

Irrigation Controller User Guide

Version: 20 July 2022

The irrigation controller is designed to switch relays to irrigate vines in blocks. It has a manual start and can run for up to 24 hours. There is a backwash program that repeats after a delay.

There are 4 programs (ie. sequences of stations). Three are for blocks and the last one is for backwash. So a maximum of three blocks can be irrigated simultaneously.

There are 8 physical stations, one for pump, two for backwash and five for irrigation blocks.

Each station can run for a specified time. Normal stations have delays shown in hours and the special backwash stations have delays shown in minutes.

The pump station activates when the program is started. ie. run mode.

Programs are stored in the system flash memory. Also the system state is stored to allow for restarting automatically after power failure.

There is a delay on startup to allow the pump to build up pressure before starting the backwash cycle.

Programming mode

On initial power on the display will normally show "00", unless it is recovering from power loss, in which case it will show run time blinking in the 2nd and 3rd digits. To exit run mode press button "4".

Button "1" steps through programs 1,2,3 and 9. Programs 1,2,3 are for normal irrigation blocks, and program 9 is for backwash cycle.

Button "2" steps through stations. For programs 1,2,3 there are stations 3,4,5,6,7 and for backwash there are stations 1,2,d. The "d" station is the delay between backwashes.

Button "3" increments the run time for each station. Normal stations increment in 0.5 hour steps. The backwash stations increment in 1.0 minutes. The delay station "d" is in hours.

Button "4" clears the run time for the station.

Backwash program

The backwash program is "9". There are two stations which are used for filter 1 and filter 2, plus a delay station "d". Normal configuration is to set station 1 to 2 minutes, which shows as "912.0" and station 2 to 2 minutes (ie. "922.0"), then set a delay of 3 hours (ie. 9d3.0).

Note that backwash stations 1 and 2 are in minutes and the delay is in hours.

Starting Run Mode

When in program “0” and the display shows “00” and the controller is ready to be started by pressing the button “3” (and can be cancelled by pressing button “4”).

If only one program is required for a run, then press “2” to select. For example “00” means run all programs (and backwash), “01” means run program 1 (and backwash) only.

Run mode

In run mode the 2nd and 3rd digits will blink the run time. For example 1.2 hours.

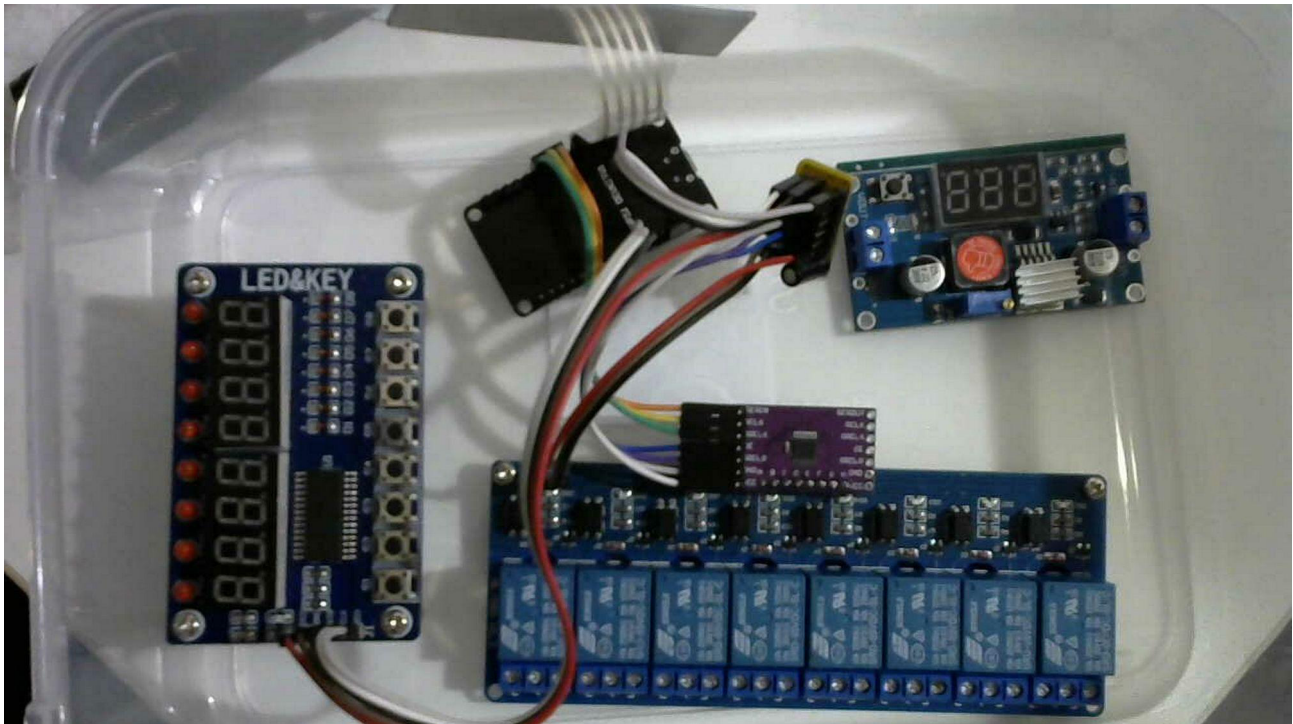
The last 3 digits cycle through the active stations and show the remaining time for that station. For example 31.2 means station 3 has 1.2 hours to run. And “d0.9” means the backwash delay has 0.9 hours to run before the next backwash cycle. Note that backwash stations 1 and 2 are in minutes so “12.0” means the backwash of filter 1 has 2 minutes to run.

To cancel run mode press button “4”.

Fast mode

There is a fast mode for checking the programs. It is activated by pressing the little 8th button (right hand side) below the display. It switches the timer from 60s increments to 5s increments and displays an “F” in the 5th digit of the display.

Photo



Wiring

Board	From	To
Relay board power	Gnd Vcc (powers the optocouplers) JDVcc (powers the relays)	Ground rail 3.3V rail 5V rail
Relay board 74HC595	SERIN RCLK SRCLK OE SRCLR GND VCC	GPIO25 (ESP32) CPIO33 (ESP32) GPIO32 (ESP32) Ground rail 3.3V rail Ground rail 3.3V rail
Display board	VCC GND STB CLK DIO	3.3V rail Ground rail GPIO4 (ESP32) GPIO16 (ESP32) GPIO17 (ESP32)
Power distribution	5V rail 3.3V rail Ground rail	5V (ESP32) 3.3V (ESP32) Ground (ESP32)
AC to DC board (set to 5V) (maybe better to use USB cable)	VOUT+ VOUT-	5V rail Ground rail
24VAC supply plug pack	Relay lower rail Relay upper rail	Rectifier to VIN+ (about 33V) Rectifier to VIN- (Ground)

Power Supplies

Power for the actuators is 24VAC. This is connected to the relays and then to the actuators. The 24VAC will come from a plug pack from Jaycar for about \$30.

The ESP32 processor requires a 5V power supply (which it regulates down to 3.3V). This 5V can be supplied via the DC/DC converter board or via a USB cable and plug pack.

It is probably easier to have separate 24VAC and 5V power supplies to simplify future repairs.

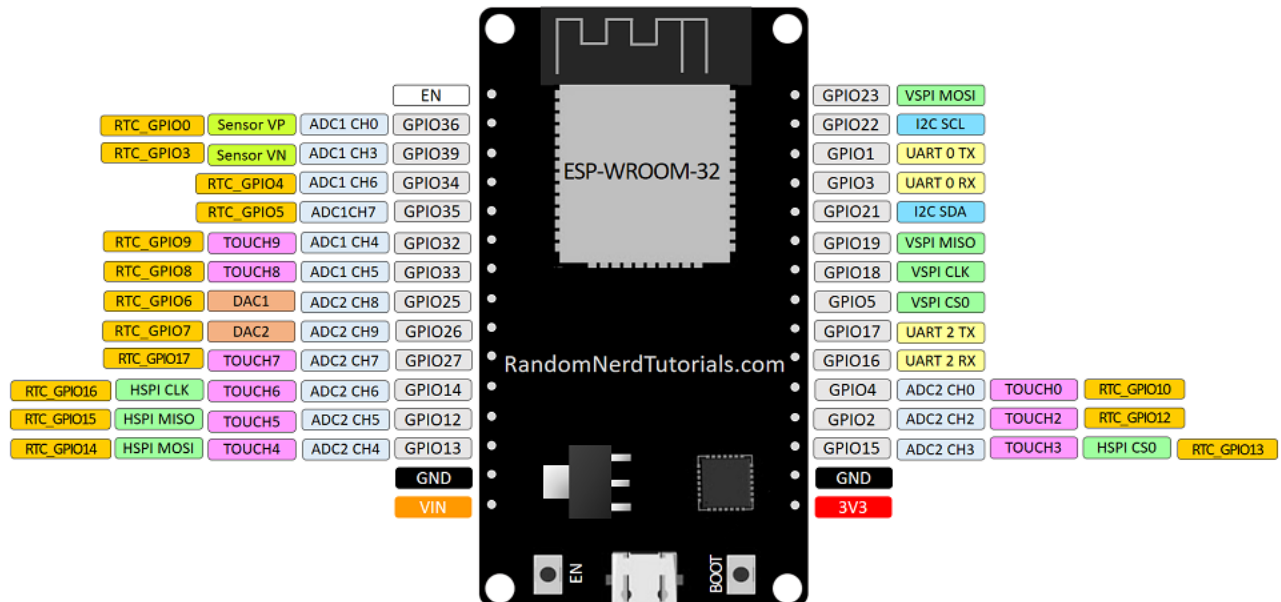
Case (Lunch Box)

The boards are housed in a lunchbox. Holes drilled to screw the boards down. And keypad stuck on the side of the lunchbox. It is expected bugs will be a problem so the box needs to be sealed. Cables entry ports will be packed with silicon sealer.

ESP32 DEVKIT V1 pinouts

ESP32 DEVKIT V1 – DOIT

version with 30 GPIOs



<https://randomnerdtutorials.com/getting-started-with-esp32/>

Note that this devkit v1 board is obsolete. Conversion of the code to a newer board should be just a matter of remapping the pins. See <https://lonelybinary.com.au/collections/esp32> for similar boards.

The ESP32 is programmed through the Arduino IDE as a special board. The code for the irrigation controller is written in the Arduino IDE. See <https://www.arduino.cc/en/software>

<https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/>

“There’s an add-on for the Arduino IDE that allows you to program the ESP32 using the Arduino IDE and its programming language.”