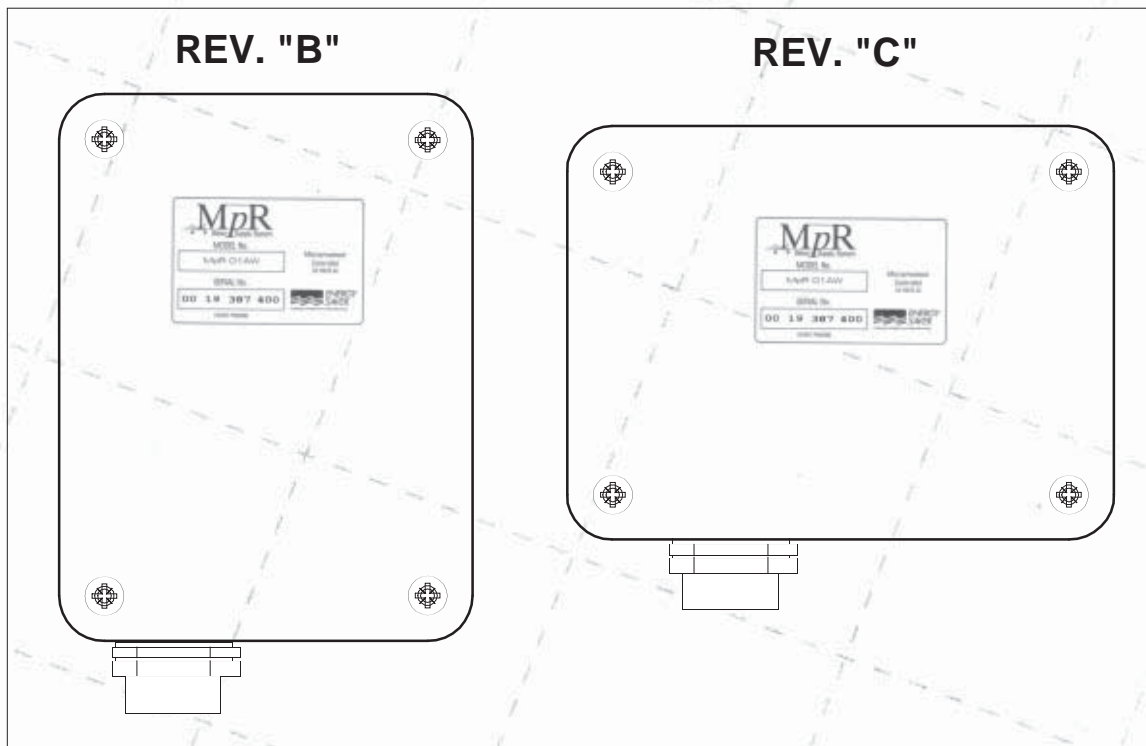


MICROPROCESSOR CONTROL WATER SUPPLY SYSTEM

(MPR-01AW)

Installation, Operation, and Maintenance Manual



**PLEASE READ ENTIRE DOCUMENT BEFORE
PROCEEDING WITH INSTALLATION**

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I - THEORY OF OPERATION

A. General

The Microprocessor Regulated Water Supply System (MPR) is an eight-bit micro-processor. This device measures the ambient (outside) dry bulb air temperature and then uses this data to determine the most efficient way to apply water to the system's evaporative media (pads) by opening and closing a 24-volt solenoid valve.

The system is designed for low maintenance and low drain water while at the same time providing the flow rates required for flushing of the evaporative media.

The MPR system has water consumption equivalent to and most often less than the water consumption of a properly set recirculating water control system. The portion of the cycle without water flow also provides higher efficiency due to increased evaporative surface area.

B. Description

The MPR is designed to control the ON TIME and OFF TIME of the water supply solenoid valve.

The ON TIME for the water supply solenoid valve is programmable. This is the length of time that is required for the water supply solenoid valve to remain on in order to ensure that the evaporative media (pads) become saturated.

The OFF TIME is either increased or decreased depending upon the (outside) ambient dry bulb temperature. When the air temperature is warm less time is required for the media (pads) to dry out, and the solenoid valve is allowed to turn on more frequently.

If the unit is a MPR-78PC the minimum ambient (outside) air temperature at which the water supply solenoid valve will be turned on is 78°F. Below this the valve is turned off and the controller enters an idle state until the temperature rises above 78°F. This MPR series does not have an adjustable minimum operating temperatures.

A manual brass ball valve is supplied for each media cell for the purpose of water flow adjustment in the system.

Operating water pressure must be between 40 and 60 psi. Above 60 psi, a pressure regulator must be used. The MPR is not recommended for use below 40 psi.

II - INSTALLATION

A. General

The MPR water distribution system for single cells and single cabinet installation can be factory mounted. For multiple cells or cells with transitions require installation in the field. The following are instructions for multiple cell MPR installations:

B. Mechanical

There are four physical components to mount in the typical MPR installation.

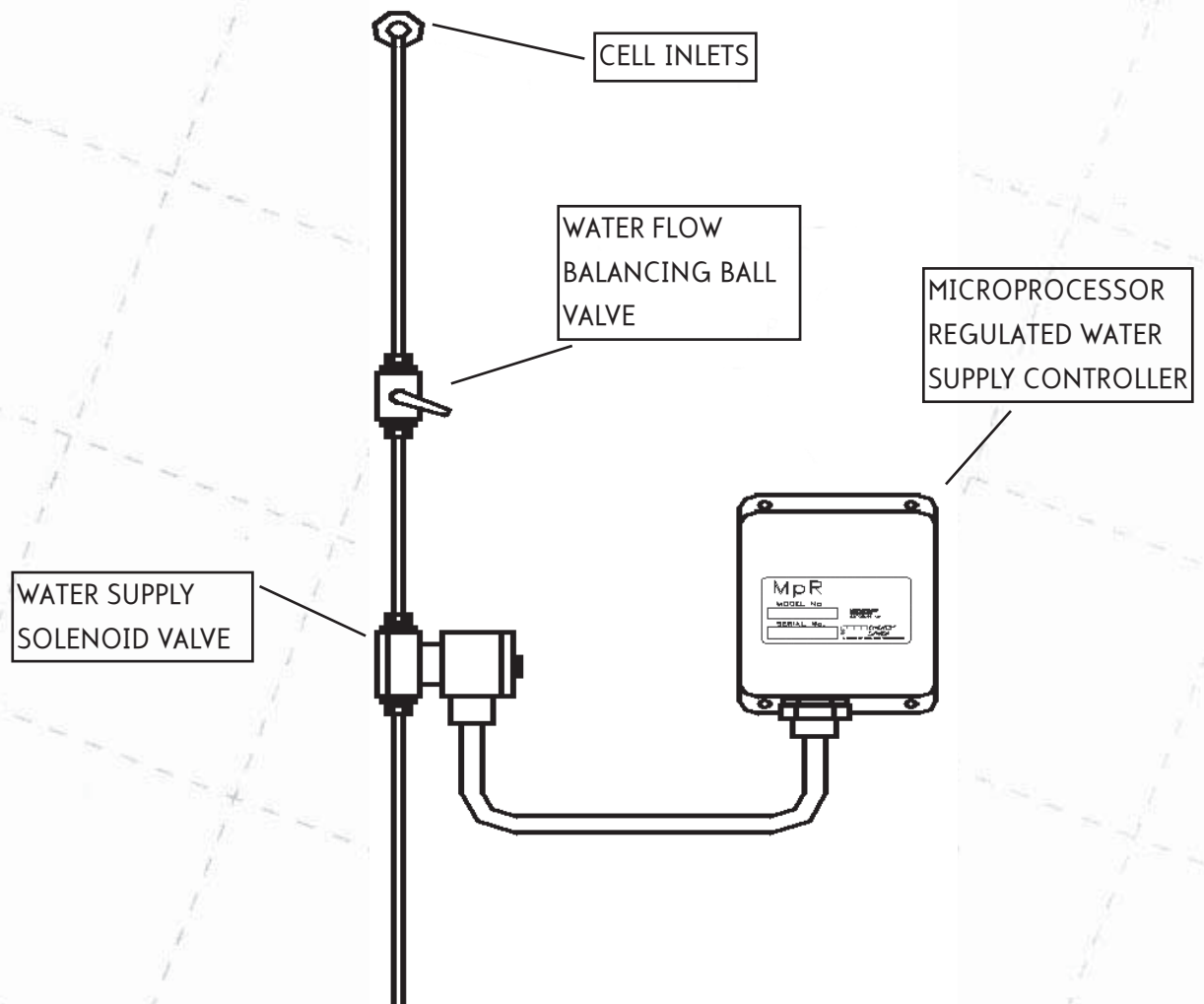
They are:

1. MPR Control Box
2. Water Flow Control Valve
3. Transformer
4. 24 volt solenoid valve

Plan where to mount the MPR control box housing before proceeding. Read all instructions to recognize the detail required.

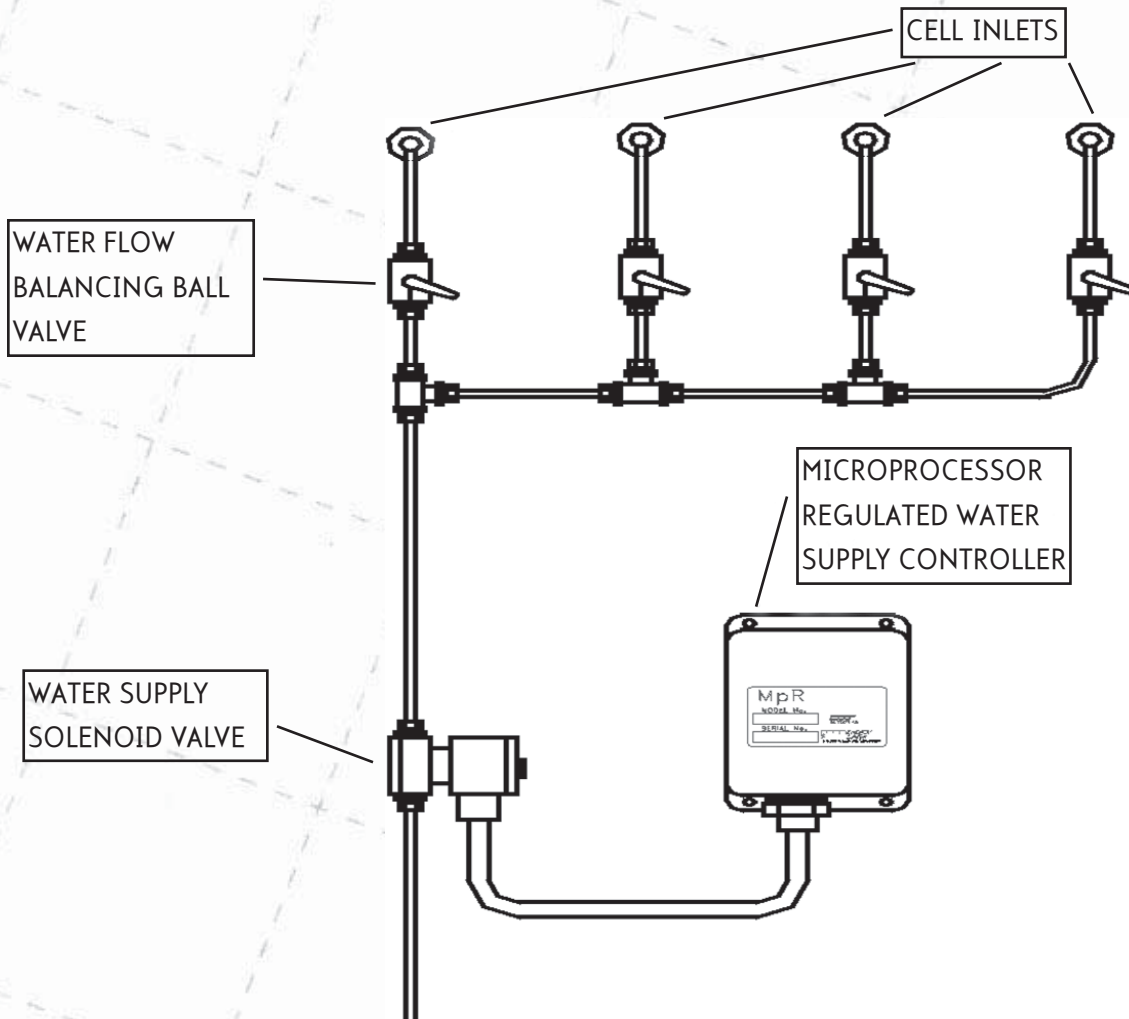
Mount the MPR housing to the appropriate AHU case or cabinet using the four (4) Tek screws provided. Allow room after the MPR for the water flow control valve(s) as shown on the following pages.

C. MPR Single Unit Application



Note: If an MPR unit is to be installed in a location that is subject to freezing temperatures, a method of draining the water supply line and MPR should be provided at the time of installation. ENERGY SAVER provides an optional auto freeze protection system, which includes all the controls and valves with an adjustable thermostat. Any valves used for freeze protection should be located in a completely freeze free area.

D. MPR Multiple Unit Application



Note: If an MPR unit is to be installed in a location that is subject to freezing temperatures, a method of draining the water supply line and MPR should be provided at the time of installation. ENERGY SAVER provides an optional auto freeze protection system, which includes all the controls and valves with an adjustable thermostat. Any valves used for freeze protection should be located in a completely freeze free area.

E. Electrical Connections

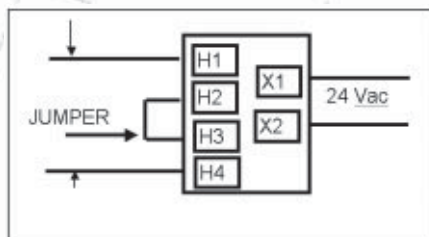
The electrical power requirement for the MPR is 24 volts ac with a minimum of 30 VA.

Locate and mount the 24-volt transformer near the source of power. One of two types of transformers is available. The most common is the multiple-tap (230/208/115V to 24V) transformer. The other type is a (460/230V to 24V) transformer.

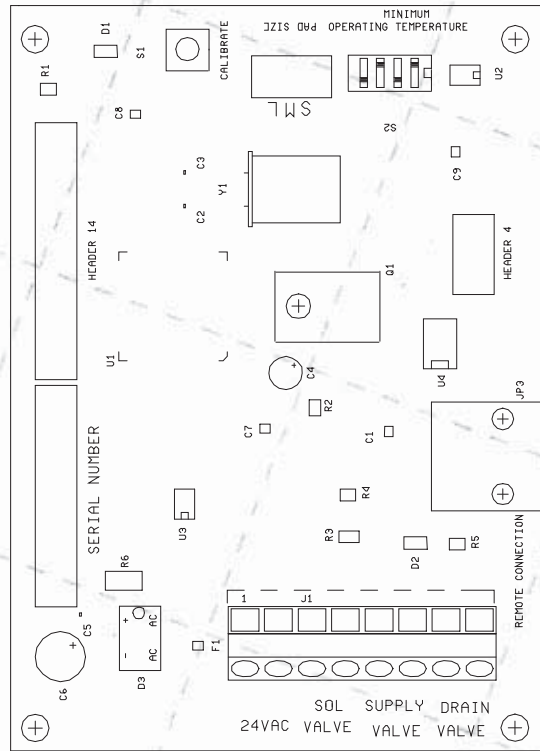
Select the appropriate line voltage wire pair on the transformer and attach to the incoming power source (see tables below).

| | | |
|----------------------------|---------------|-----------------|
| Incoming Voltage (primary) | 120 v., 60 Hz | Black & White |
| | 208 v., 60 Hz | Black & Blue |
| | 230 v., 60 Hz | Black & Red |
| Output Voltage (secondary) | 24 v., 40 VA | Yellow & Yellow |

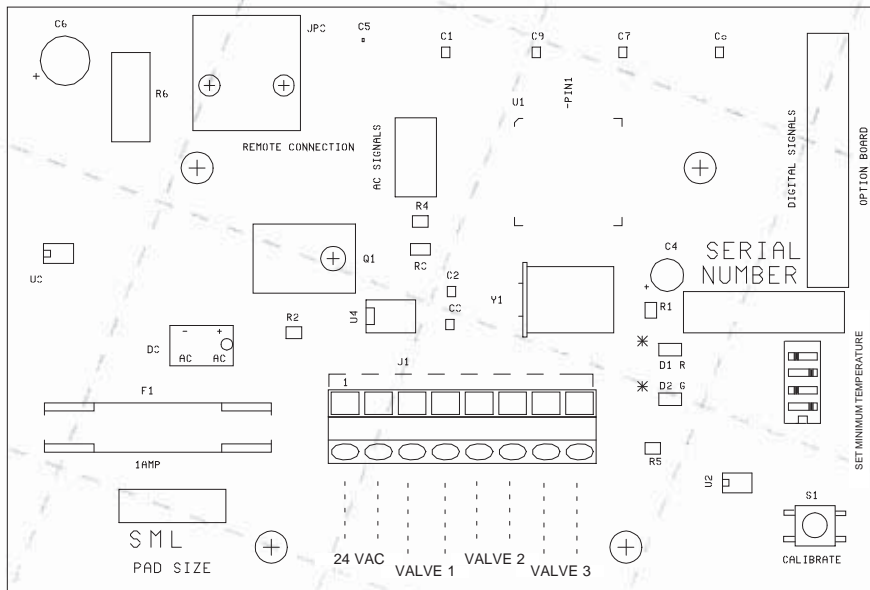
120/208/230 Volt Transformer Connections



460 Volt Transformer Connections



REV "B"



REV "C"

Figure 1

Attach the low voltage, 24-volt ac, secondary output terminals from the transformer to the terminals marked 24 Vac on the MPR terminal block. See Figure 1 on page 8.

CAUTION: Be sure to seal off any unused transformer wires with wire nuts or electrical tape. Do not connect unused wires to each other.

F. Water Connections

Water Supply

All ENERGY SAVER evaporative systems are designed to use non-treated, non-softened, domestic water supply. Caution is suggested when using treated, softened, DI, or well water. The two extremes will cause dissolving of the resins in the evaporative media and excess mineral deposits on the media. ENERGY SAVER warranties do not apply to these extenuating conditions.

Water Pressure

Water pressure should be between 40 PSI minimum and 60 PSI maximum. A pressure-reducing valve should be used on systems exceeding 60-PSI water pressure.

Water Supply Line Sizes

Typical water supply piping should be 1/2" O.D. Smaller evaporative units can operate effectively with 3/8". Check the size of the inlet compression fitting supplied with the MPR water control and do not down size the water supply line from this MPR fitting size.

NOTE: To avoid leakage or damage to the water supply compression fitting be sure to use two (2) wrenches when tightening.

One simple method of determining adequate water pressure and water supply to effectively operate the unit as it was designed is to connect to the water supply with about a 12" length of 3/8" copper. With water supply turned on and holding the water line out horizontally, the stream of water should shoot out a minimum of ten (10) feet before arcing down.

Water Valves

A water shut-off valve (not supplied) must be installed in the water supply line to the MPR solenoid valve. This valve is necessary for service of the MPR and not intended for a flow adjustment to the units. It is recommended that any shut-off valve be equal to the pipe size so as not to restrict the water supply when the MPR control is in the "ON" cycle.

Note: The customer supplies the copper water supply line and it is the responsibility of the installing party to meet all local plumbing codes.

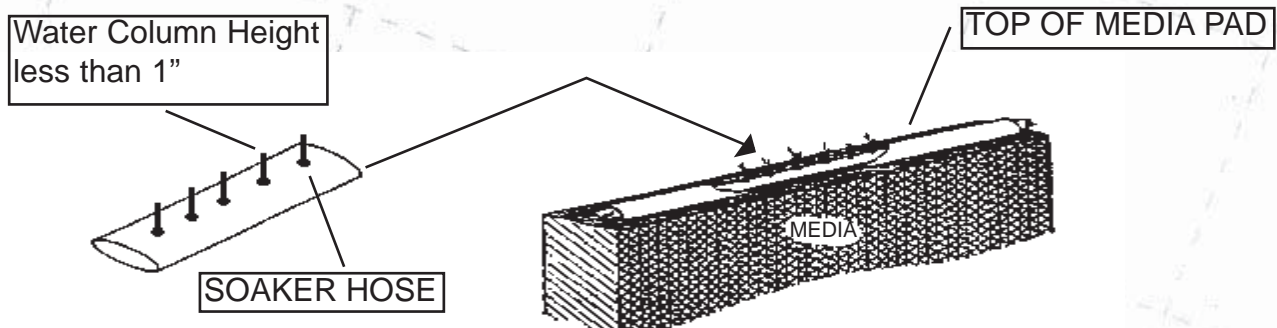
G. Adjustment of the MPR Water Control

1. General

It is best if water flow is adjusted at maximum airflow and wet bulb depression, to assure complete wetting of the media at the extreme operating conditions. The adjustment and wetting of the media is two-part, the water column height and the length of time the water is "ON".

2. The Water Column Height

The water column height is controlled by the flow control ball valve on each cell. Remove the two brass thumb screws. Remove the top ABS case cover. Remove the half moon PVC water distribution cover. Connect the 24-volt AC solenoid valve to the MPR. (See Figure 1, page 8) Connect a 24-volt power supply to the MPR. Observe the red power light blinking on and off at a 1 second rate. This will verify that the unit is powered on. If the unit's red power light is not blinking verify correct voltage (24) at the units' terminal block connection points marked 24 volts AC. (If correct voltage is present and connections are tight but the red power light is not blinking contact the factory for further instructions). Press the calibration button and hold it on for 2 seconds, then release, and the red power light should blink rapidly. Press the button once more and the system water supply valve will open and the red power light will blink off, then on for 1 second. Adjust the water flow to the water distribution perforated "sock" by opening or closing the flow adjustment ball valve located between the MPR and the water distribution "sock". With the top access panel off the cell, adjust the valve such that the water column heights in the water distribution "sock" holes are between 1/2" to 3/4" as illustrated below. Press the calibration button once more and the system water supply solenoid valve will close. Reinstall the half moon PVC water distribution cover and ABS top case cover and brass thumb screws.



3. Calibration

Calibration mode provides a means of changing the valve open time from its factory setting value to adjust for varying flow rates and the valved closed schedule to compensate for climatic conditions.

To enter calibration mode, press and release the calibration pushbutton for two seconds or until the indicator light flashes at a rapid rate, then release the pushbutton. If the valve is currently open it will then close and the unit will wait indefinitely for another button press. Press and release the calibration button the valve will open and the blink rate slows. When the water flow reaches the bottom of the media, press and release the button again and the valve will close (starting the off calibration cycle).

The time that the water has been flowing through the system during this procedure will be saved as the calibrated time for all future valve open cycles. When the media starts to dry, press and release the calibration button once again and this time will be the calibrated time for all future valve closed cycles at this temperature.

The calibrated times are stored in non-volatile memory so that they will be remembered even if power is removed from the unit.

The calibrated times are stored as offsets and therefore have a maximum range of $\pm 100\%$ of the factory setting value. These offsets are cleared upon entering calibration mode. So, to restore the factory setting times, simply enter calibration mode and then turn off the unit. When power is restored, the system will use the factory setting times for the selected configuration.

To calibrate the on time but still use the factory setting off schedule, complete the on time portion of the calibration procedure. Then, at any time during the off calibration cycle, turn off the unit. When power is restored, the system will use the calibrated on time with the factory setting off schedule.

4. Summary

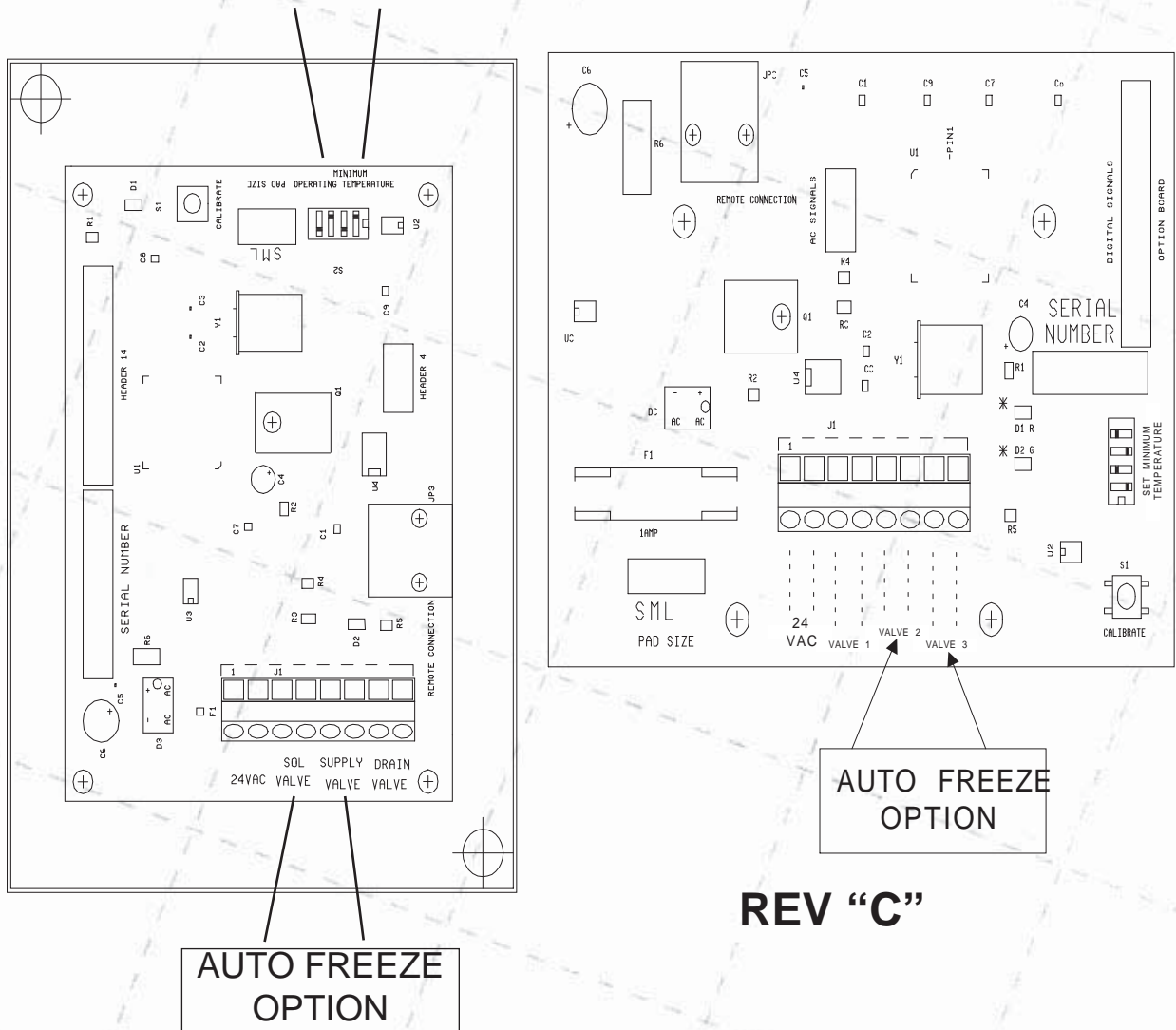
Media pads should wet evenly after a few "ON" cycles, with no dry spots and minimal streaking at 3" from the bottom.

The proper flow rate of water over the media pad is correct when a small amount of excess water is obtained at the case drain at the completion of the "ON" cycle.

CAUTION: Do not flood the media pads with extreme quantities of water for long periods, as this will cause premature breakdown of the media. An even flow from top to bottom of the media with the least amount of water is all that is required to assure maximum efficiency and media life span. More water does not provide more evaporation or more cooling, in fact it can have the opposite effect.

H. Minimum Operating Temperature Adjustment

The MPR-01AW has an adjustable operating temperature pin setting, which can be adjusted to operate at minimum temperature between 51.8°F and 78.8°F. Locate the 4 pin adjustable plate on Figure 2 and using the minimum operating temperature switch settings table on page 14 move the 4 pins to the desired temperature location.



REV "B"

Figure 2

MPR-01AW Minimum Operating Temperature Switch Settings Table

| | Switch | Switch | Switch | Switch |
|--------|--------|--------|--------|--------|
| | One | Two | Three | Four |
| 92.3 F | OFF | OFF | OFF | OFF |
| 89.6 F | ON | OFF | OFF | OFF |
| 86.9 F | OFF | ON | OFF | OFF |
| 84.2 F | ON | ON | OFF | OFF |
| 81.5 F | OFF | OFF | ON | OFF |
| 78.8 F | ON | OFF | ON | OFF |
| 76.1 F | OFF | ON | ON | OFF |
| 73.4 F | ON | ON | ON | OFF |
| 70.7 F | OFF | OFF | OFF | ON |
| 68.0 F | ON | OFF | OFF | ON |
| 65.3 F | OFF | ON | OFF | ON |
| 62.6 F | ON | ON | OFF | ON |
| 59.9 F | OFF | OFF | ON | ON |
| 57.2 F | ON | OFF | ON | ON |
| 54.5 F | OFF | ON | ON | ON |
| 51.8 F | ON | ON | ON | ON |

H. Automatic Freeze Protection Option MPR-AFP

Operation:

Once the option board is installed, configured and connected system operations is completely automatic.

This auto freeze option monitor's the ambient temperature and if the temperature falls below the threshold set by the freeze temperature dip switches then normal operation is suspended and the supply valve is closed and the drain valve is opened for the time set by the drain time dip switches.

Installation:

Remove power for MPR and then plug the option board into the main board.

Configuration:

Set the temperature and drain time dip switches according to desired settings using Table #1. Reinstall power to main MPR board.

Connection:

Connect the supply and drain solenoid valve to appropriate connections on the main MPR board. (See Figure #1) Reinstall power to main MPR board.

Testing:

Press and hold the test button (see Figure #3) for two seconds to verify supply and drain valve operation.

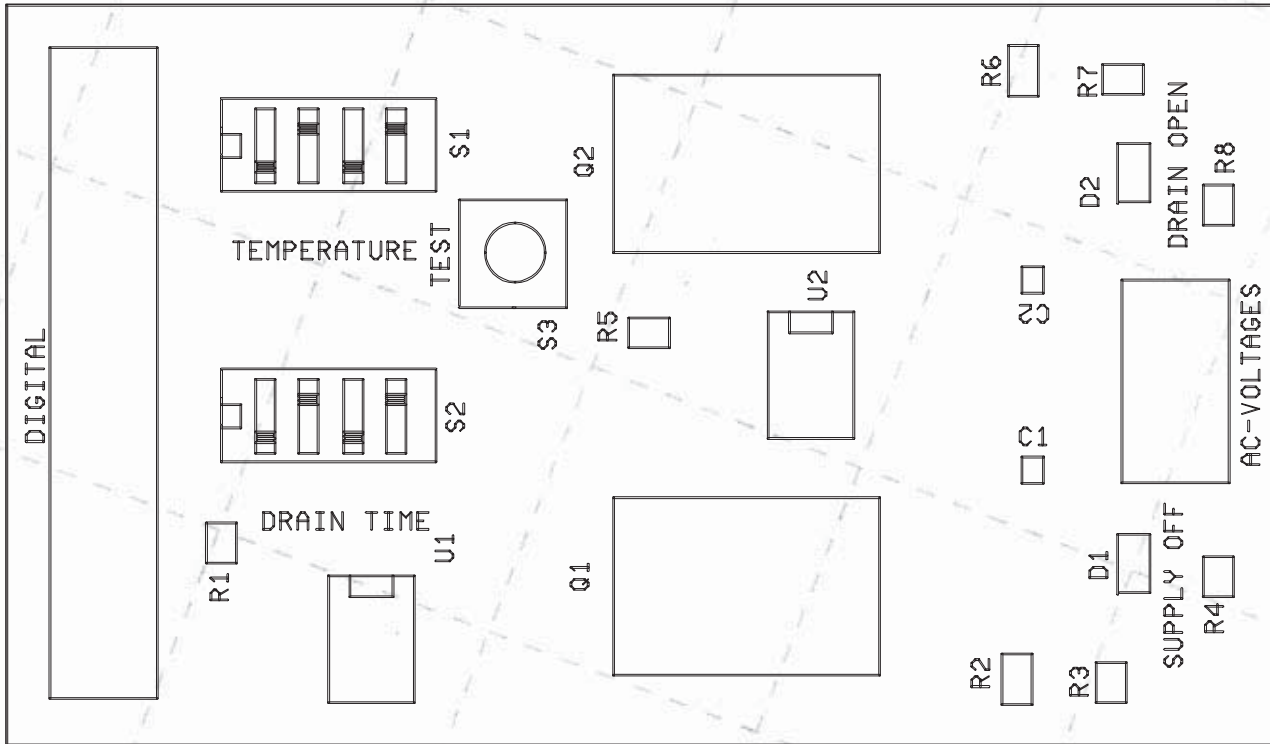


FIGURE 3

Switch Settings

The drain time is adjustable from 2 to 30 minutes in 2 minute increments and should be set to the appropriate time required to completely drain the system plumbing should the temperature drop below the freeze temperature setting. Set the four switch positions for the appropriate time according to the table below:

| Drain Time | SWITCH POSITIONS | | | |
|--------------|------------------|-----|-----|-----|
| | (S2) | | | |
| Minutes | 1 | 2 | 3 | 4 |
| 0 (Disabled) | OFF | OFF | OFF | OFF |
| 2 | ON | OFF | OFF | OFF |
| 4 | OFF | ON | OFF | OFF |
| 6 | ON | ON | OFF | OFF |
| 8 | OFF | OFF | ON | OFF |
| 10 | ON | OFF | ON | OFF |
| 12 | OFF | ON | ON | OFF |
| 14 | ON | ON | ON | OFF |
| 16 | OFF | OFF | OFF | ON |
| 18 | ON | OFF | OFF | ON |
| 20 | OFF | ON | OFF | ON |
| 22 | ON | ON | OFF | ON |
| 24 | OFF | OFF | ON | ON |
| 26 | ON | OFF | ON | ON |
| 28 | OFF | ON | ON | ON |
| 30 | ON | ON | ON | ON |

Switch Settings (continued)

The freeze temperature threshold is adjustable over a 15° C (27° F) range by setting the four switch positions according to the table below:

| Freeze Temperature | | SWITCH POSITIONS (S1) | | | |
|--------------------|------|-----------------------|-----|-----|-----|
| °C | °F | 1 | 2 | 3 | 4 |
| 0 | 32 | OFF | OFF | OFF | OFF |
| 1 | 33.8 | ON | OFF | OFF | OFF |
| 2 | 35.6 | OFF | ON | OFF | OFF |
| 3 | 37.4 | ON | ON | OFF | OFF |
| 4 | 39.2 | OFF | OFF | ON | OFF |
| 5 | 41 | ON | OFF | ON | OFF |
| 6 | 42.8 | OFF | ON | ON | OFF |
| 7 | 44.6 | ON | ON | ON | OFF |
| 8 | 46.4 | OFF | OFF | OFF | ON |
| 9 | 48.2 | ON | OFF | OFF | ON |
| 10 | 50 | OFF | ON | OFF | ON |
| 11 | 51.8 | ON | ON | OFF | ON |
| 12 | 53.6 | OFF | OFF | ON | ON |
| 13 | 55.4 | ON | OFF | ON | ON |
| 14 | 57.2 | OFF | ON | ON | ON |
| 15 | 59 | ON | ON | ON | ON |

III - MAINTENANCE - *(WITHOUT AUTO-FREEZE PROTECTION OPTION)*

Shutting off the water supply and disconnecting both incoming and outgoing water lines at the MPR can accomplish draining the MPR control, before freezing temperatures. This should drain all water remaining in the solenoid valve and accompanying water lines.

IV - WARRANTY

The MPR water control module manufactured by ENERGY SAVER shall be free of original defects in workmanship and materials for a period of one (1) year from date of shipment, provided the unit has been properly stored, installed, serviced, maintained, and operated.