

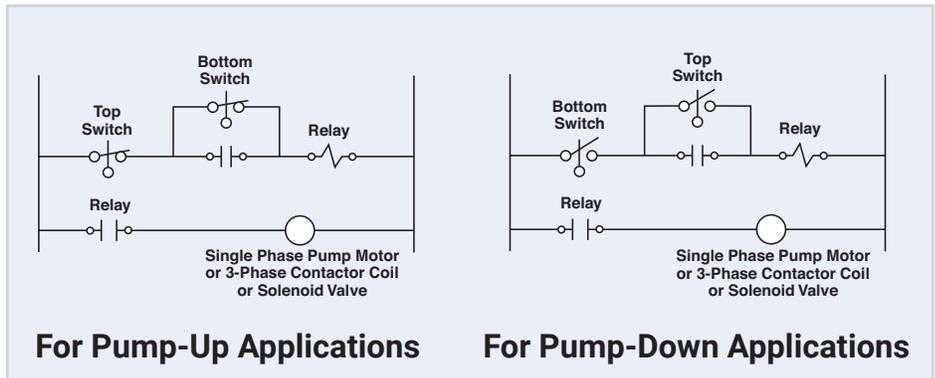


Sensing Solutions since 1959

Madison has extensive experience in the design and production of tank level controls for “Pump-Up” or “Pump-Down” applications. Two independent float switches, or a custom multi-point float level sensors with two or more floats is often used as part of a control system for pumps and other filling devices, when combined with a controller or PLC. Madison’s **R2-120 controller** is ideal for tank level control between two points. For larger applications, Madison also offers Tilt level float switches like the **M4189**, which are ideal for sumps, tanks or ponds to directly control small pumps for liquid level control between 6” to 36”.

For single-phase devices, such as solenoids and pumps with fractional horsepower motors, a customized double pole relay circuit may also be used for either filling “Pump-Up” or draining “Pump-Down” operations. For larger pumps, where three-phase operation is required, the same relay circuit can be used to control a three-phase contactor in the motor control circuit. Consult your electrician for assistance with these applications. Basic relay circuits for this type of control are illustrated here (below right).

Special Note: Since each circuit has unique electrical characteristics, Madison Company cannot review or be responsible for the hook-up of your circuits. In order to insure proper circuit connections and Sensor life, please review all product information and consult a qualified Electrical Technician or Engineer before directly connecting your Float Switch to any powered device.



Pump Control & Float Switch Applications

Introduction

This section is a guide designed to help you understand how to properly hook up a Float Switch to control a pump or valve for Tank Level Control.

First: Consider the device that the Float Switch will control and how will it be used

1. Review the specifications for the connected device to be controlled by the Float Switch (typically available from the manufacturer).
2. Determine the power rating for the device or pump (you’ll want the rating in watts, and not voltage!)
3. Determine if the Float Switch or Sensor is to be used for:

Single-Point action control (i.e., “On”/ “Off”), or

Dual-level or Multi-level control, for starting/stopping a pump, valve or system to maintain a fluid level between two fluid level points (i.e., Fill – “Pump Up”- low to high or, Drain – “Pump Down” – high to low)



Sensor Reference Information

Tank Level Control

Single-Point Float Switch applications

Most general purpose Float Switches can only switch single-point, low power, small electrical devices, or, provide control signals to relays, PLCs or controllers.

When a larger powered device is being used, a relay is often required to isolate the Float Switch from this larger device. The Float Switch is connected in series with the relay input coil that typically draws only 3-5 watts. When the powered switch is closed, the relay coil is activated and closes the isolated output contacts. The relay contacts turn on or off the higher current required by the controlled device.

The need to isolate the Float Switch from larger powered devices by means of a relay and input coil is due to the unique Inductive and Capacitive loads and electrical spikes of these larger powered devices. Since these electrical spikes travel down to ground wire, **it is important that the Float Switch ground remains isolated from the switched load. The power and ground through the Float Switch and relay coil should be independent parallel wires, and should not be tied together with a common ground wire near the switched load.**

As a guideline, since most electrical circuits are Inductive or Capacitive and unique, a float switch rated for Resistive loads **should only switch general purpose electronics directly that are less than 1/5 the resistive rated watts for the switch.** As an example, a standard 60 watt rated Float Switch can typically switch on or off a valve or device directly that is rated only up to 10-12 watts. This is because these Inductive or Capacitive loads create electrical spikes typically 5 to 10 times the rated load when switched on or off!

Another consideration when using Float Switch is to minimize "Chattering". Since a Single-point Float Switch turns On/Off within 1/16" of level change, it can "Chatter" on and off rapidly if used to maintain the fluid level about a point, or in moving liquids. This "Chattering" will cause rapidly repeated electrical spikes that will damage and can even tack weld the switch contacts closed, as excessive heat is produced in the single switch.

High/Low, Dual Level Fluid Level Control

In order to avoid repeated "Chattering" of a Single-Point Level Switch when maintaining a High/Low fluid level, two separated switch points are needed to allow sufficient delay between starting and stopping most electrical devices. Once the switches have been installed at the proper distance apart, they need to be connected to a PLC or pump controller like the Madison **R2-120**. Whether using two independent Float Switches, a custom multi-point Float Switch or do-it-yourself **ML5555 kit**, a controller will automatically turn on and off a pump or valve to maintain the fluid level. While the Float Switches indicate the proper "Start" and "Stop" points for the liquid level, the controller turns "On" and "Off" the pump or valve via a switched set of isolated relay contacts to protect the float switch from the larger load.

Sensor Reference Information

Tank Level Control



Fig. 1 Pump Down
(2 independent float switches)

Fig. 2 Pump Up
(4 level custom float switch)

Figure 1. above shows an example of two independent switches set for a “Pump Down” scenario.

- With both switches set Normally Opened (NO) in an empty tank, they will both be closed when the fluid rises to the top Float Switch.
- Once full, the controller will switch closed the contacts to power “On” the pump or valve that will remove liquid and Pump Down the level.
- Once the fluid reaches the low level, the lower Float Switch will open and the controller will remove power from the pump or valve automatically. This cycle will automatically repeat once the level rises.

Figure 2. above shows an example of a custom multi-level Float Switch like the **M5002**- set for “Pump Up” control.

- With both float level switches set Normally Closed (NC) in an empty tank, they will both be open when the fluid rises to the top Float Switch.
- Once empty, the controller will switch closed the contacts to power “On” the pump or valve that will fill liquid and Pump Up the level.
- Once the fluid reaches the top float level, the upper Float Switch will open and the controller will remove power from the pump or valve automatically. The cycle is automatically repeated each time the level drops.

Sensor Reference Information

Tank Level Control

Wire Color Guide

Wire Colors for Full-Size Multi-Point Switches with SPDT Switches	
<i>Note: Maximum of four levels with SPDT switches</i>	
Number of Switches	Color Code (Top to Bottom)
1	C - Black, NO - Green, NC - Yellow
2	C - Blue, NO - White, NC - Red C - Black, NO - Green, NC - Yellow
3	C - Blue, NO - White, NC - Red C - Brown, NO - Orange, NC - Violet C - Black, NO - Green, NC - Yellow
4	C - Blue, NO - White, NC - Red C - Brown, NO - Orange, NC - Violet C - Grey, NO - Red/White, NC Yellow/White C - Black, NO - Green, NC - Yellow

Wire Colors for Standard Switches	
Wire Color	Switch Material or Model No.
White	Polypropylene
Black	Stainless Steel, Brass/Buna-N, PBT
Yellow	Kynar
Brown	M3326
Red	M3326-NO

Wire Colors for Full-Size and Miniature Multi-Level Switches with SPST Switches	
Number of Switches	Color Code (Top to Bottom)
2	Red Black
3	Red White Black
4	Red White Blue Black
5	Red White Blue Green Black
6	Red White Blue Green Yellow Black

