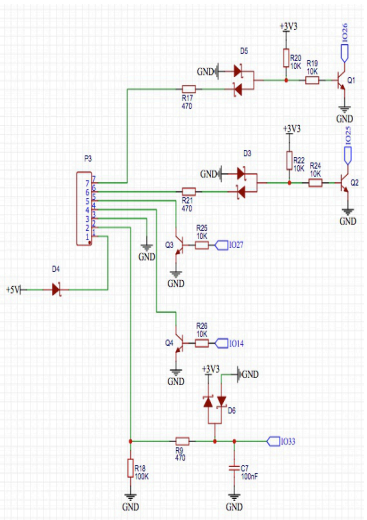
GPIO Expansion port

A 7-pin JST PH header is provided to allow

- 2 contact closure inputs
- 2 open collector outputs
- 1 analogue input
- 5V Power & ground sources

Wire Colour	Purpose
7-Blue	Digital input #1
6-Green	Digital input #2
5-Orange	Digital output #1
4-Yellow	Digital output #2
3-Black	Ground, 0V
2-White	Analogue input
1-Red	Power, +5V (from heater ECU)



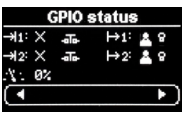
Diode array:
Blocks +ve external voltages.
Shunts -ve external voltages to 0V.

External input is pulled up by 10kΩ resistor; transistor conducts, logic 0 at ESP.
Contact closure to 0V on input; transistor stops conducting, logic 1 at ESP32.
(ESP32 uses internal pull-up)

ESP32 drives pin high to turn transistor on.

Open collector can drive a relay coil (back EMF protection required) or LED.
Either powered from 5V or external power source. (0V commoned)

GPIO Status menu



This menu only appears if GPIO hardware has been installed to the Ignite WiFi PCB.

The GPIO status menu allows the current signal states of the GPIO port to be visualised.

Digital Inputs

The 2 digital inputs are represented by the incoming arrow icons to the top left of the screen.

Depending upon how the GPIO inputs have been configured, the icons presented adjacent to the inputs will be one of the following:

	Disabled	Changes at the input are ignored
	Start	A momentary closure will start the heater, a long closure will stop.
	Stop	A momentary closure will stop the heater.
	Start / Stop	Alternate momentary closures will start or stop the heater
	Run	The heater will run whilst the input remains closed
	External Thermostat	The heater will cycle high/low power according closed/open

The switch icon shows the state of the digital input:

	The input is open circuit
	The input is closed to ground

Digital Outputs

The 2 digital outputs are represented by the outgoing arrow icons to the top right of the screen.

	Disabled	The output remains inactive
	LED Status	An attached LED will dynamically indicate the heater run state

	User	The output is controlled by user command
	Temperature threshold	The output is active according to the defined temperature threshold
	Heater On status	The output is active whenever the heater is not is the standby/stopped condition

The state of the output is reflected by the 'bulb' icon:

	The output is inactive
	The output is active

Analogue input

The input voltage applied to the Analogue input is presented as a percentage between 0.0V and 3.3V.

Presently the analogue value is purely for user interpretation.

User interaction

If a digital output has been defined as User Controlled, the current state can be toggled by holding down the **LEFT** or **RIGHT** keys:

The **LEFT** key toggles digital output #1

The **RIGHT** key toggles digital output #2

GPIO configuration (User Settings menu loop)

The GPIO Configuration menu is only available if GPIO capability is detected on the PCB.

By default, the functions of the GPIO pins is disabled. They must be enabled via this menu in the User Settings menu loop:

The top 2 left hand entries show the input mode of the 2 digital inputs.
The 2 right hand entries show the output mode of the 2 digital outputs.
The 3rd line shows the analogue input mode.

The IO line to be configured is selected by using the **UP/DOWN** keys.
The mode is then changed by using the **LEFT/RIGHT** keys.

Some modes have a further option, in which case a long hold of the **LEFT** or **RIGHT** keys will allow you to switch focus to the side parameter:

Temperature Threshold adjustment

For the Temperature Threshold output mode, hold the **RIGHT** key to allow adjusting the threshold temperature.
Once the selection is expanded, short presses of **LEFT**/**RIGHT** will adjust the value.
Holding the **RIGHT** key down defines the output to be active when the temperature exceeds the set value. Holding the **LEFT** key down makes the output active when below the set value.

Digital Input configuration

The 2 digital inputs can be configured as:

Input #1 – Blue wire

• Disabled	
• Start – *time sensitive*	A short close (<1.5 seconds) will **start** the heater. A long close will **stop** the heater
• Run	Holding the input closed will run the heater, opening will stop the heater.
• Start / Stop	If stopped, a momentary close will start the heater, a subsequent momentary close will then stop the heater.

Input #2 – Green wire

• Disabled	
• Stop	A momentary close will stop the heater.
• External Thermostat	Closed: heater runs at high speed Open: heater runs at low speed. An optional open time can be defined to stop the heater after being held open for longer than the chosen interval. Heater is always started upon initial contact closure.
• Zero Fuel Usage	Fuel usage is zeroed if held closed > 1 second.

Digital Output configuration

The two digital outputs can be configured as:

Output #1 – Orange wire

• Disabled	
• LED Status Indicator	Standby – OFF Heater starting – "Breathe up" illumination Heater running – Steady illumination Heater starting – "Breathe down" illumination
• User controlled	Can be made active upon user demand
• Temperature Threshold	Output active when either above or below a defined temperature threshold
• Run Status	Output is active when heater is in any running condition -from start through to final cooling phases

Input #1 – Blue wire

• Disabled	
• Start – *time sensitive*	A short close (<1.5 seconds) will **start** the heater. A long close will **stop** the heater
• Run	Holding the input closed will run the heater, opening will stop the heater.
• Start / Stop	If stopped, a momentary close will start the heater, a subsequent momentary close will then stop the heater.

Input #2 – Green wire

• Disabled	
• Stop	A momentary close will stop the heater.
• External Thermostat	

GPIO Capability

The enabled PCBs provide extra input and output conditioning circuitry to allow the ready addition of external switches or status indicators/relays.

A digital input is considered as being active when the external pin is connected to 0V.
The Mk4.01 PCB however due to the input transistor inverts this to a high level at the ESP32.
During initial birthing, the PCB version is identified so the correct digital input behaviour occurs for either PCB, in relation to the applied external signal input point.

By default, the GPIO functionality is disabled. It must be enabled via this menu in the User Settings menu loop:

The top 2 left hand entries show the mode of the 2 digital inputs.
The 2 right hand entries show the mode of the 2 digital outputs.
The 3rd line shows the analogue input mode.

Navigation of the menu is explained in the User Settings Menu Loop section.

Digital Inputs

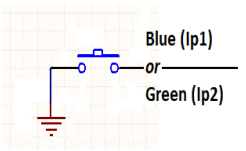


Figure 1: User furnished equipment

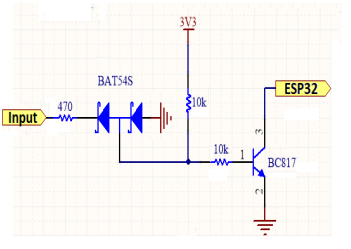


Figure 2: Digital Input circuit of Ignite WiFi

An example usage may be using a conventional “dry contact“ furnace thermostat, with the heater starting and stopping according to the condition of the thermostat’s output. Bear in mind it takes over 5 minutes to start the heater, and a couple of minutes to shutdown the heater.

External Thermostat

This mode is specifically intended for use with an external “dry contact“ thermostat.
When the contact is closed, the heater will be made to run at maximum power.
When the contact is open the heater will be made to run at minimum power.

If the heater is off upon the initial closure, it is requested to start.

Additionally, a time period can be associated with this mode.
If the contact remains open longer than the selected time interval, the heater is requested to stop.

This allows operation solely using the wall thermostat. Initial operation will see the heater start, then cycle according to the setting. Finally disabling the thermostat will see the heater eventually stop once the time period elapse.
If the time period is set to zero, the heater will always run unless commanded to turn off.

Fuel Usage Reset.

This input allows a switch to be mounted nearby the fuel tank, to be used to reset the accumulated fuel usage when the tank is re-filled.
Resetting the accumulated fuel usage is important if you are using the Excess Fuel Usage shutdown feature to avoid running the tank dry, which usually requires the fuel line to be re-primed.

Digital Outputs

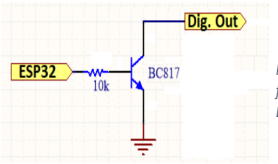


Figure 3: Ignite WiFi digital output circuitry

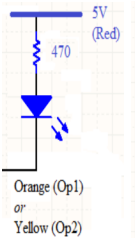


Figure 4: User furnished equipment: Driving an LED

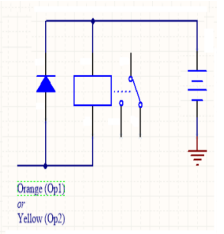


Figure 5: User furnished equipment : Driving a relay, diode must be included.

The 2 digital outputs are offered as open collector devices, effectively providing a path to ground when active.

- When the heater is running, the LED will be constantly on.
- When the heater is shutting down, the LED will cycle in decreasing brightness manner.
- If the heater is suspended due to the cyclic mode threshold being crossed, the LED will momentarily flash every second or so.

Temperature Threshold

The output will monitor the ambient temperature and activate as required.
The output can be defined to be active when above or below the threshold.
When defining the GPIO function to be temperature threshold, either:

- Hold the right button to enable editing the temperature threshold, and making the output become active if **above** the defined temperature. OR
- Hold the left button to enable editing the temperature threshold, and making the output become active if **below** the defined temperature.
- Adjust the new temperature threshold using the **UP/DOWN** keys.
- Accept the threshold by pressing the **CENTRE** key

Run Status

The output is made active whenever the heater is not in standby, ie starting, running, or shutting down.
If the heater is suspended (in standby) due to Cyclic Mode, the output is not active.

Analogue Input – White wire

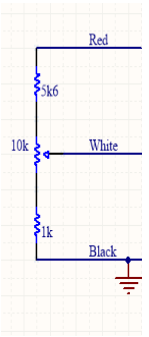


Figure 6: Suggested input circuit for a potentiometer

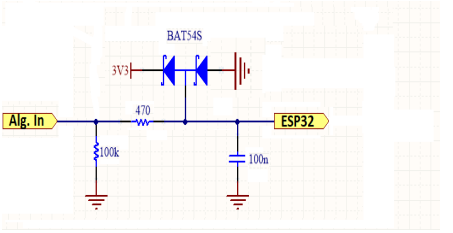


Figure 7: Analogue input circuit of the Ignite WiFi

The analogue input accepts a voltage in the range from 0.0V to 3.3V.
The power supplied from the Ignite WiFi on the GPIO connector is 5V so if using a pot you must pad the top end with a resistor to limit the maximum expected voltage, as shown above.
Note that there are clamping diodes in the input circuit, but these are a safety feature and should not be relied upon.

The single analogue input can be configured as:

• Disabled	
• Enabled	Input voltage applied to white wire is digitised and presented as a percentage of the usable range (0 – 3.3V)