

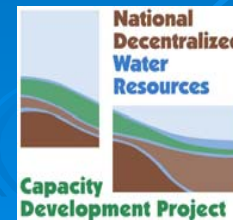
Controls Section III: Electro-Mechanical Controls in Onsite Systems

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for Decentralized Wastewater
Management

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Section Objectives:

- Understand the different types of floats, and the different uses of floats in onsite design.
- Know best uses of demand and timed dosing.
- Understand different control options for wastewater systems.
- Become familiar with different components of typical wastewater control panels.

Overview

Electro-Mechanical controls generally include at least three components; a sensing feature, a switching feature and a controlled device.

The sensing features for hydraulic control includes:

- Float switches of all sorts,
- Pressure transducers,
- Conductivity probes, and
- Devices that bounce a signal (sound wave, microwave, light etc) off a liquid surface.

On Site Control With Electrical Float Switches

Float Switch Features

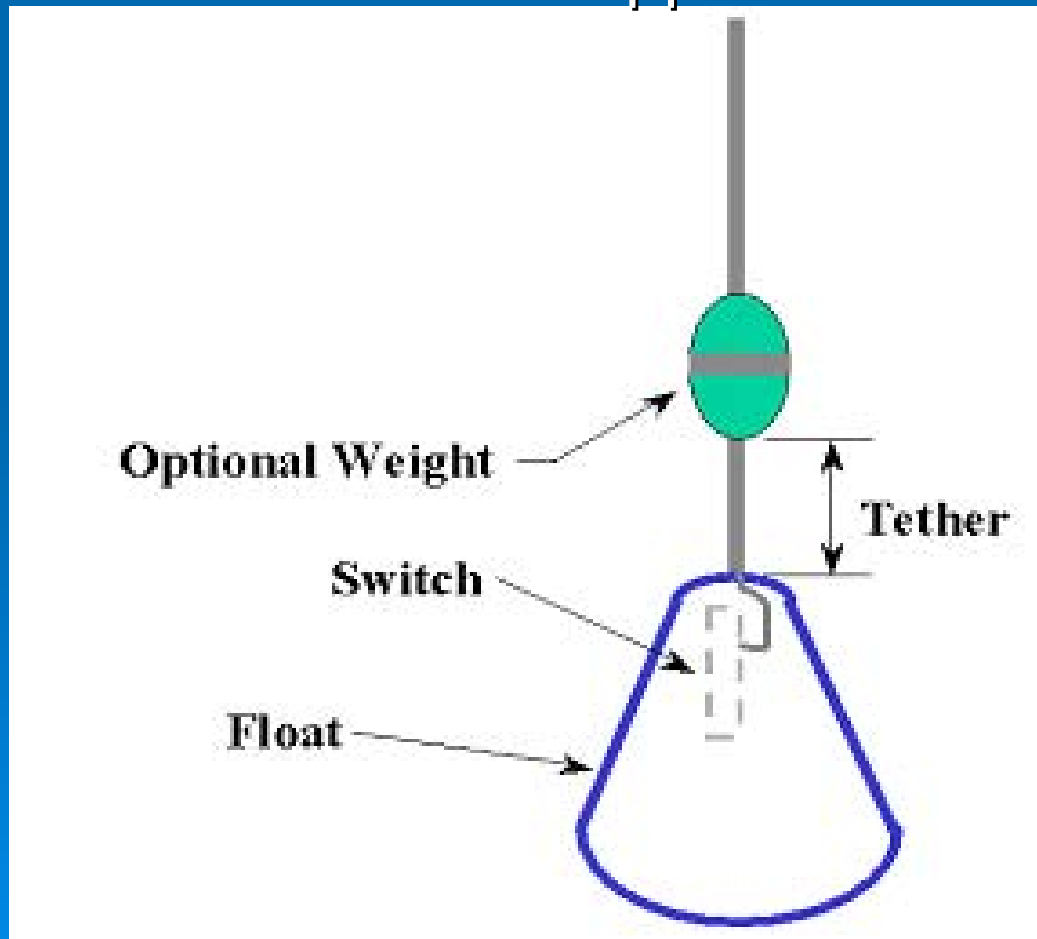
The switching feature can be as simple as an electrical contact inside the float, or can involve either mechanical or electronic relays in addition to the electrical switch in the float.

Float switches have several main components:

- A weight
- The connecting electrical line or tether
- The float
- The internal switch

Components of a Simple Float Switch

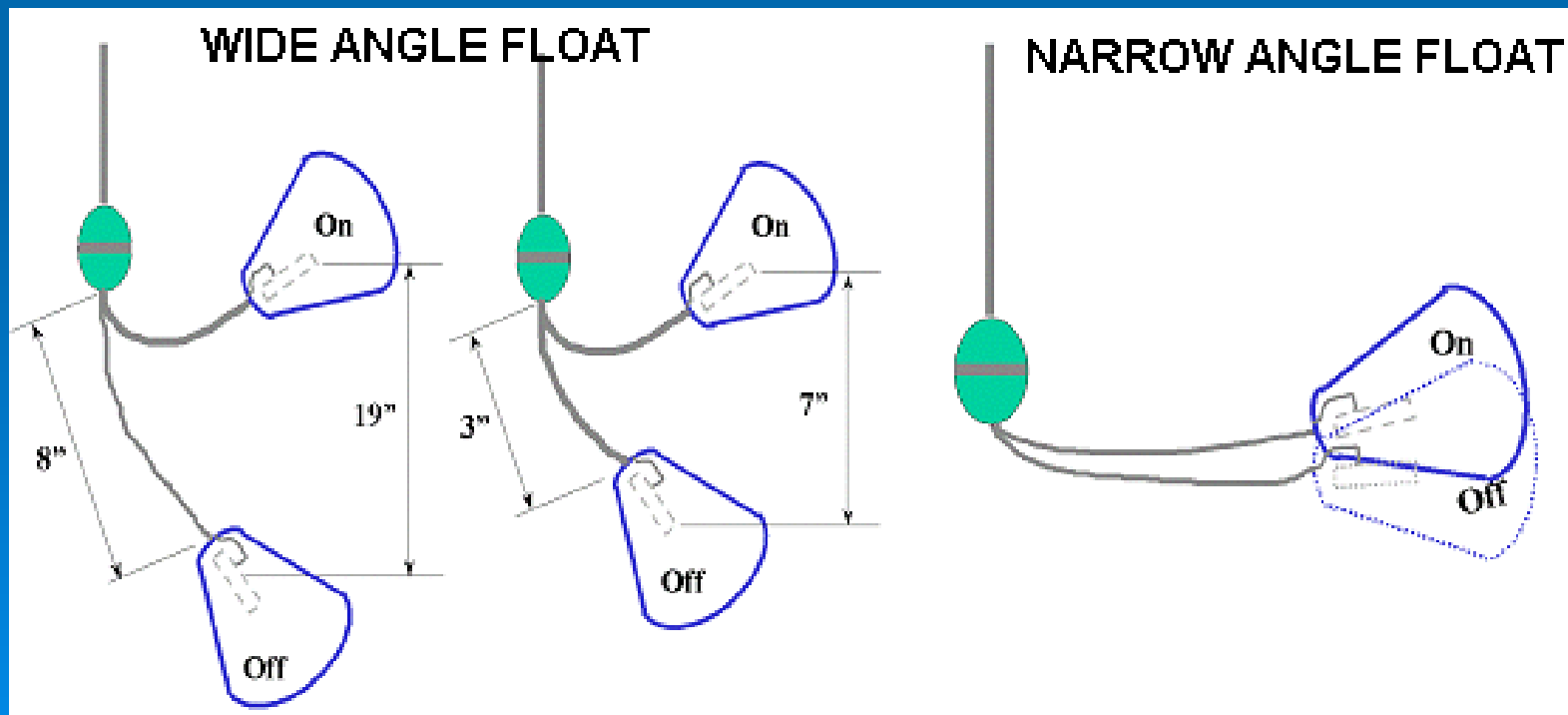
The float switch illustrated has a weight to allow it to be placed in a tank without the need to be attached to a vertical support.



Wide Angle and Narrow Angle Float Switches

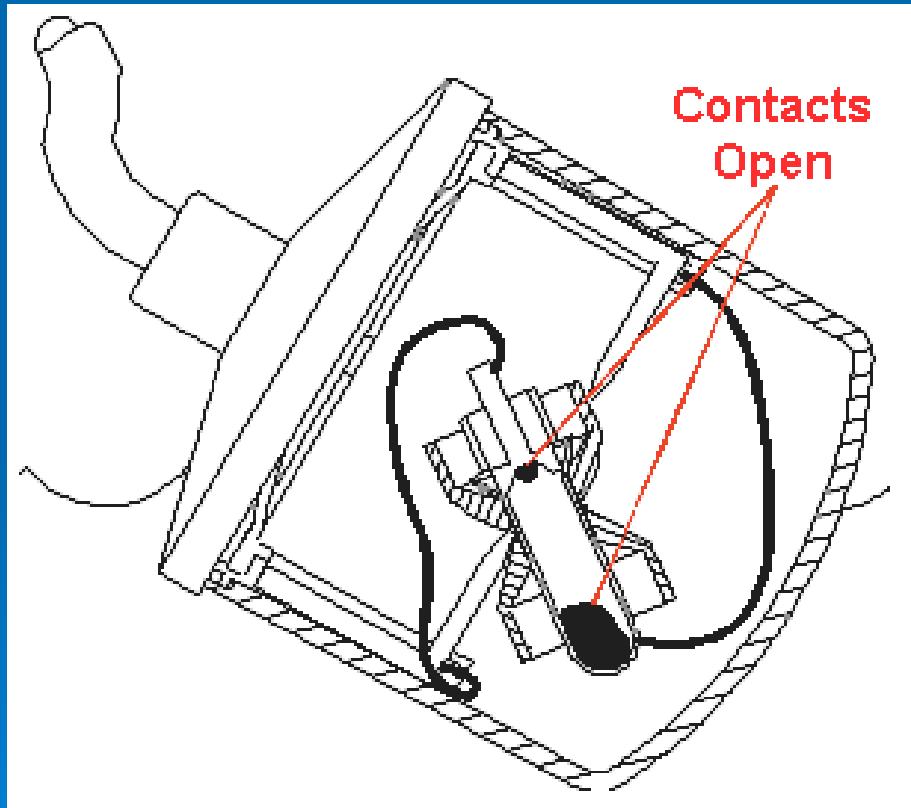
Float switches fall into three main categories:

- Narrow angle pilot float switches
- Wide angle pilot duty float switches
- Wide –angle motor control switches

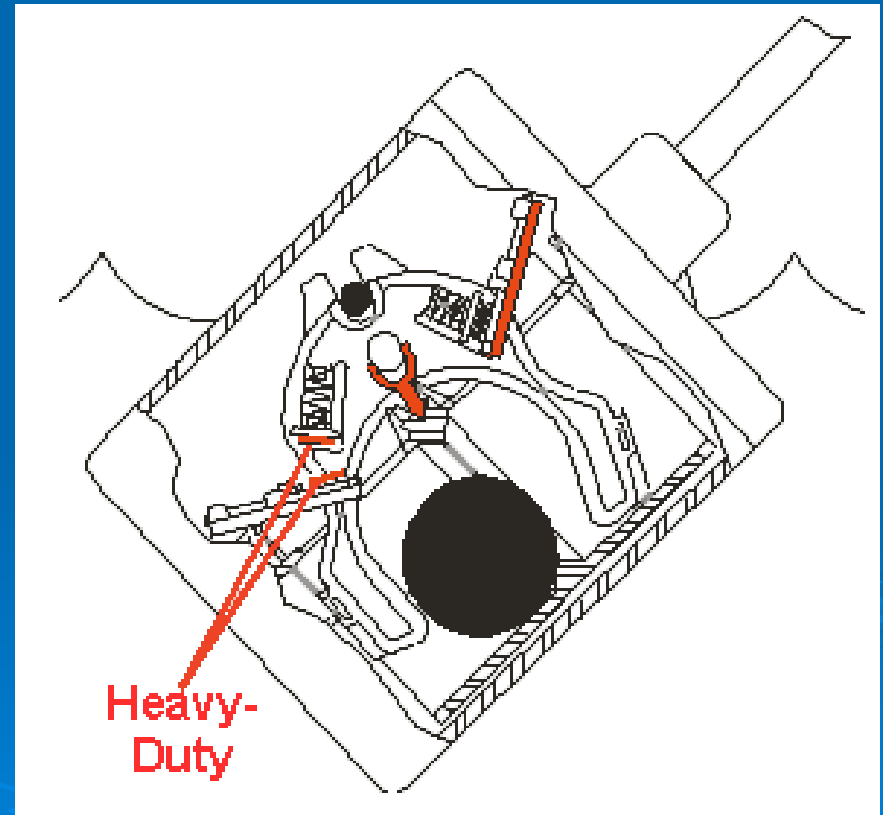


Mercury and Mechanical Float Switch

Mercury Float Switch

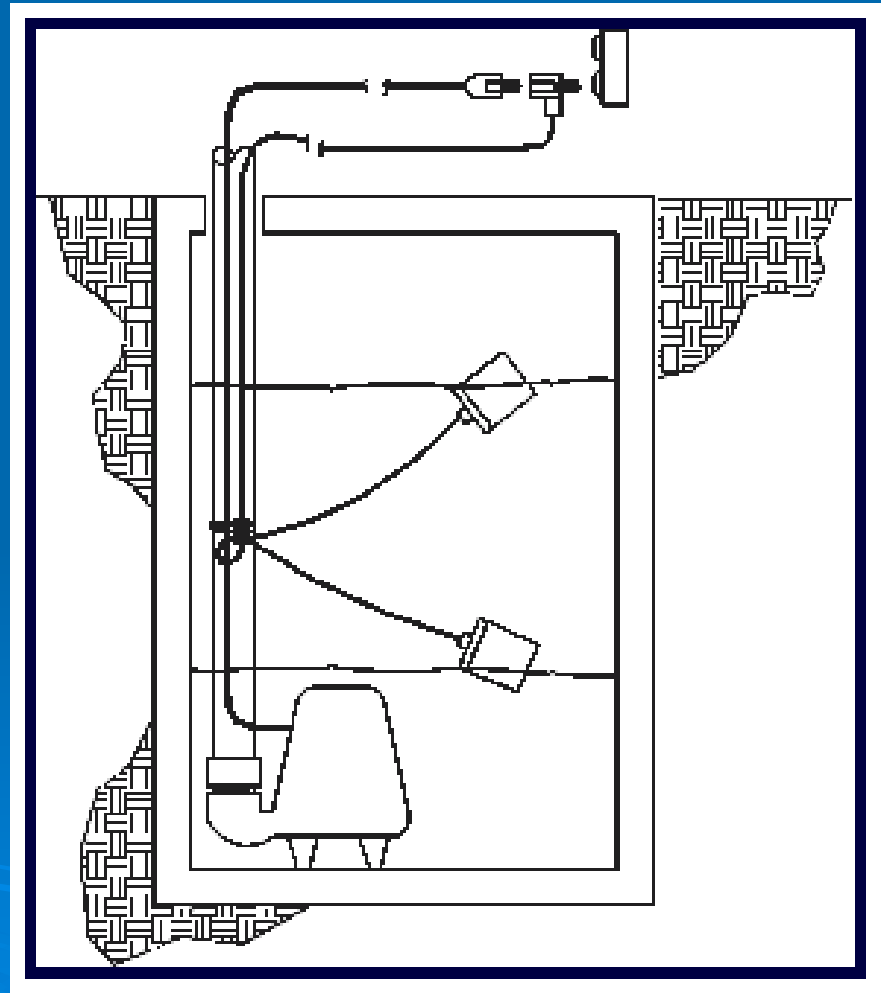


Mechanical Float Switch



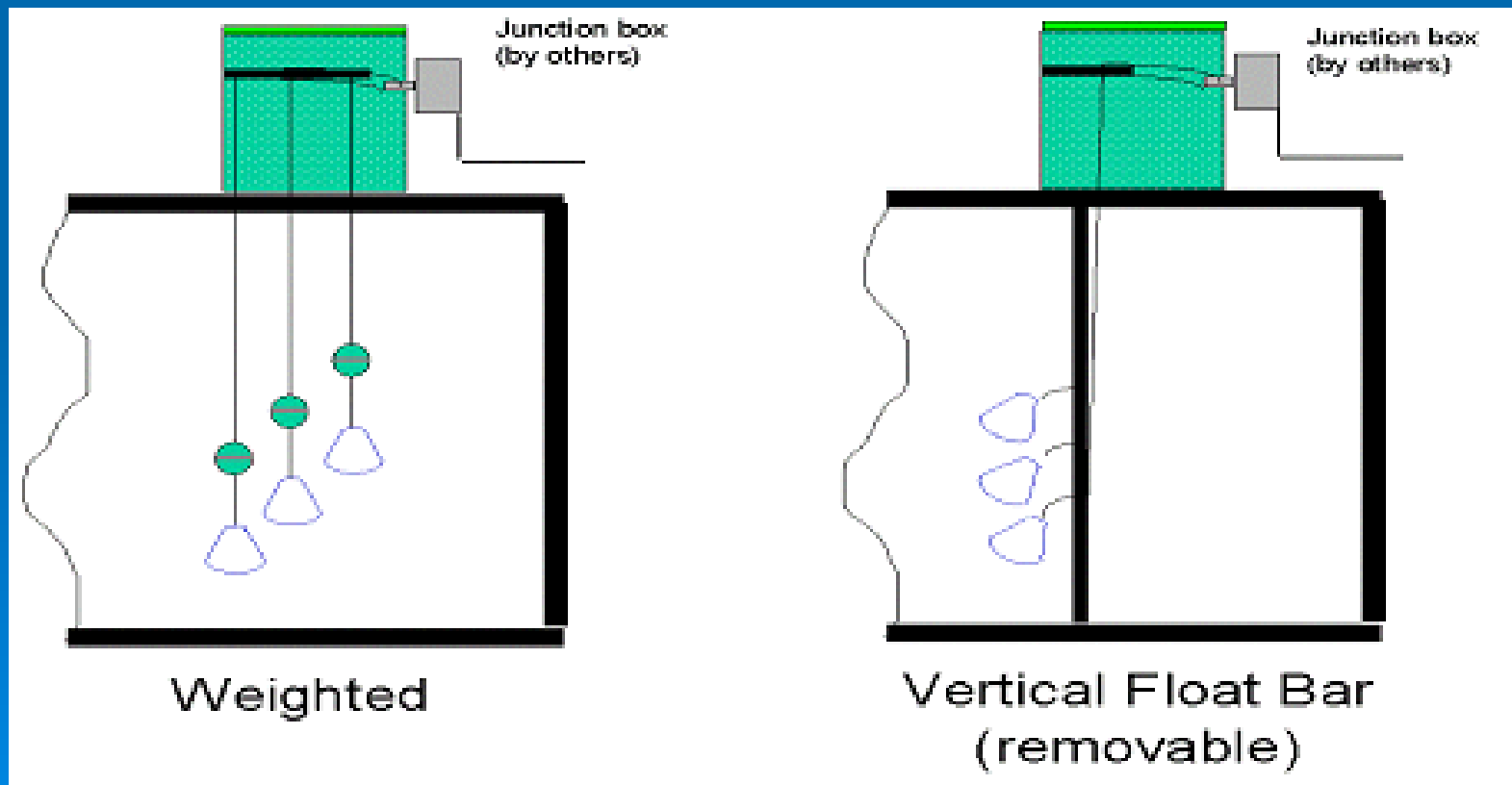
Demand Dosing With Floats: Single Float System

The most common use of electrical floats is to achieve control over the discharge from a holding tank to either the next step in the treatment or to the disposal field.



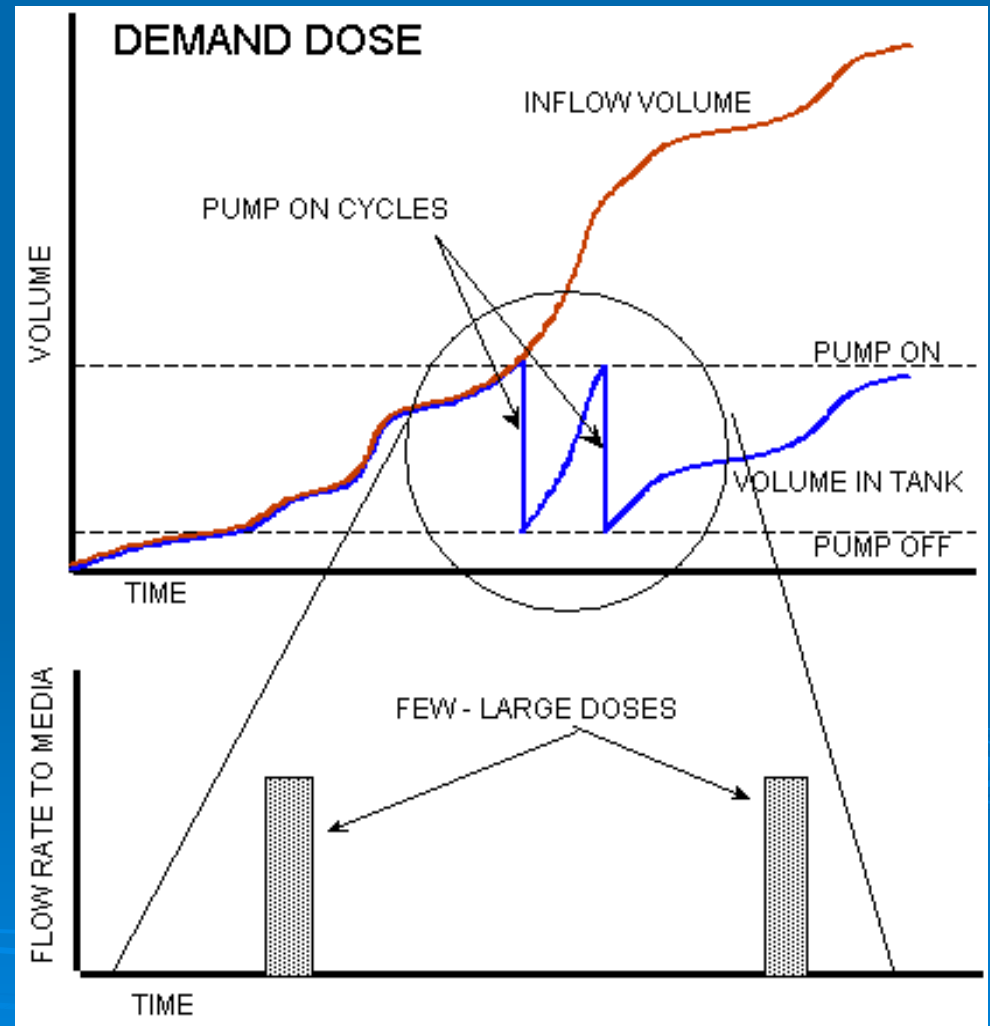
Weighted Versus Attached Floats

Tethered floats can be connected to weights and hung into a tank or attached to a vertical support.



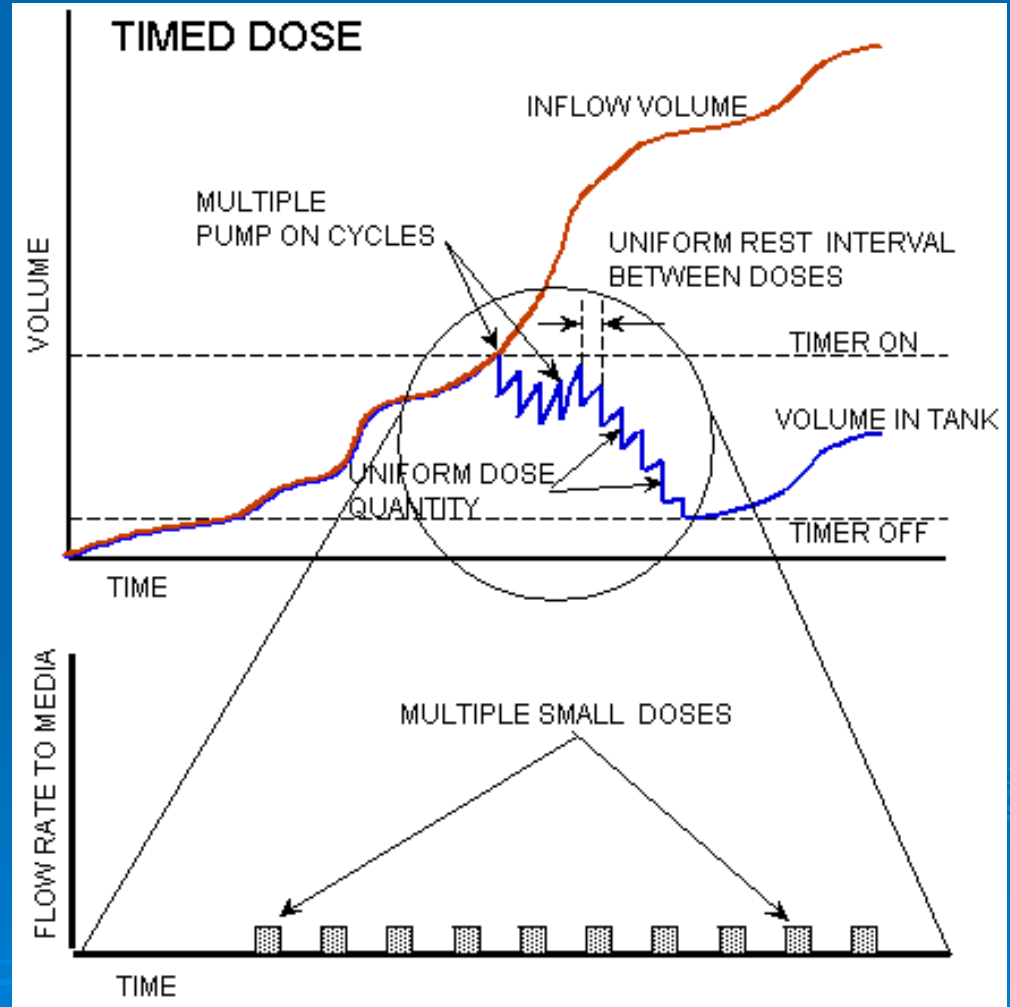
Demand Dosing

Demand dosing results in a dosing schedule that is dictated entirely by the incoming flow and the set points of the floats.



Timed Dose

Controlled dosing and resting of media with predetermined dose quantities can be achieved through the use of one or more floats in conjunction with a programmable timer.



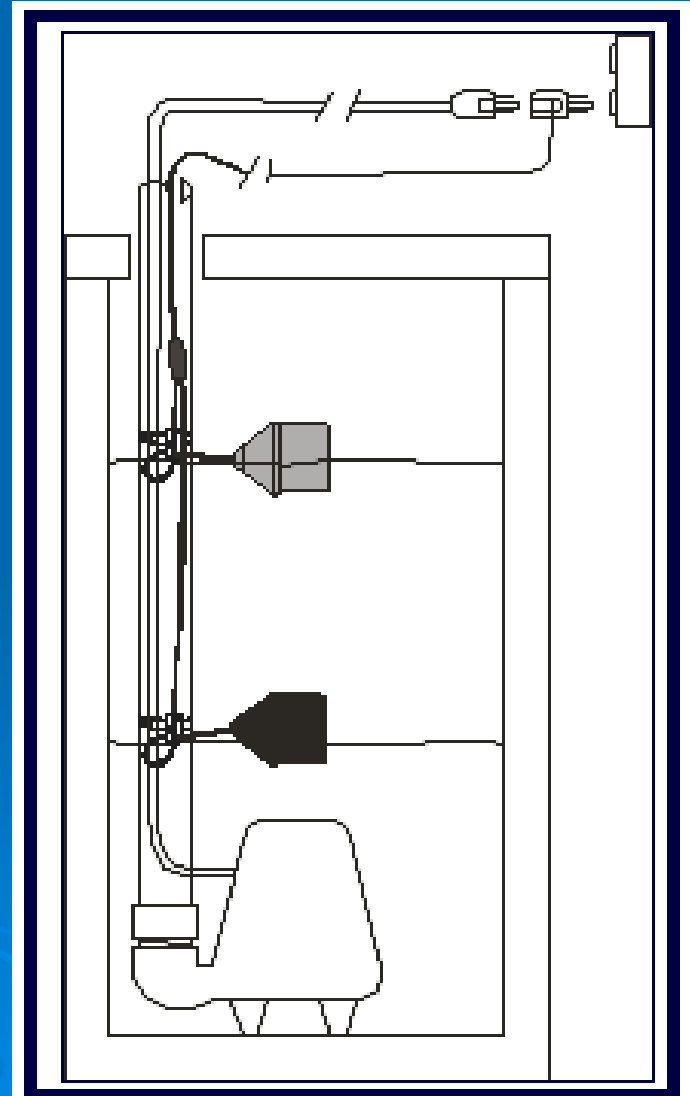
Demand Dosing With Floats: Two Float System

There are several reasons why a two-float system may be necessary:

- The tank geometry makes it impossible to adjust a tether to achieve the desired dose.
- The available float switches have a small operating angle.
- A high water alarm or warning signal is necessary.

Achieving Control & Design Objectives with Two Floats

Illustrated is a simple two-float system. The top float will close the circuit with rising water while the bottom float will open the circuit with falling water.



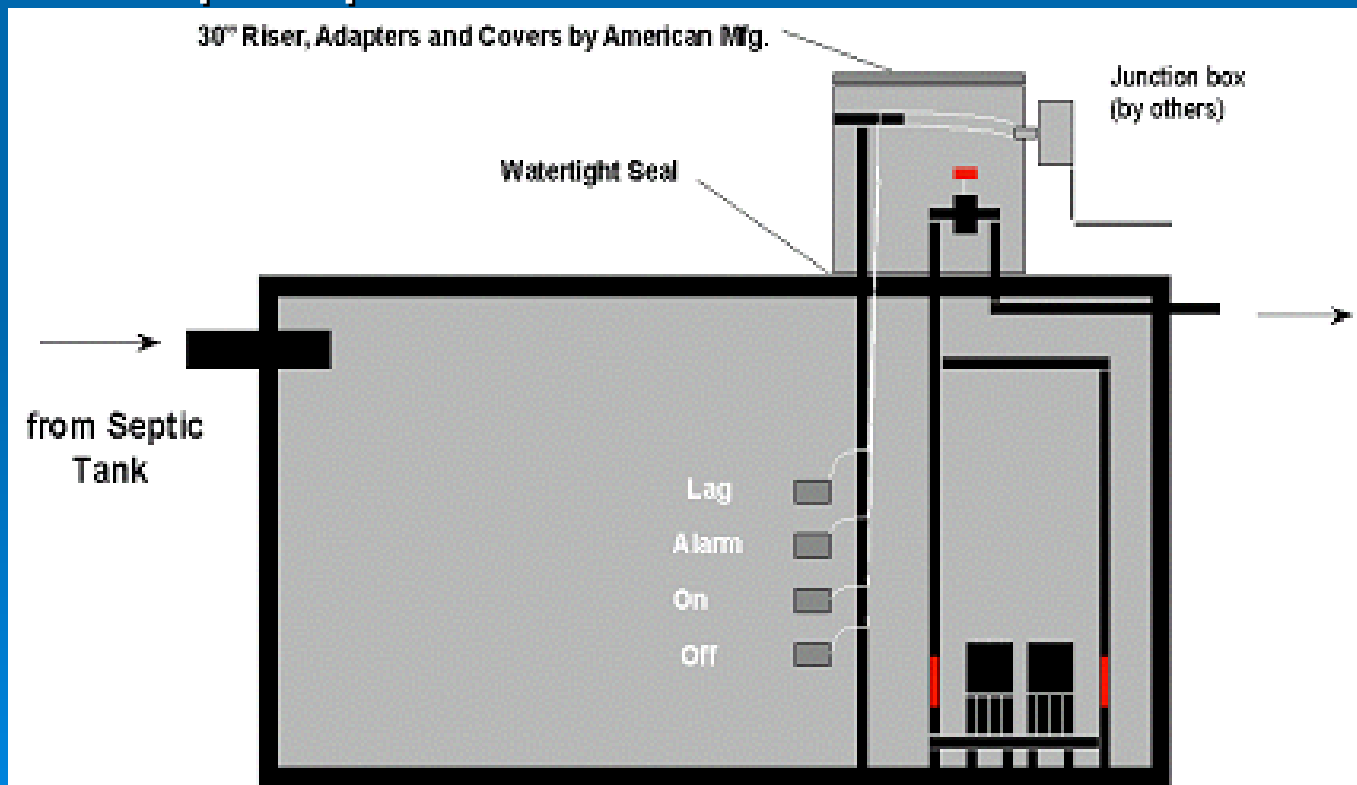
Demand Dosing With Floats: Three & Four Float System

With more floats more functionality can be achieved. Additional floats enable the addition of:

- High water alarms
- Second (Lag) pump operation
- Timer bypass for continuous pump on operation
- Low-Water alarm signaling the pump chamber is running dry and pump may burn out.

A 4 Float System Controlling Two Pumps and Alarm

This configuration illustrates the use of four floats to control a duplex pumping system in which the second pump will come on after an alarm sounds.



Control Systems For Onsite Wastewater

Control systems can be divided into four categories:

- Controls which operate the system routinely and automatically
- Controls which alert local operators to immediate and emergency conditions
- Controls which collect data for long term management decisions
- Controls which interface with larger automated management systems

Automatic Operational Controls

Automatic operational controls can be summarized as:

- Pump controlled with attached float (demand dosing)
- Pump relays for simple on off function (demand dosing without timers)
- Pump relays and timers to allow timed interval dosing.
- Above plus a timer override function to change the dose on and off timing
- Above plus the control of a second pump (duplex system) for backup and/or discharge of high flows

Local Operator Control Aids

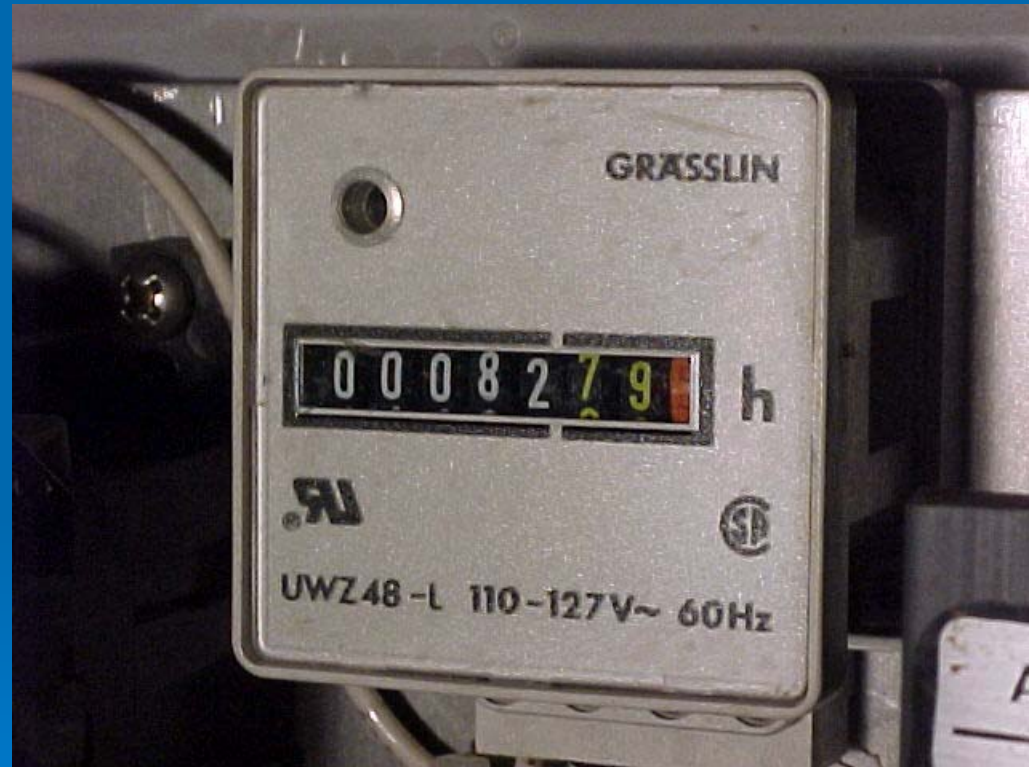
High Water Alarm

- Control panels are often used to facilitate local supervisor control functions
- The most fundamental local alert function is the high water alarm



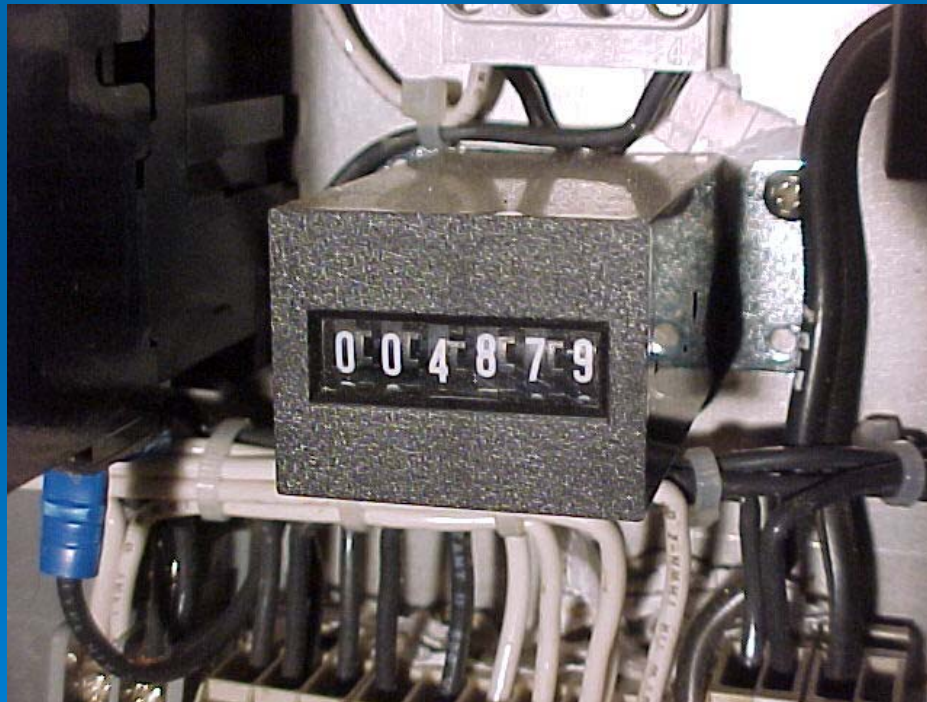
Elapsed Time Meter

- The elapsed time meter reveals the total amount of time that the pump has been running.
- If the pumps discharge flow rate is known it can be multiplied by the elapsed time to determine the total amount of effluent discharged



Event Counter

Event counters will increment each time the pump is turned on.



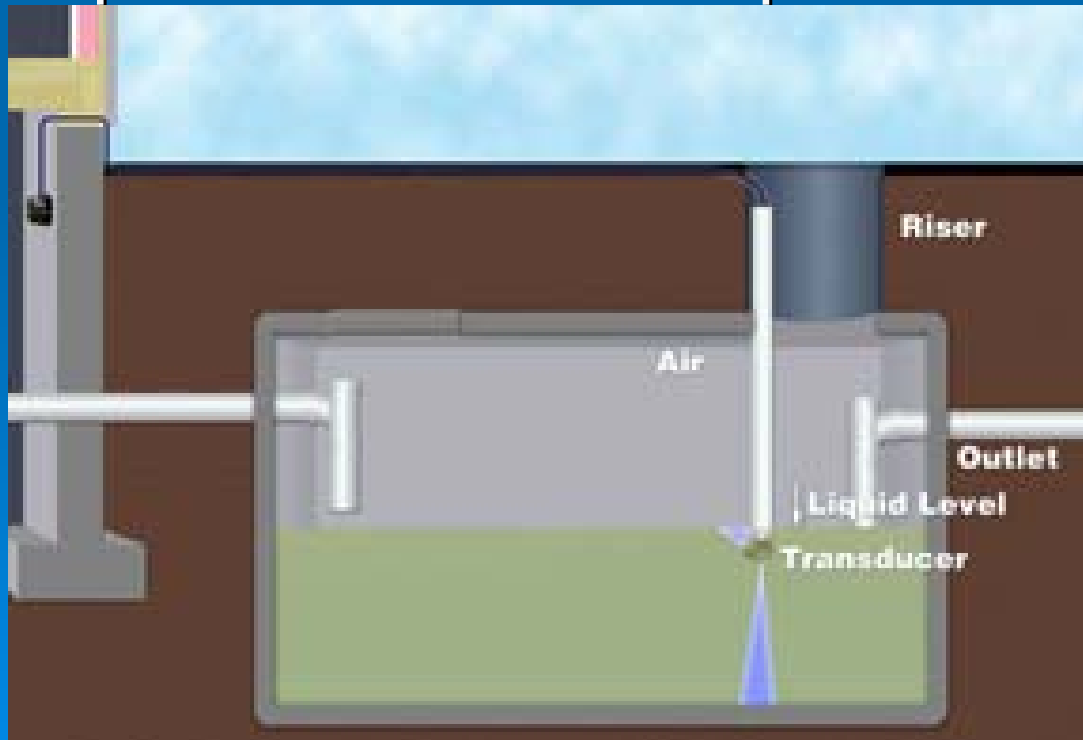
Automated Septic Tank Monitoring

A designer or operator can use programmable timers to:

- Increase the dose amount during periods of high flow
- Hold the pump on until the high level has receded.
- Internally record the number of high water situations to allow operational adjustment if necessary.

Example of Automated Septic Tank Monitoring: SEPTICwatch

SEPTICwatch™ uses ultrasonic transducers and embedded microprocessor to continuously sense the positions of the floating solids, bottom solids and the liquid level within a septic tank.



Control Panels for System Management

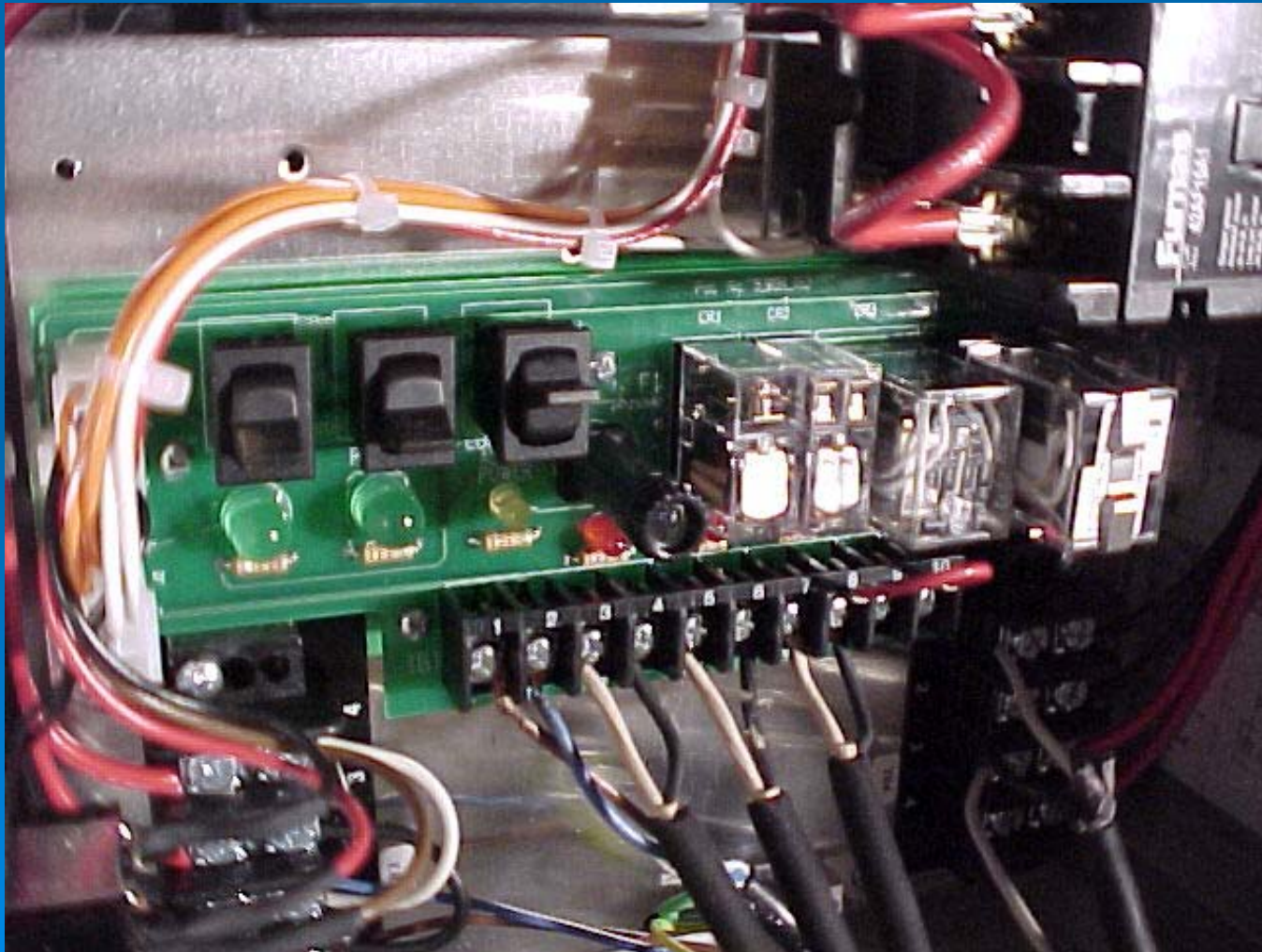
- Panels are available which will dial out over either a dedicated or non-dedicated phone line to send alert messages to management entities.
- Panels are available which will interface with a variety of hand held data devices ranging from simple palm type PDA's to uniquely designed and dedicated portable data acquisition and programming devices.

Common Internal Components of Panels

- As panels become more complicated including features which operate the system on a day-to-day basis, provide alarms, record management data and interface with comprehensive management systems their components become more sophisticated.
- Two more common components are relays and programmable timer scheduler.

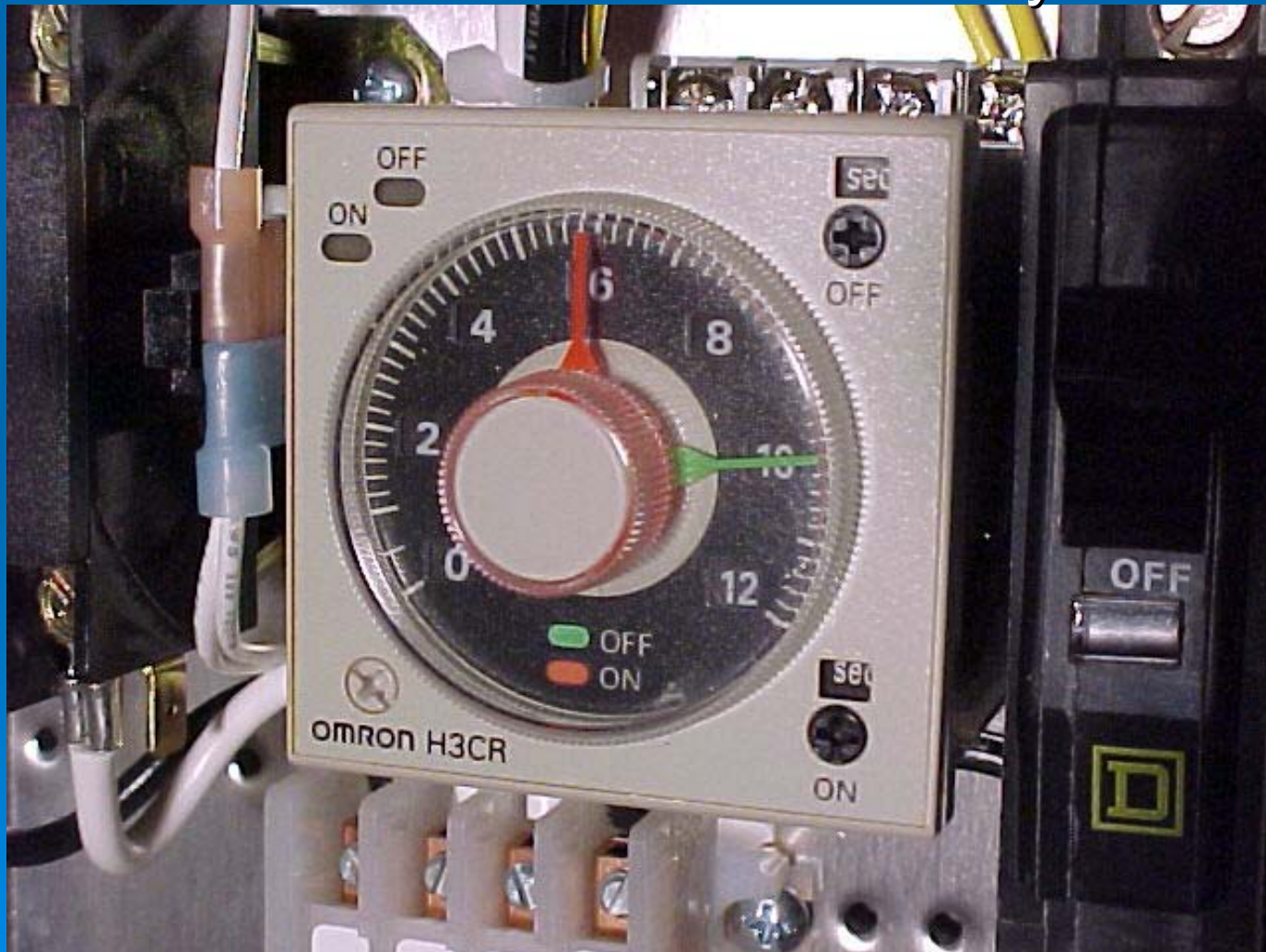
A Portion of a Control Panel

Shown is a portion of the inside of a control panel which illustrates the complex nature of the inside of a modern control circuit.



Analogue Programmable Timer

The modern electronics industry provides the onsite designer a variety of mechanical, electronic and digital timers and schedulers to control an onsite system.



Digital Programmable Timer

Some timers have taken advantage of modern technology and provide the designer with more control over system operation.

