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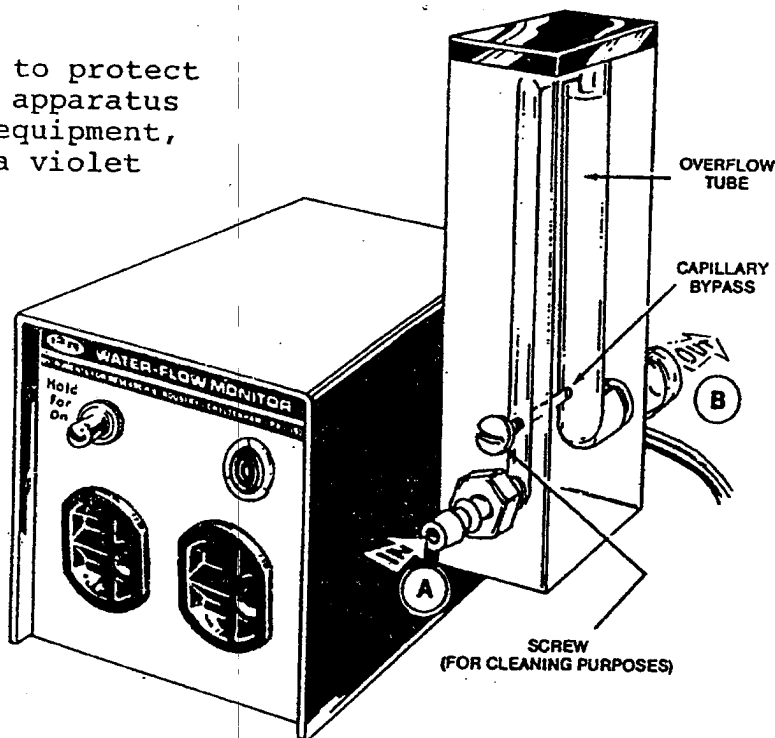
OPERATING NOTES

WATER-FLOW MONITOR Model WFM

WATER-FLOW MONITOR fills the need for a simple device which will turn OFF the power to a water-cooled apparatus if the flow of cooling water ceases.

The Monitor can be used to protect a variety of laboratory apparatus such as: distillation equipment, reflux extractors, ultra violet lamps, etc.

When combined with a solenoid valve, the Monitor can also turn OFF the flow of water at the source, thereby preventing a flood in the case of hose or equipment failure.



Operating Principle:

Water flowing into the Plexiglas block at (A), divides, with most of the flow going up the small vertical tube, down thru the larger overflow tube, and out to the drain thru (B). A small flow bypasses this main stream, flowing thru a capillary bypass between the inlet (A) and the outlet (B) ports. A hydrostatic head (h) is created as the water flows thru this system. A pressure switch inside the metal case senses (h) and turns the electrical outlets ON or OFF.

The capillary bypass is important for two reasons: 1.) At low flows, it is the primary restriction to flow, and causes (h) to develop, 2.) Should the flow of water cease, the capillary bypass acts as a drain, allowing the water in the small tube to empty, thus permitting (h) to decrease. The pressure switch responds to this decrease in (h) and turns off both outlets.

Where do I attach WATER-FLOW MONITOR to my cooling water?

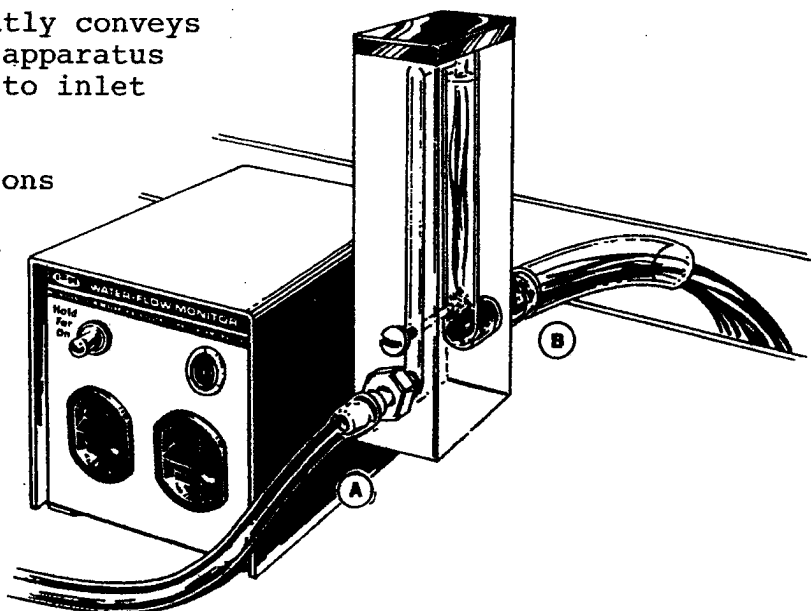
Always connect the WATER-FLOW MONITOR between the apparatus being protected and the drain. We suggest the following:

1. Mount the WATER-FLOW MONITOR close to your drain so that when water flows out of port (B) it passes freely into a drain.

You may find it convenient to extend port (B) with the short piece of 5/8" i.d. plastic tubing that we supply with the WATER-FLOW MONITOR.

2. Use the hose that presently conveys the cooling water from your apparatus to the drain and connect it to inlet port (A).

3. Test these flow connections by slowly turning on your cooling water. Water should flow freely through (A) into the Plexiglas block and out (B) to the drain.



Why use accessories like a Solenoid Valve and Pressure Regulator?

There are definite advantages in combining a solenoid valve and a pressure regulator with a WATER-FLOW MONITOR.

- (1). If a hose breaks or the equipment itself fails, the water may flow out onto the floor instead of going to the drain. A solenoid valve installed in the supply line and connected to WATER-FLOW MONITOR can stop such flooding.

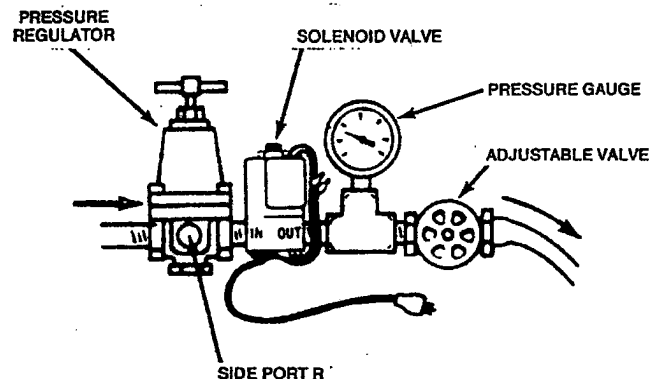
- (2). Water pressure fluctuates in most labs. Pressure builds up in "off hours." That's one reason why hoses split or blow off, and lab floods occur. The pressure regulator will minimize variations in pressure.

Where do I install the solenoid valve and the pressure regulator?

When you are using your WATER-FLOW MONITOR with a solenoid valve and a pressure regulator, you should connect these accessories to your water supply line as follows:

1. Install the pressure regulator and solenoid valve to your water pipe ahead of the adjustable valve that you are probably already using. We suggest that you connect them so that water flows through the pressure regulator to the solenoid valve, then to the adjustable valve and on into your apparatus.
2. Temporarily, plug the line cord from the solenoid valve into a convenient 115V wall outlet.
3. Adjust the pressure regulator to an intermediate pressure such as 15 psig and then control flow by use of the adjustable valve.

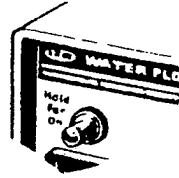
NOTE: Some pressure regulators have an extra side port "R". This can be used with a second solenoid valve to supply water to another water-cooled apparatus. If there is an extra side port and it is not used, make sure it is plugged!



How do I hook up WATER-FLOW MONITOR electrically?

1. Plug line cord from the WATER-FLOW MONITOR into a convenient 115v wall outlet.
2. Plug the heater (or the critical part of your apparatus that should be turned OFF) into one of the WATER-FLOW MONITOR outlets.
3. Plug the line cord from the solenoid valve into the other WATER-FLOW MONITOR outlet.

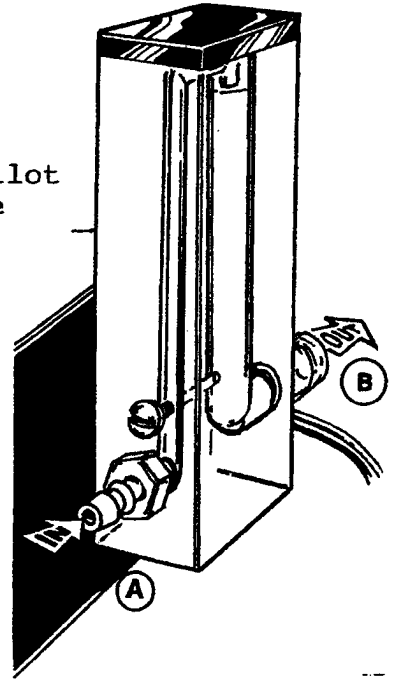
Why the push-button switch?



The push-button switch is there to help you start up your apparatus when you are using a solenoid valve (most solenoid valves will not open until they receive power). Press the switch and keep it pressed until the solenoid valve opens and allows water to flow through your apparatus and through the WATER-flow monitor. As soon as this flow creates a suitable hydrostatic head in the Plexiglas flow tube, the pressure switch will be energized. You will hear a loud "click" and the red pilot light and outlets will turn ON. You can then release the switch.

How do I know WATER-FLOW MONITOR is working properly?

After you have water flowing thru your unit and the pilot light is ON, test your set-up by slowly decreasing the flow of water. As the flow decreases, the overflow will cease and water will fall back in the small vertical tube. With a further decrease you will reach a critical head at which the pilot light will turn OFF. Now, if you slowly increase the water flow, when water rises several cm higher, the pilot light will go ON and you will simultaneously hear the loud "click" as the pressure switch and relay are energized. Your unit is indeed operating correctly.



What is that adjustment on the left-hand side?

This adjustment is for the pressure switch. It is important because if the hydrostatic head (h ^{URNS} _{OFF}) is no longer in the range of 2.5 to 5 cm above the entrance port (A), the pressure switch should be readjusted. The adjustment is made by using a broad-bladed screwdriver (or a dime) and turning the plastic screw located within the grommet clockwise to raise the operating range with respect to the water height or counterclockwise to lower it. Only rarely, if ever, will you need to change this adjustment. Caution must be observed here. If the plastic screw is turned too far counterclockwise, it and a small spring will pop out--surprise? (If this happens, first disconnect the unit from the source of power, then turn the instrument on its side and look up into the opening and you will notice a little metal pin. Carefully, center the spring and the plastic screw around this pin and carefully screw them all back in.)

NOTE: If the plastic screw is turned too far counterclockwise, the operating range of the pressure switch may be lowered to such an extent that the unit may stay on even if no water is flowing.

What about the electrical usage - are there any precautions?

The rating of this model is given by the label on top of the case; do not exceed it.

What about the water flow to the drain--are there any precautions?

Yes, it is very important that the water flow out of WATER-FLOW MONITOR be unimpeded on its way to the drain. In fact, it is best if the water falls freely into a drain or drain trough. Therefore,

1. Do not mount the WATER-FLOW MONITOR below your drain.
2. If you add tubing from port (B) to the drain, use a short, large diameter piece. Do not allow the tubing to rise above port (B) or to become kinked between port (B) and the drain.

Either (1) or (2) will create a steady hydrostatic back pressure on the WATER-FLOW MONITOR and render it inoperative in so far as flow monitoring is concerned.

At what water-flow rate does WATER-FLOW MONITOR normally operate?

Tests on typical WATER-FLOW MONITOR show that the electrical outlets are turned ON at a flow of approximately 300 ml/minute and are turned OFF if the flow drops as low as 200 ml/minute. We suggest that the WATER-FLOW MONITOR can be used with flows above 400 ml/minute. For operation at even lower flows, see notes in Appendix I. Our information suggests that typical water flows used in water-cooled equipment in the lab range from 500 ml to 2000 ml/minute. Thus, WATER-FLOW MONITOR is ideal for this range.

We believe WATER-FLOW MONITOR can be readily used with flows as high as 5000 ml/minute. If this WATER-FLOW MONITOR is not suitable for your flow, let us know. Perhaps we can modify it or advise you as to how to modify it. But, if it is not suitable for your application, return it and we will cancel the invoice.


NOTE: Do not exceed a flow of 6000 ml/minute as the resulting back pressure may damage the pressure switch.

Finally: The WATER-FLOW MONITOR is such a handy little device that you may find a number of places to use it. The low price can make it reasonable for you to use one with each water-cooled apparatus in your lab. We will appreciate knowing what new applications you find for this unit.

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APPENDIX I

Can I increase the sensitivity of WATER-FLOW MONITOR - to make it work at a flow of a few ml/minute?

Yes! One of the features of our design is that now you can get at the capillary bypass to clean it out or to alter it. To make the WATER-FLOW MONITOR work at low flows, experiment with partially obstructing the capillary with a piece of wire. To put the wire in, just remove the clean-out screw and insert the wire. We suggest bending the wire like this  so that it will stay in place.

Can I increase the level of flow that causes the WATER-FLOW MONITOR to turn off?

Yes! You can enlarge the capillary bypass by very carefully re-drilling it using an electric drill. As we made this unit, it was drilled with a #42 drill. CAUTION: Since the flow will change very greatly with the slightest increase in bypass diameter, do not pick a large drill for your first test!

APPENDIX II

Q. I am using both a WATER-FLOW MONITOR & a THERM-O-WATCH with the same apparatus. How do I interconnect them so that WFM will shut down my apparatus (and its T-O-W) if the water flow fails?

ANS. This depends on the model T-O-W:

FOR SINGLE CORD T-O-W, the various S3, L7 and L8 Models -it's easy.

Plug the T-O-W directly into one WFM outlet saving the other WFM outlet for use with a solenoid valve.

FOR DOUBLE CORD T-O-W, the various L6 Models - our advice is more elaborate

All the L6's have two line cords: ① a black cord which supplies 115v for the T-O-W electronics; ② a gray cord which is connected either to 115v, or more likely, to the output of a Powerstat or Variac. As advised in the operating instructions for the L6 T-O-W, you probably have the interconnections between the T-O-W ①, ② and the autotransformer ③ as shown in the sketch below.

