MJKZZ Water Drop System Controller

User Manual

Overview

The MJKZZ Water Drop System, aka, WDS, controller can control up to six solenoid valves. All valve ports are actively protected for over current, ie, short circuit. It is operated by an IR remote control.

This controller is not just an water drop controller, it also has an input port with low latency. This means, it can be used as high speed photography controller with various sensors.

Hardware

Electrical Requirements

- Operating voltage for this device is 24V
- Valve must be rated 24V and wattage must be less than 8W (Shako is rated approximately 6W)

Features

- Controls up to six 24V valves
- IR remote based operation

- Input port for remote triggering or triggered by other units
- One Camera output port for triggering a camera
- One Flash output port for triggering a flash
- Each valve port can be programmed with up to 8 delays and 8 drops
- Camera and Flash ports can be independent of each other in terms of timing
- Purge/Empties liquid inside bottle with a push of button
- Load and Save ONE settings

There are six valve ports, namely V1, V2, V3, V4, V5, and V6 as labeled on the case. These are used to connect 24V solenoid valves or other devices compatible with 24V operation. Important note: only 24V rated 8W or less valves are supported. These valves ports are current limited (to 0.33A).

The Input port can be used to activate the unit from other devices by pulling the tip of the port to ground. The other device can be the flash or camera port of yet another 6 valve controller so that multiple units can be cascaded. Response time of INPUT is less than 100us or 0.1ms

The Camera port can be used to trigger a camera or two flashes (triggered at same time).

The Flash port can be used to trigger a flash.

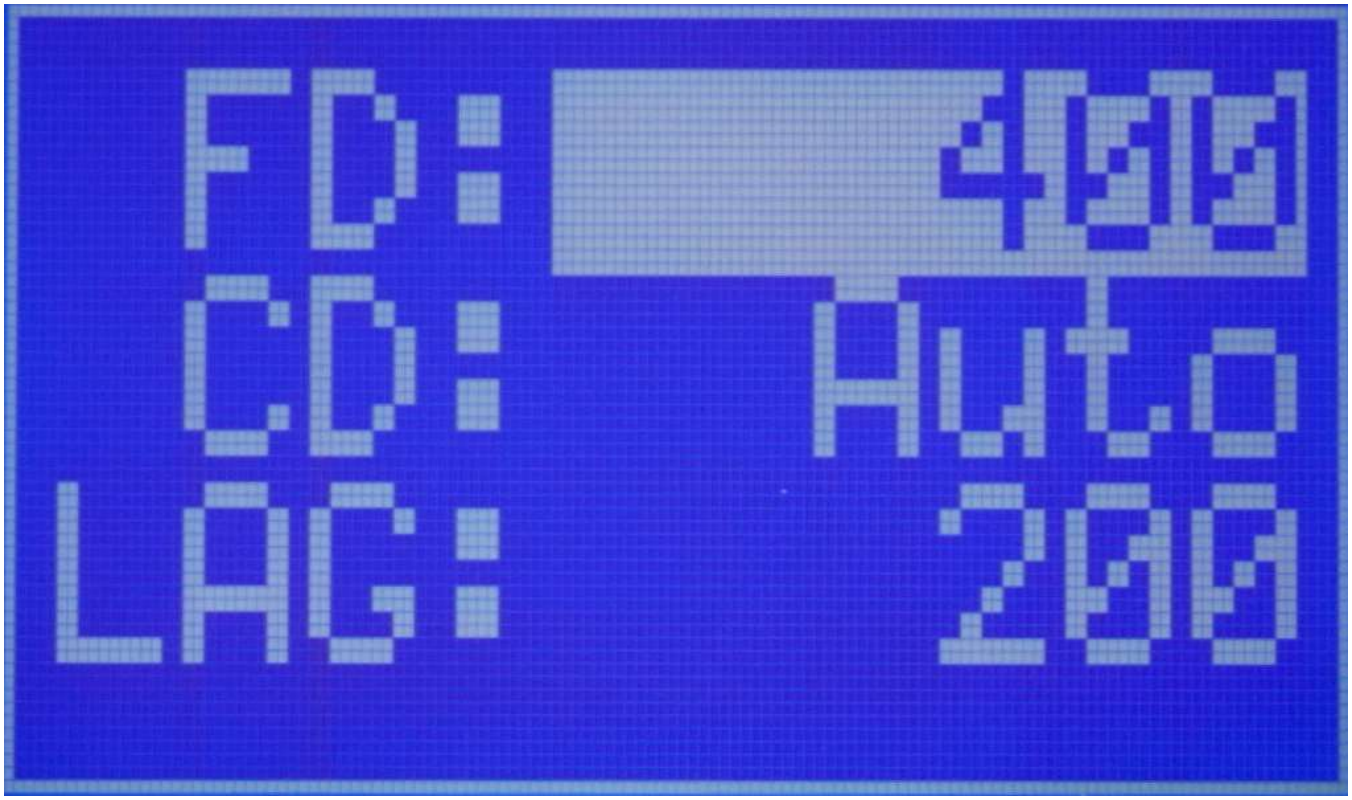
Both camera and flash output ports are optically isolated and their timing can be set to be independent of each other.

Remote Control

This water drop controller is controlled by an IR remote control. It has 7 rows with 3 buttons each, total 21 buttons.

In water drop photography, images are exposed almost always by flash to "freeze" collision in time. Collision happens after certain period of time, therefore, it is critical to set some delay before triggering flash, not just to capture a collision, *but also at different stages of a collision*. Therefore, the Flash Delay (FD) is a very important parameter and its unit is milliseconds

The FD button on the remote switches to entry of FD (Flash Delay) parameter. This parameter controls when flash is triggered in milliseconds. Use +1, +10, +100, -1, -10, and -100 buttons to change the FD value. The value represents milliseconds.



CD

The CD button on the remote switches to entry of CD (Camera Delay) parameter. This parameter controls when camera is triggered in millisconds. Use +1, +10, +100, -1, -10, and -100 buttons to change the CD value in milliseconds. When this value becomes less than zero, the moment at which camera is triggered is automatically determined.

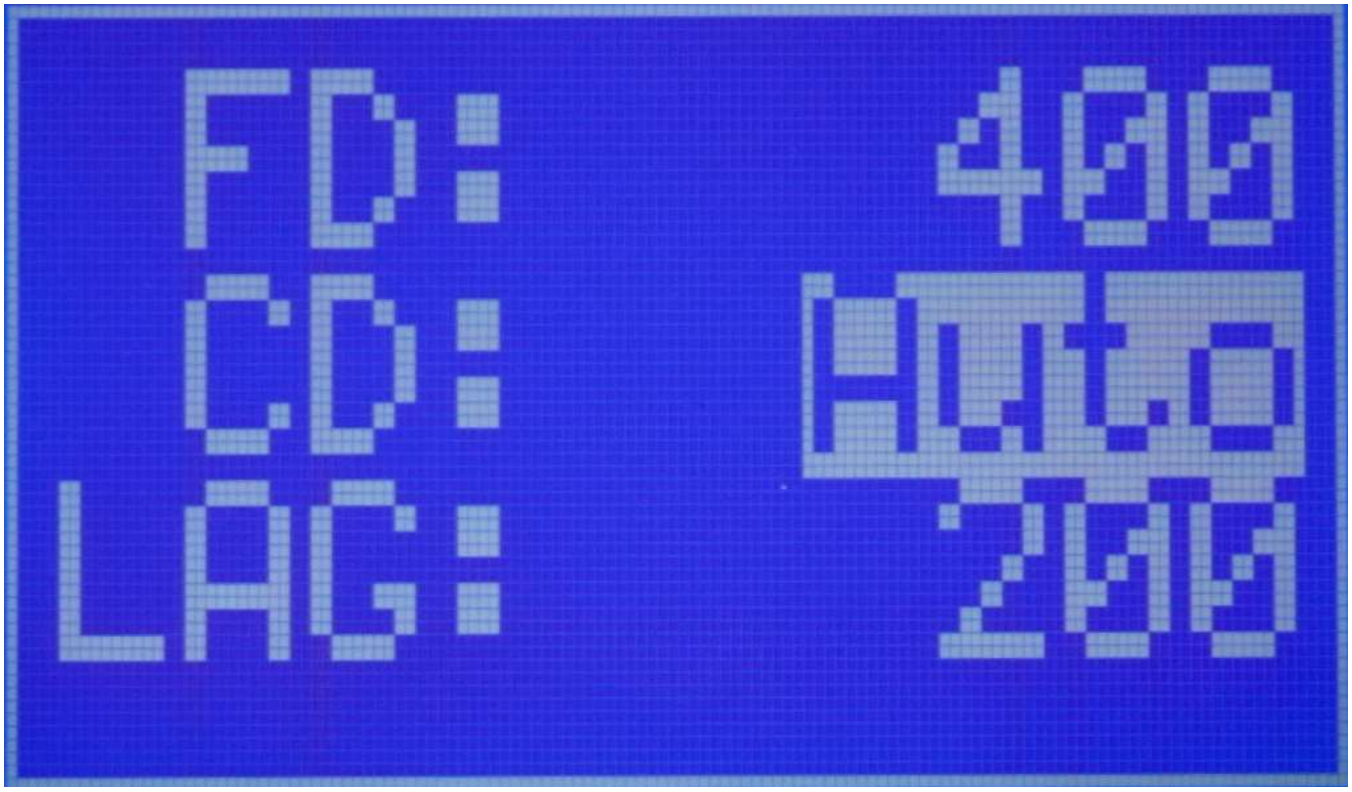
Though in water drop photography, images are mostly exposed by flashes, this controller also automates camera triggering and the time camera is triggered is controlled by this Camera Delay (CD) parameter.

When CD is set to AUTO (shown below), camera is triggered at time of (FD - LAG) millisconds or even at the very beginning if (FD-LAG) is less than zero. Here is the formula for CD in AUTO mode:

CD = FD - LAG

What does this mean? It means the camera is triggered at time LAG milliseconds before flash is triggered (FD). If FD is less than LAG, the camera is triggered at the very beginning of session, ie, as soon as the session is started, the camera is signaled to open its aperture and get ready to take a picture.

When Camera Delay, CD, is not set to AUTO, the camer will be triggered at time specified by the value of CD in milliseconds. This decoupling from the value of FD has some benefits -- camera can be kept open for much longer when multiple flashes are used, to create multiple exposure as just one of the examples.



#

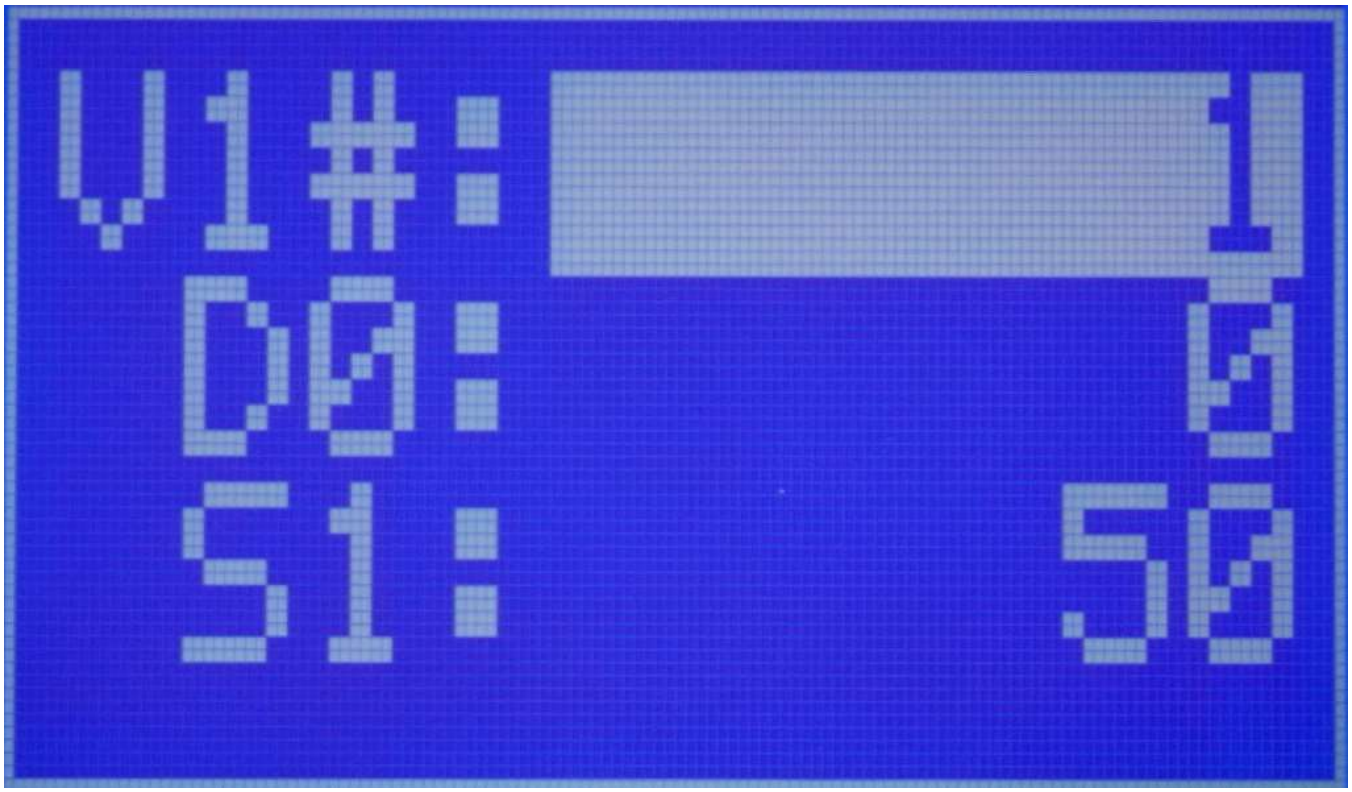
The # button switches to number setting screen. Use UP or DOWN arrow key to select data entry such as delay, drop size, etc. Use +1, +10, +100, -1, -10, and -100 buttons to change the value.

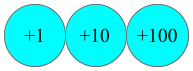
Note, the number after Delay (D) is always one less than the number after Size (S). What this means is that the delay happens before drop.

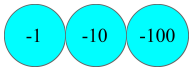
Use the ↑↓ buttons to scroll up and down for more values.

Use V↓ V↑ to change valve selection.

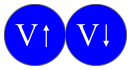
If a valve is not used, set number of drops to zero -- a "-" will show to indicate this. Maximum number of drops is 8





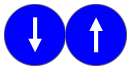


Use these buttons to change the value of selected parameter.



These are the buttons to change valve selection, moving valve number up or down by one.

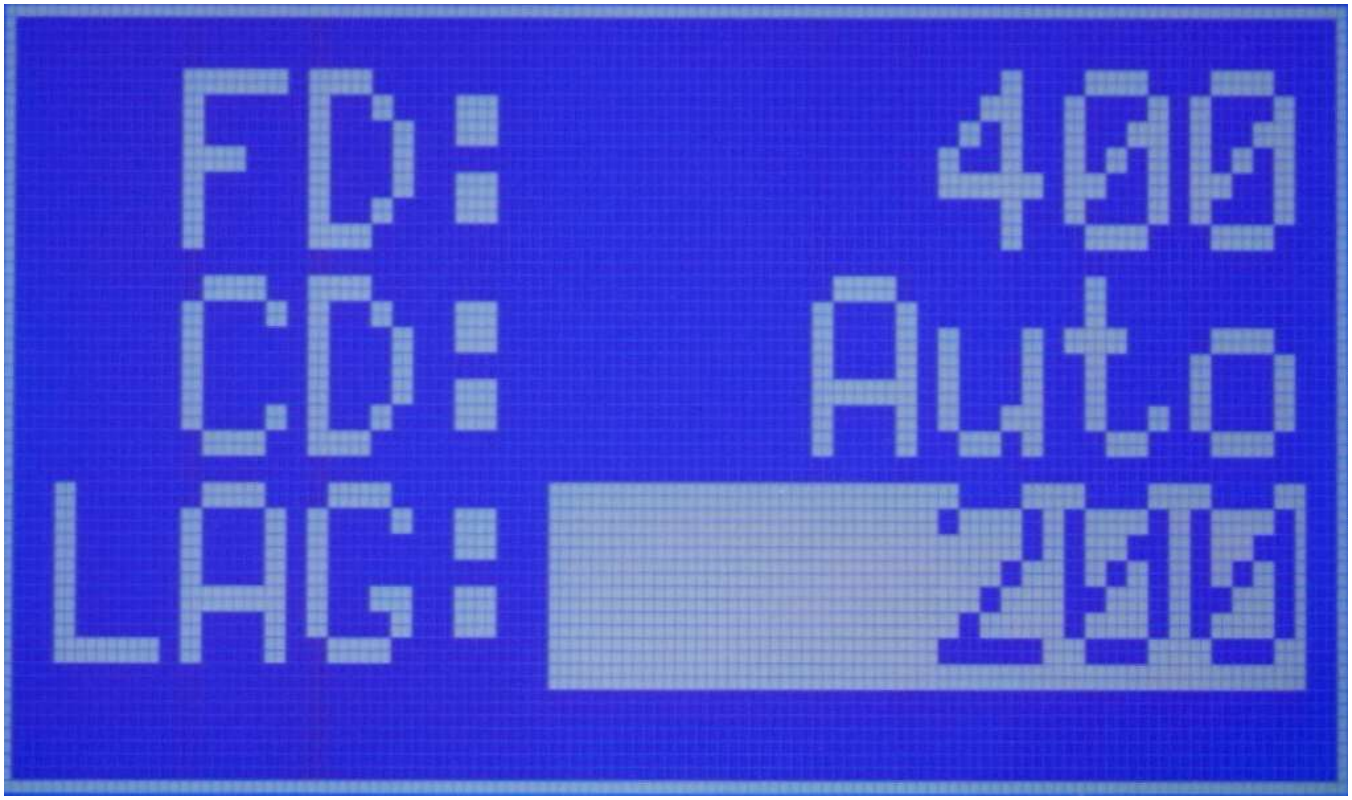
This button is used to execute a session.



These two buttons are used to select parameters or menu items.

This button switches to camera lag entry screen. Use +1, +10, + 100, -1, -10, and -100 buttons to change the CD value.

Cameras can not respond to remote shutter trigger signal immediately, there is certain lag after receiving trigger signal. This LAG parameter is used for this and is specified in milliseconds



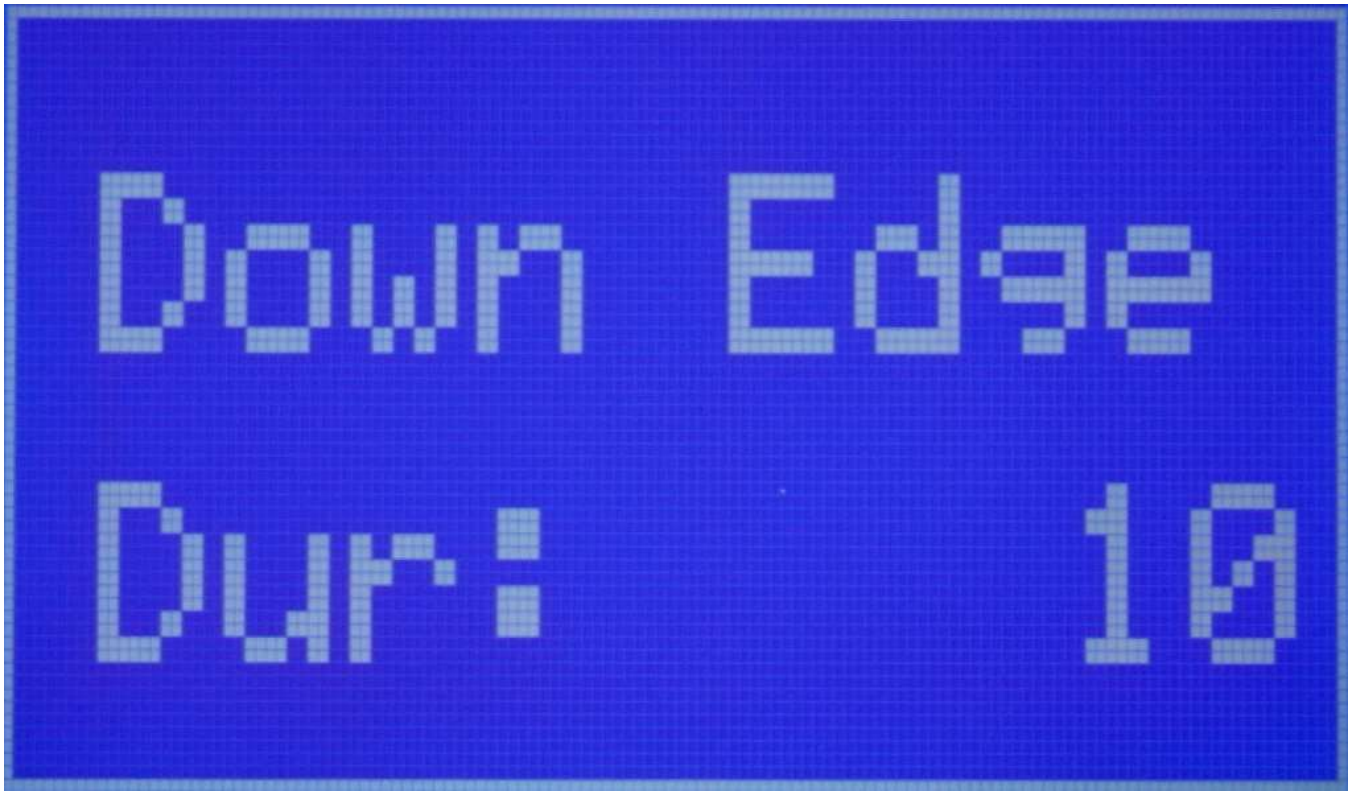
F1

This button puts the unit into a special state -- waiting INPUT port to be pulled low and responds at the moment the signal goes LOW (edge trigger). However, it will not respond afterward even if the INPUT stays low because, again, it will only respond at the edge.

The unit will stay in this state untill this F1 button is pressed again. Otherwise, it will ignore any other buttons on the remote. This is very useful when this unit is being cascaded as it will allow the master to be programmed by IR remote.

The Duration (Dur) parameter can be changed by pressing -1, +1, -10, + 10, -100, and +100 buttons. But all positive buttons increase the Dur value

by one and all negative buttons decrease the value by one



F2

This button puts the unit into a special state -- waiting INPUT port to be pulled high and responds at the moment the signal goes HIGH (edge trigger). However, it will not respond afterward even if the INPUT stays HIGH.

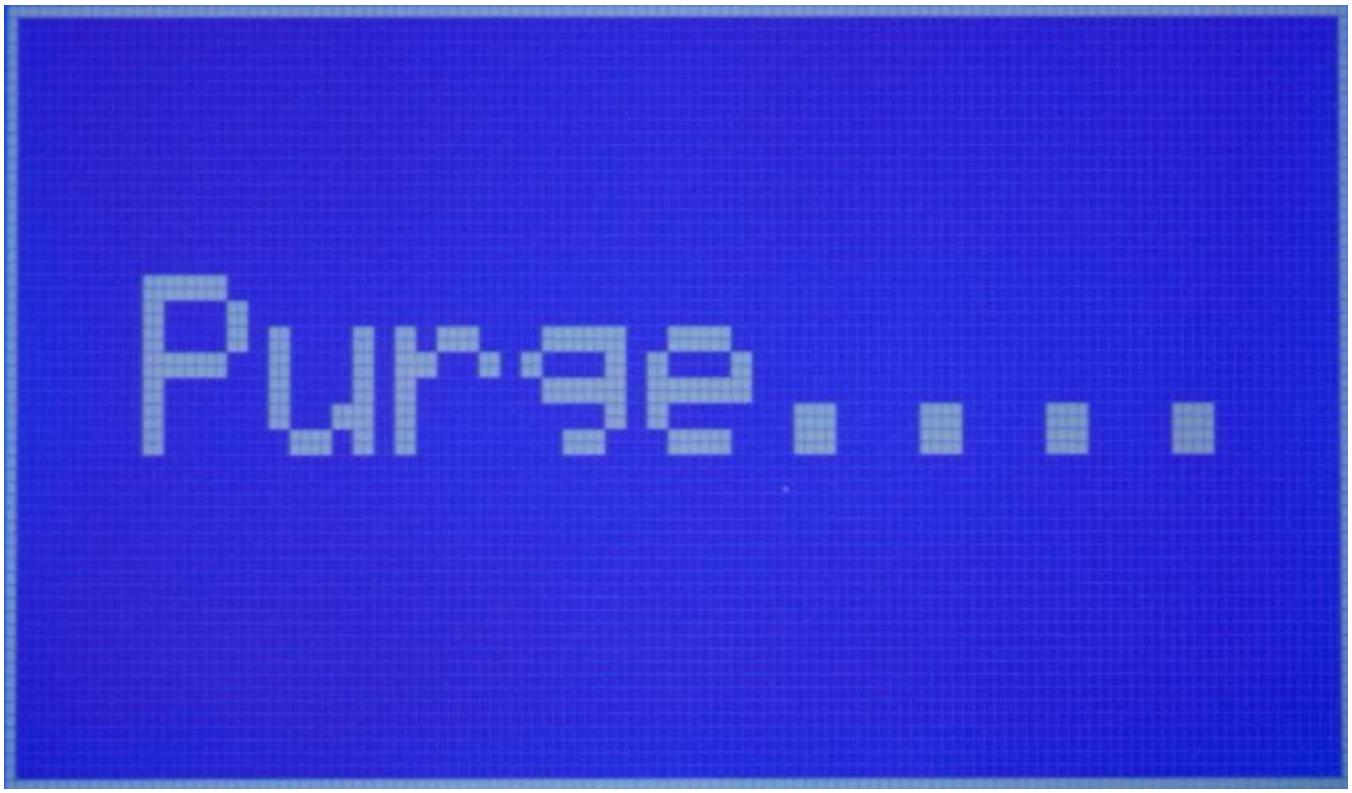
The unit will stay in this state untill this F2 button is pressed again. Otherwise, it will ignore any other buttons on the remote. This is very useful when this unit is being cascaded as it will allow the master to be programmed by IR remote.

F3

This button puts the unit into a special state -- waiting INPUT port to be pulled low and will be triggered again after finishing one session and the INPUT signal is still LOW, this is called LEVEL trigger. The unit will stay in this state untill this F3 button is pressed again. Otherwise, it will ignore any other buttons on the remote. This is very useful when this unit is being cascaded.

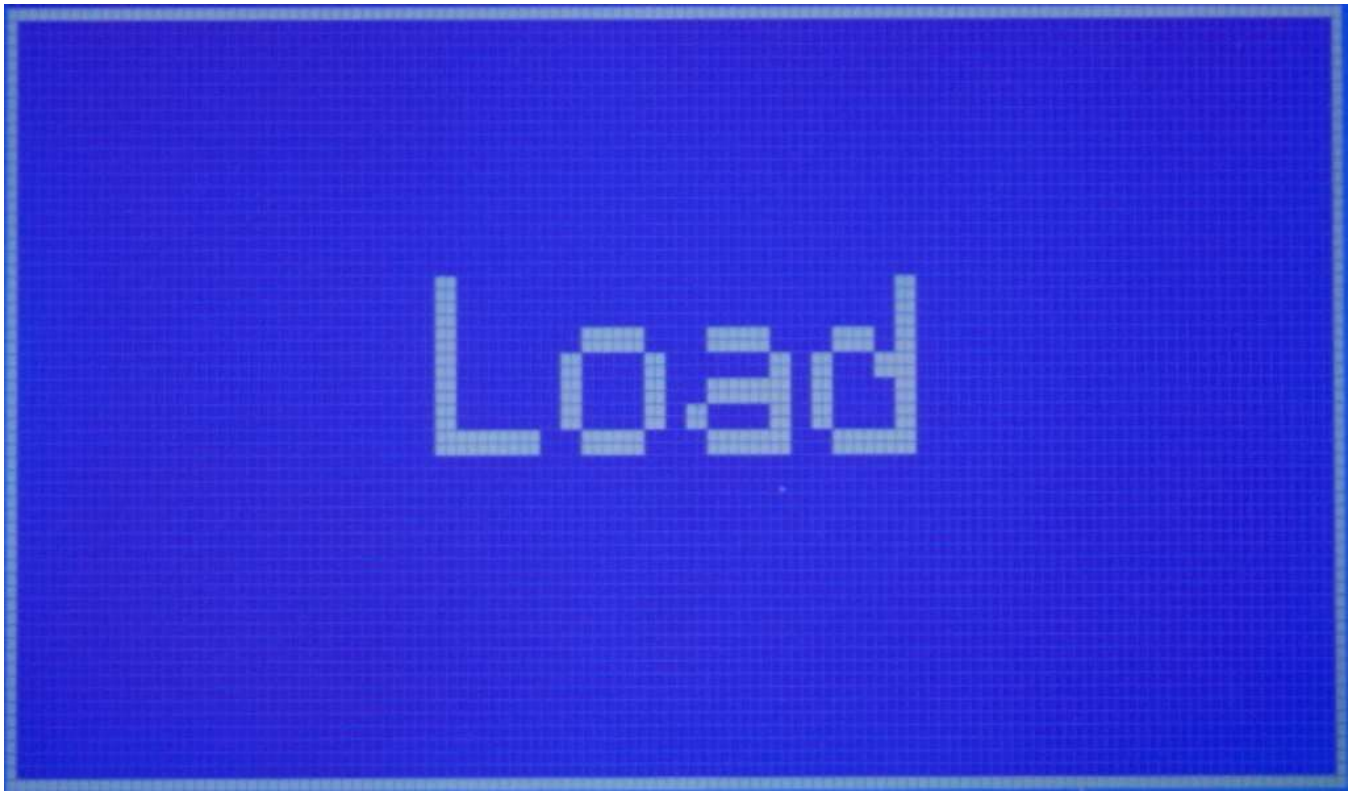
PG

This button starts purging liquid in the bottle for the selected valve port. It will stay that way for 30 seconds, if that is not enough to completely drain the liquid, press this button again. However, during purging, press this button will stop purging.

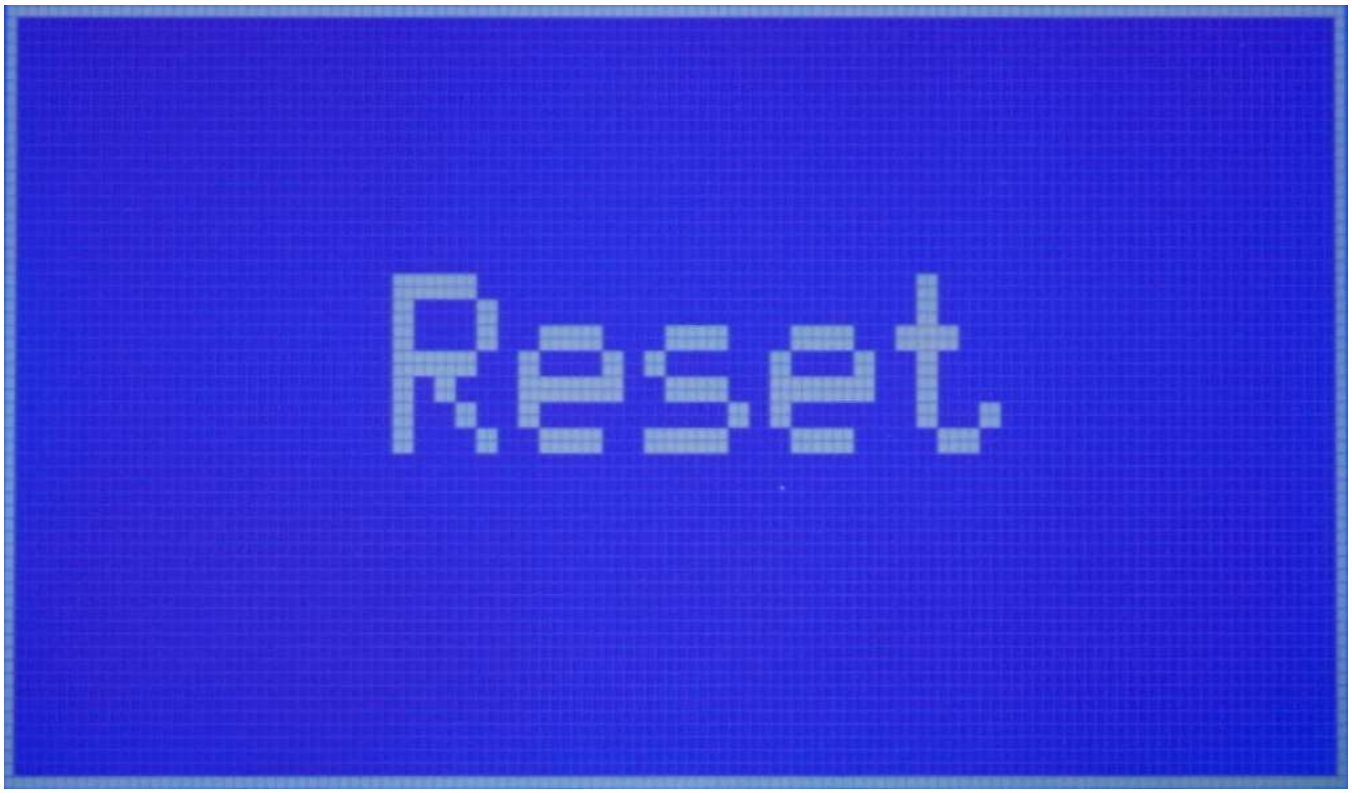


L

Pressing this button will enter setting LOAD screen. Press this button again will enter RESET mode where factory default setting will be loaded. In this LOAD mode, press ⏯ to load settings



Press LOAD button twice will enter RESET mode shown below, which loads factory default by pressing ⏯



S

This button save current settings into permenent memory which can be loaded back later

Why Special Functions F1, F2, and F3?

Why these functions? This controller is designed to be used not only as water drop controller, but also as high speed controller -- capturing high speed events as they occur. To be able to capture high speed event, sensors must be used.

Sensors usually output a trigger signal which can have different forms.

Some sensor outputs low as soon as it detects an event and if the event lasts afterwards, the signal stays low.

For example, one such sensor is a laser detection sensor where when laser shines on the sensor, the sensor pulls output signal low and stay low as long as the laser is shinning on it. If our goal is to capture the moment when laser shines on the sensor, say a high powered laser bursting a balloon and the sensor is placed just before the balloon, then the controller needs to be able to react the moment the sensor is shinned upon, but ignore the sensor afterwards.

Some sensor might pull its output signal high after some detection. Again, take laser example, if a laser is already shinning on a sensor, the sensor output stays low, but as soon as some object interrupts the laser, the sensor will pull its output high. In this case, the interest is the moment the laser is being interruped. Therefore, the F2 function, detectiong an UP EDGE is useful.

There are also other times where INPUT signal stays low and our controller needs to continue sessions over sessions as long as the signal is low. For example, lets say several units are cascaded together so that it will shoot up water jets in sequence, if all timings are set correctly, a dynamic water jet shape will form. This will continue for ever till we pull the plug. To accomplish this, all needed to be done is to short the master unit (all other units are cascaded down) INPUT and it will generate FLASH output which in turn triggers cascaded units.

Creative Uses

Along with some sensors, this controller can be used as high speed photography controller and multiple units can be cascaded to achieve special effects. Here is a list of all possible things:

- Water jet arts -- using multiple units, cascaded together, it is possible

to control the timing and size of each valve so that a dynamic water jet art can be formed

- Because of low latency of the INPUT port, it is possible to detect bullets or pallets coming out of barrel using a laser sensor.
- Ballon poping using sound sensor.