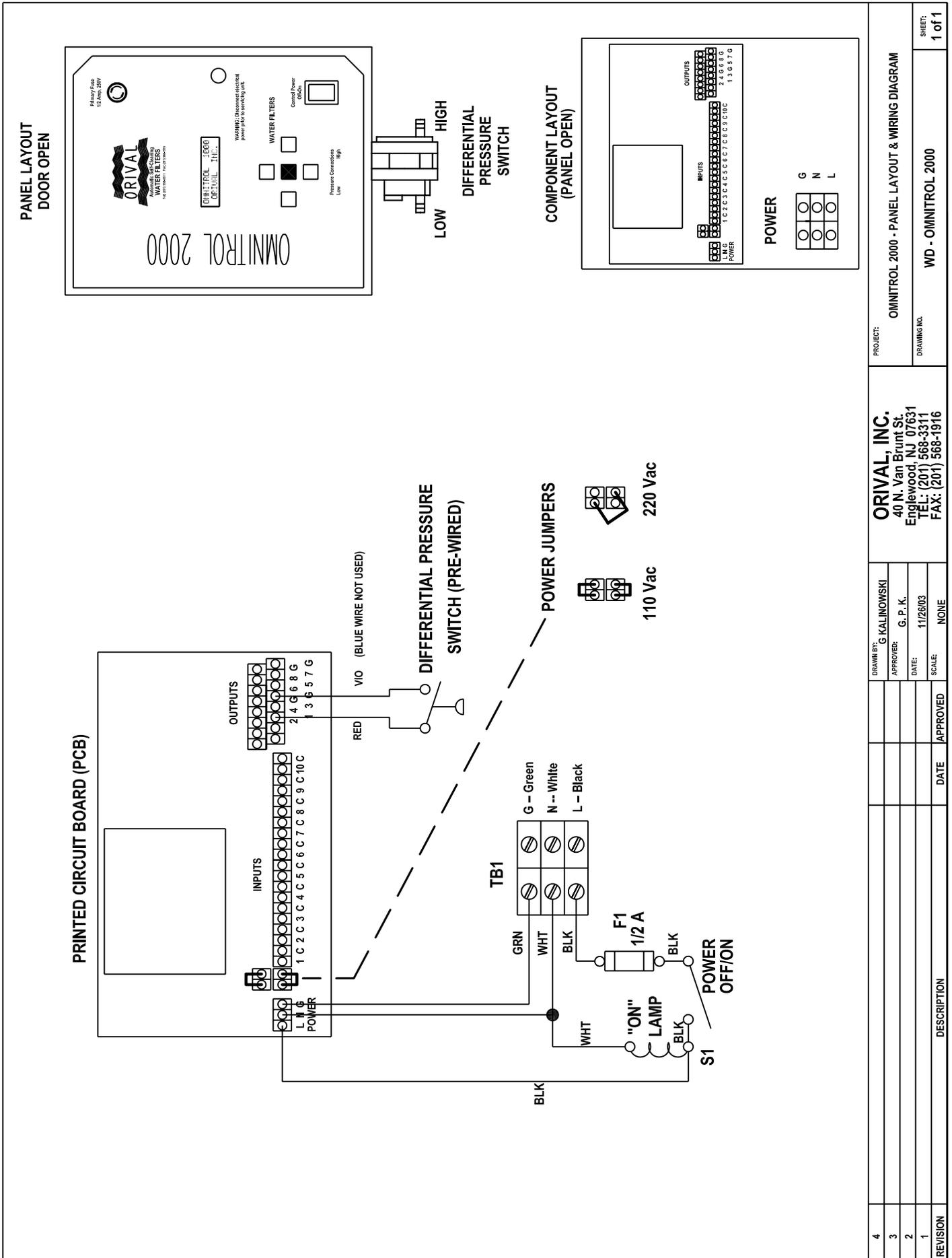
- Filter Solenoid Valves (1 through x, where x is the number of filters)
- Controlled Outlet Valve, if present
- Delay Valve, if present
- Alarm Relay and/or Automatic Built-In By-Pass Valve, if present

The proper terminal connections are shown on the first screen of the PLC configuration process. To check these values, depress the left and right arrows simultaneously to enter PLC configuration mode. When complete, press <ENTER> to exit configuration.

Pages 9 & 10 show the connection of the appropriate inputs and outputs for several of the most common installations. Note that the inputs are fixed, and may not be used in all installations.

**WARNING:** Connection of the outputs as shown on pages 9 & 10 does not eliminate the need to configure the system, and should only be done once the configuration process is complete. To ensure that configuration was successful, check the terminal numbers shown on the wiring diagram against those shown on the first screen of the configuration process.

# 1. Wiring Schematic



## 2. Optional Alarm and/or Mode Relay

Mounting holes have been provided for a optionally OVIVAL supplied DPDT relay that can be used in conjunction with a customer's DCS to provide additional signals indicating filter status.

Used as a Mode Relay, the relay's coil is connected as a C O V coil. The relay's normally closed contacts are dry contacts indicating the filter is in **FILTER** mode, and when the filter goes into a rinse, the C O V output energizes the relay's coil and the normally open contacts provide dry contacts indicating the filter is in **RINSE** mode.

Used as an Alarm Relay, the relay's coil is connected as an ALARM coil. Once a filter with a high DP reaches the number of consecutive rinses programmed in, the controller displays the following:

```

DP.FAULT.RELEASE
BY < ENTER >
```

and the relay coil is energized. The normally open contacts provide dry contacts that can be used to indicate the filter is has a high DP (Alarm mode) that regular rinse cycles can not reduce, and/or the dry contacts can be used to set a visual or audio alarm (flashing light, buzzer, horn etc.).

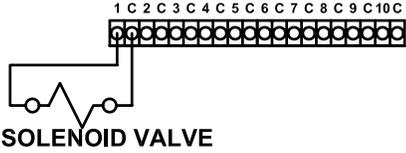
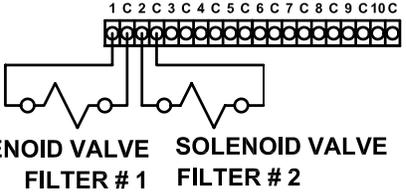
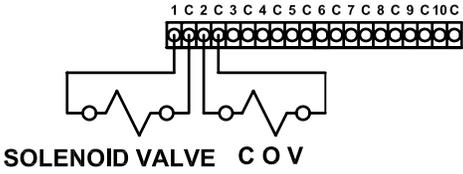
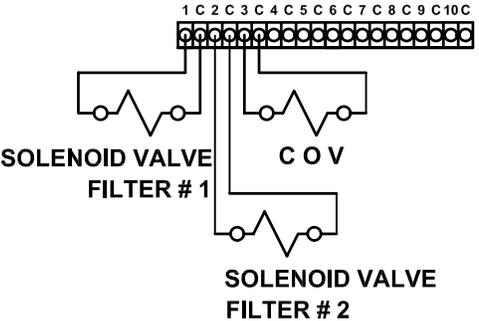
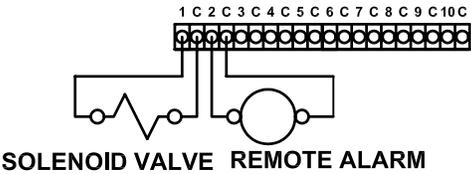
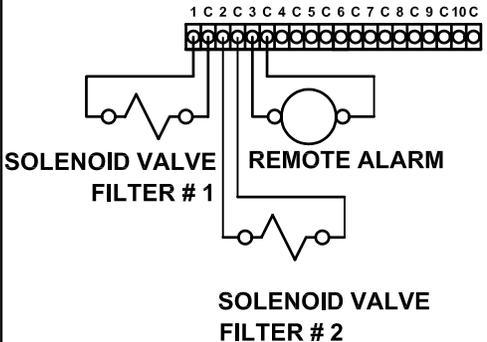
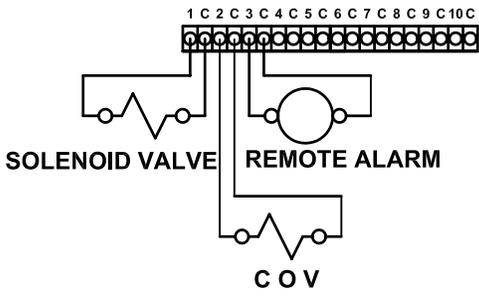
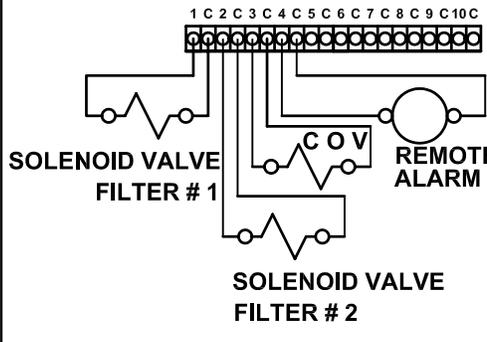
Two relays can be provided to provide all functions as described above.

Relay contacts are as follows:

View of	RELAY	Bottom
<b>#1 - NC</b>	<b>#2</b>	<b>#3 - NC</b>
<b>#4 - NO</b>	<b>#5</b>	<b>#6 - NO</b>
<b>#7 - COM</b>	<b>#8</b>	<b>#9 - COM</b>
<b>A - COIL</b>		<b>B - COIL</b>
<b>POLE 1</b>	<b>Mounting Tab</b>	<b>POLE 2</b>

### 3. Output Connections

**WARNING:** System must first be configured as described in Section III, Pages 3-5.

	One Filter	Two Filters
<b>Filter(s)</b>	 <p>SOLENOID VALVE</p>	 <p>SOLENOID VALVE FILTER # 1    SOLENOID VALVE FILTER # 2</p>
<b>Filter(s) &amp; Controlled Outlet Valve</b>	 <p>SOLENOID VALVE    C O V</p>	 <p>SOLENOID VALVE FILTER # 1    C O V</p> <p>SOLENOID VALVE FILTER # 2</p>
<b>Filter(s) &amp; Remote Alarm</b>	 <p>SOLENOID VALVE    REMOTE ALARM</p>	 <p>SOLENOID VALVE FILTER # 1    REMOTE ALARM</p> <p>SOLENOID VALVE FILTER # 2</p>
<b>Filter(s), Controlled Outlet Valve &amp; Remote Alarm</b>	 <p>SOLENOID VALVE    REMOTE ALARM</p> <p>C O V</p>	 <p>SOLENOID VALVE FILTER # 1    C O V    REMOTE ALARM</p> <p>SOLENOID VALVE FILTER # 2</p>

# Output Connections (continued)

**WARNING:** System must first be configured as described in Section III, Pages 3-5.

	<b>One Filter</b>	<b>Two Filters</b>
<b>Filter(s) &amp; Automatic Built-In By-Pass Valve</b>	<p>SOLENOID VALVE FILTER # 1      SOLENOID VALVE AUTO BYPASS</p>	<p>SOLENOID VALVE FILTER # 1      SOLENOID VALVE AUTO BYPASS</p> <p>SOLENOID VALVE FILTER # 2</p>
<b>Filter(s), Controlled Outlet Valve &amp; Automatic Built-In By-Pass Valve</b>	<p>SOLENOID VALVE FILTER # 1      SOLENOID VALVE AUTO BYPASS</p> <p>COV</p>	<p>SOLENOID VALVE FILTER # 1      SOLENOID VALVE AUTO BYPASS</p> <p>SOLENOID VALVE FILTER # 2</p>
<b>Filter(s), Remote Alarm &amp; Automatic Built-In By-Pass Valve</b>	<p>SOLENOID VALVE FILTER # 1      REMOTE ALARM</p> <p>SOLENOID VALVE AUTO BYPASS</p>	<p>SOLENOID VALVE FILTER # 1      REMOTE ALARM</p> <p>SOLENOID VALVE FILTER # 2</p>
<b>Filter(s), Controlled Outlet Valve, Remote Alarm &amp; Automatic Built-In By-Pass Valve</b>	<p>SOLENOID VALVE FILTER # 1      REMOTE ALARM</p> <p>SOLENOID VALVE AUTO BYPASS</p> <p>COV</p>	<p>SOLENOID VALVE FILTER # 1      REMOTE ALARM</p> <p>SOLENOID VALVE FILTER # 2</p> <p>COV</p>

## V. Testing Solenoids and Adjusting Parameters

### 1. Testing Solenoids

Once the system has been configured and all connections have been made, the next step is to test the solenoids to check for any short-circuits. To begin the test, depress the right arrow until the display shows the following:

```
PRESS < ENTER >
TEST SOLENOIDS
```

Pressing <ENTER> will begin testing the solenoids. If a solenoid is found to be satisfactory, the display will show the following:

```
Test solenoid 1
Filter OK !
```

The system will test all solenoids, including those for the controlled outlet valve, alarm and/or automatic built-in by-pass valve, and delay valve. The display will be similar, with the exception that the words Master (for COV), V.Del. and Alarm will be shown in place of the word Filter. If a solenoid is found to be short-circuited, the display will show the word SHORTED in place of OK. The output to that solenoid will be interrupted until the system is informed that the problem is fixed. The screen to the right of the title screen displays which solenoids are short circuited and is also used to confirm that the problem has been fixed by depressing the <ENTER> key.

### 2. Adjusting Parameters

Once the connections are complete and the integrity of the solenoids has been confirmed, the next step is to adjust the parameters as necessary. The following steps assume that the user begins with the title screen and cycles through the screens by depressing the right arrow. Based on the configuration used, some of the screens shown here may not be applicable, and the related steps should be ignored. See Section II for instructions on using the keypad to adjust values.

The first value to be entered is the volume of water to pass through the filter to activate an automatic rinse cycle. Recall that this option requires the existence of a water meter. The value is entered in gallons in the following screen:

```
WATER VOLUME
100 gal.
```

The water volume can be defined as any value between 0 and 999 gallons. The counter will be automatically reset following any rinse cycle activation, manual or automatic.

Depressing the right arrow will allow the user to enter the meter ratio. The meter ratio is defined as the volume of water measured by each pulse of the meter. For example, a meter ratio of 1 gallon per pulse would be defined as 100/100. This value is entered in the following screen:

```
METER RATIO
100/100 gal.
```

The meter ratio can be defined as any value from 1/100 to 1000/100.

**TIP:** *The water meter can also be used for activation of rinse cycles by an external signal. To do this, configure the system to confirm the existence of a water meter. Set the water volume to 1 gallon and the meter ratio to 100/100. With this configuration, each pulse will activate a rinse cycle. This can be used for activation of rinse cycles by water treatment systems, remote interface, etc.*

Following configuration of the water meter, the delay for the rinse cycle lockout signal must be adjusted. Input 2 is used to prevent the activation of rinse cycles in the presence of an external signal, such as a low-pressure switch or a level control system. The lockout signal delay provides for a delay between the presence of this signal and the system lockout. The display will appear as follows:

```
LOCKOUT SIGNAL
DELAY 10 SEC.
```

The delay is adjustable between 0 and 99 seconds. Note that the same delay will apply not only on initiation of the lockout, but on the removal as well. Removal is accomplished only by the elimination of the external signal.

The next screen is used to define the amount of time to elapse between automatic rinse cycles based on time cycle. Note that the timer will be reset following any rinse cycle, manual or automatic. The display will show the following:

```
CYC. TIME
MIN. 100
```

In this screen, any value between 0 and 9999 can be entered. A value of zero should be used if no rinse cycles based on timer are desired.

When the **OMNITROL 2000** is used to control multiple filters, the dwell time is defined as the delay between the individual filter rinse cycles.

DWELL	TIME
SEC.	5

Measured in seconds, this value can be set between 1 and 99 seconds.

When a delay valve exists, the following screen is used to define the delay between the activation of the filter rinse cycles and the delay valve:

VALVE	DELAY
SEC.	5

The delay can be set between 1 and 99 seconds.

The next step is to input the desired flushing time *per filter*. This is accomplished in the following screen:

FLUSHING	TIME
SEC.	10

Although this value is adjustable between 2 and 240 seconds, the value is based on the filter model being used. As an example, the following table should be used for the **OR** Series of filters.

Model	Duration	Model	Duration
OR-02-PE	5-7	OR-08-xS	8-10
OR-03-xS	5-7	OR-08-xE	12-15
OR-03-xE	8-10	OR-10-xS	8-10
OR-04-xS	5-7	OR-12-xS	12-15
OR-04-xE	8-10	OR-14-xS	12-15
OR-06-xE	8-10	OR-16-xS	12-15

Refer to the appropriate filter manual for a similar table of values for that series of filters.

Note that this table gives an approximate range of values. The rinse cycle duration may require adjustment based on the operation of the filter. Refer the filter manual for additional information.

Two parameters must be defined regarding the differential pressure switch. First, the delay between the closure of the switch and the activation of a rinse cycle must be input. Adjustable between 2 and 30 seconds, this delay prevents the activation of false rinse cycles due to pressure fluctuations not representative of dirty screen conditions. The display appears as follows:

```
D.P DELAY
SEC.      5
```

The second parameter to be input is the number of consecutive rinse cycles activated by differential pressure, which constitutes a malfunction. Upon completion of an automatic rinse cycle based on differential pressure, a fixed delay of approximately 30 seconds is imposed on the system. During this delay, the status of the DP switch is monitored. If the switch remains closed ("ON"), another rinse cycle is activated. The number of consecutive rinse cycles which constitutes a malfunction, adjustable from 0 to 8, is entered on the following screen:

```
D.P FAULT NO. OF
FALSE FLUSHES  5
```

If the limit of consecutive rinse cycles input on the previous screen is exceeded, the controller will cease performing additional rinse cycles and the local alarm, remote alarm and automatic built-in bypass are activated. The local alarm results in the following screen being displayed:

```
DP.FAULT.RELEASE
BY < ENTER >
```

Following the input of the number of consecutive rinse cycles, the last parameter to be adjusted is the delay of the Controlled Outlet Valve (COV). This is the delay between the activation of the system rinse cycle and the first filter rinse cycle. This delay allows for activation of an outlet valve (or an external water source valve) prior to activation of the first filter rinse cycle, compensating for the difference in outlet valve closing (or external source valve opening) and filter rinse valve opening times. The delay should be adjusted to allow the outlet valve to close (or external source valve to open) fully prior to activating the filter rinse cycle. The delay is adjusted on the following screen:

```
C.O.V. DELAY
SEC.      12
```

The COV delay is adjustable from 0 to 999 seconds, and completes the adjustment of parameters. The system is now ready for operation and the filter(s) may be put on-line as described in the filter's Operation and Maintenance Manual.

## VI. Manual Operations

In addition to activating automatic rinse cycles based on a number of factors, a manual rinse cycle may also be activated using the keypad. To activate a manual rinse, depress the right arrow until the following screen is displayed:

```
MANUAL START
< ENTER >
```

Pressing <ENTER> causes the entire system to engage in a manual rinse cycle.

The system can also be halted while engaged in a rinse cycle. To do so, depress the right arrow until the following screen is displayed.

```
Manual Stop
< ENTER >
```

Pressing the <ENTER> key will terminate the rinse cycle (manual or automatic) and return the system to ready mode.

In addition, the system may be paused, preventing activation of manual or automatic rinse cycles. To do so, depress the right arrow until the following screen is displayed:

```
MANUAL PAUSE
< ENTER >
```

Pressing <ENTER> will pause the system. A continuous chirp will alert the user that the system has been paused, and the display will appear as follows:

```
MANUAL PAUSE
RELEASE (ENTER)
```

Note that while the system is in pause mode, all operations, including the countdown of the backwash timer, are paused. Attempting to activate a manual rinse cycle will result in the following screen being displayed:

```
RELEASE MANUAL
PAUSE FIRST !!
```

To release the manual pause, depress <ENTER>.

## VII. Process Monitoring

The main monitoring screen, shown below, is the main source of information regarding system status. During the filtering mode, the screen appears as follows:

```
TO NEXT   DP-Off
START 123:56 MI
```

This screen provides information regarding DP status **DP-OFF** means the switch is open (DP is less than 7 psi). **START** is the time remaining until the next timer activated rinse cycle. The counter shown counts down to zero, at which time a rinse cycle is activated. Recall that this timer is reset following any rinse cycle, manual or automatic.

Once a rinse cycle has begun, this screen begins to display information regarding which filter is currently being rinsed, delay times, etc. The current filter is displayed in the upper left of the screen, and will flash when rinsing. A typical display appears as follows:

```
Fi.- 1   DP-Off
Flushing - 12
```

If a water meter is present, it may be desirable to monitor the amount of water, which must pass through the filter(s) to initiate a volumetric flow rate. Depressing the down arrow while in the main monitoring screen will display the following:

```
CURRENT FLOW 45
LEFT VOLUME 355
```

This screen shows the current flow rate through the filter and the volume of water, which must pass through the filter to initiate an automatic rinse cycle. As is the case with the timer, the volumetric counter counts backward to zero, and is reset following any rinse cycle (manual or automatic).

Pressing the right arrow twice from the main monitoring screen displays the counter as follows:

```
DP- 452 Ti- 56
Ma- 23 Vo- 0
```

Which displays the number of rinse cycles activated by differential pressure (**Dp**), timer (**Ti**), manually (**Ma**) and by volumetric flow rate (**Vo**).

Pressing the right arrow again displays the total accumulation of water passed through the filter in gallons:

```
WATER ACCUM.  
0 gal.
```

Note that this requires the use of a water meter (not supplied).

To reset all of the counters, depress the right arrow again to display the following:

```
ERASE ACCUM.  
< ENTER >
```

Note that this will reset **all** of the counters. It is not possible to reset select counters while leaving the others intact.

In certain cases, alarms or the automatic built-in by-pass valve may be activated by situations not considered as normal operation. One such case is described in Section V, Paragraph 2, which describes the activation of an alarm based on an adjustable number of consecutive rinse cycles activated by differential pressure.

Another such case is the use of an external lockout signal, such as a low-pressure sensor. Connected to input 2, this external signal will cause the system to temporarily halt. A repetitive beep will be heard and the following screen will be displayed:

```
PAUSE  
EXTERNAL LOCKOUT
```

Note that an adjustable delay of 0 to 99 seconds is placed on this signal, and the condition will persist until the signal is no longer present. The same delay is also imposed on the release of the lockout, which can only be accomplished by the removal of the signal.