PiIO-DO-H

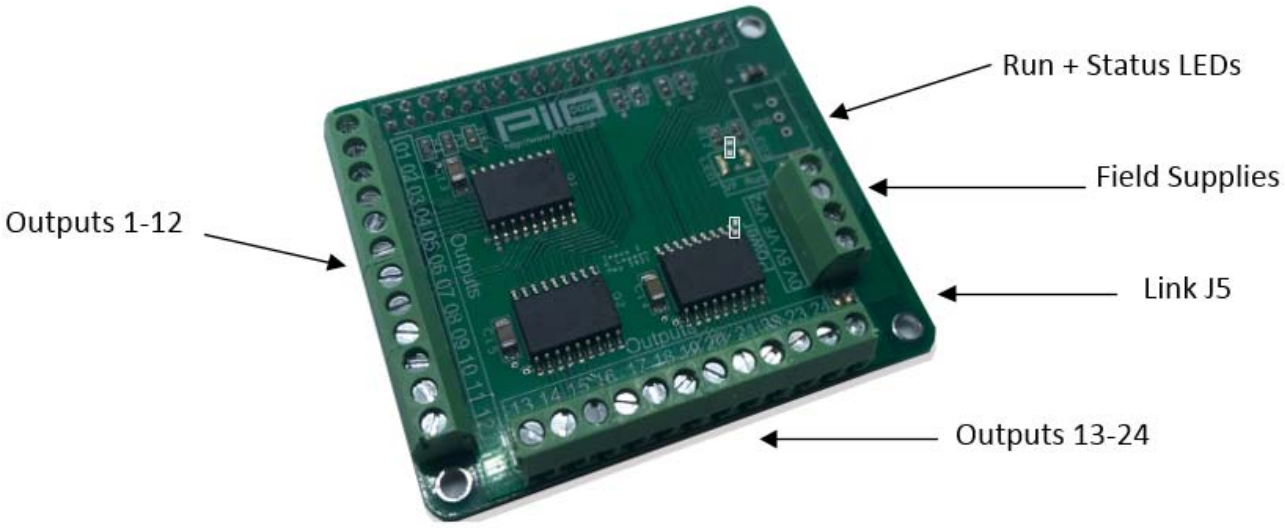
Digital output board for raspberry Pi

User's Manual

Document Change Register				
Revision	**Date**	**Author**	**Change Description**	**Section**
0	30 May	K Lawson	Initial revision	

1 Introduction

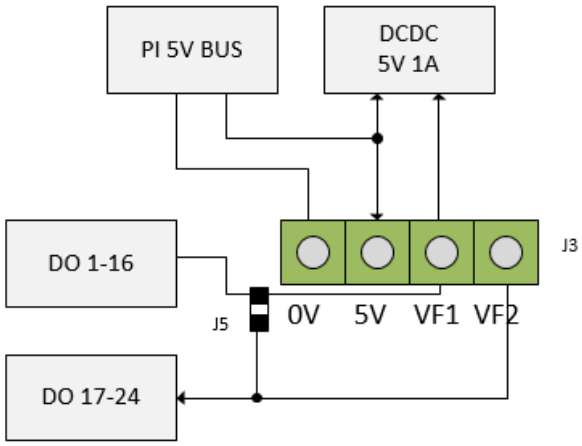
The PiIO-DO-H PCB sits on top of a raspberry PI Model 1-4 and can be used to interface it to light industrial and test / measurement /educational applications. The board features 24 high side DMOS FET digital outputs which can be operated at 2 different field voltage levels.



Note - PiIO-XXX-H Boards follow the Pi HAT mechanical specification but do not have an onboard device ID EEPROM.

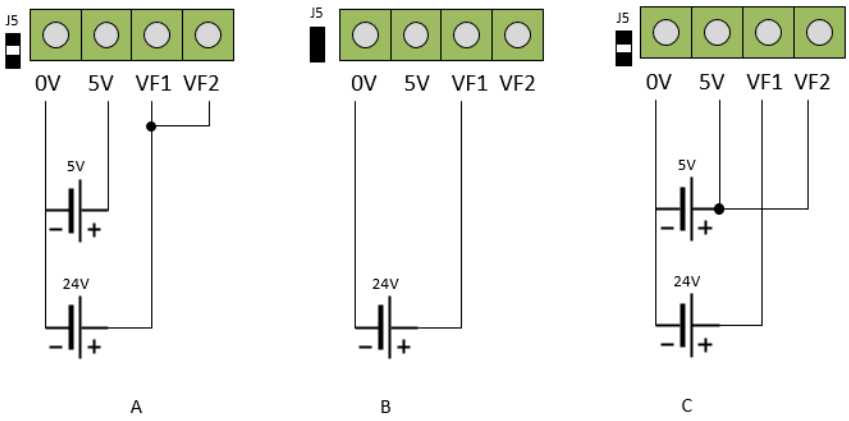
2 Powering the board

The board is powered via the 4 way connector block J3. How this is used depends on the board option you have purchased.



2.1 DCDC Not fitted

If you have not chosen to not have the DCDC fitted then then the 5V terminal can be used to power the PI assuming you have your own 5V supply. Alternatively you can power the pi via a micro USB and the J3 pin would then become an output for that supply.



In the above figure illustrates three powering options:

A/ External power supplies power the Pi and the field supply which runs at 24V.

B/ As A but the Pi is powered by the micro USB, the field supply is powered at 24V but LK J5 is made so we don't have to wire VF2.

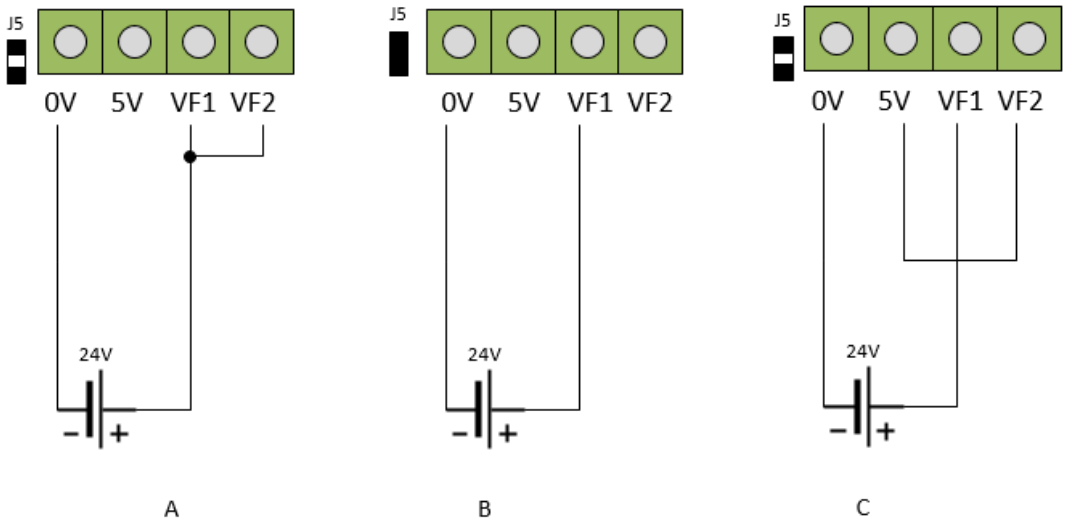
C/ In this instance the Pi is powered by an external 5V power supply which also feeds into VF2 so that DO17-24 operate at 5V. VF1 is powered by 24V so that DO1-16 operate at 24V.

Note – the 5V terminal is connected straight to the PI power rail, any overvoltage will likely damage the Pi.

Note - Make sure you know what you are doing when you are powering up your device as there is no reverse polarity or back-feeding protection on these terminals. Always check with a multi meter before you apply power.

2.2 DCDC fitted

If you have chosen to have the DCDC fitted then the 5V terminal on J3 is again an output for that supply but the Pi will be powered by VF1 which then feeds the on board DCDC converter.



A/ Pi Powered by field 1, which also powers all field supplies

B/ As above but link J5 simplifies wiring.

C/ Pi powered by onboard DCDC via VF1, output 5V reused as VF2. This gives 2 digital output voltage levels. There will be limited current capacity on VF2 however.

2.3 Field supplies

The field supply inputs are used to power the digital outputs and the optionally fitted on-board DCDC for the PI.

- VF1 – Powers output 1-16 and the on board 5V DCDC
- VF2 – Powers output 17-24

It is possible to therefore possible to have the outputs of this board at different voltage levels i.e maybe one bank doing 5V interfacing and another handling 12V supplies.

The Link J5 may be soldered which joins VF1 and VF2 together – this may be useful for simplifying wiring.

2.4 On-board DCDC

A 1A or 2A DCDC Power supply is optionally fitted to the board to power the PCB. This generally has a maximum input voltage of 28V which limits the maximum fieldbus voltage used.

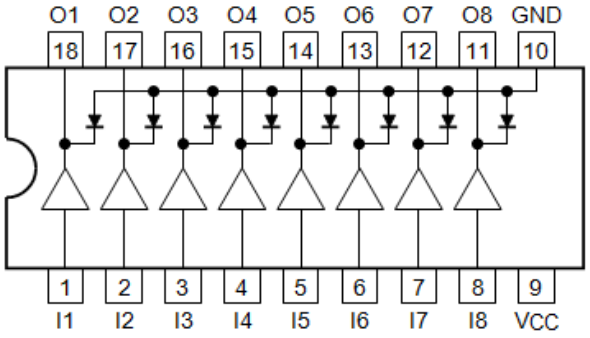
2.5 LEDs

There are two LEDs on the board.

- **VF** – Indicated Field supply VF1 is powered.
- **Run** – software controlled to a GPIO Output, generally set to pulsing to indicate the program is running.

3 Digital outputs

The digital outputs are controlled via a TBD62783AFWG High side driver IC. This contains DMOS FET driver arrays and operator up to 50V.



The drivers feature the following functionality:

- 50V Max voltage
- Built in diodes for inductive loads
- 8x 500mA High side DMOS drivers
- Total current through device circa 2A (see thermal limitations doc)

3.1 Application thermal considerations

The device is thermally limited in operation, the following table provides a guideline to the maximum number of outputs which can be powered at a certain current. This is purely a thermal limit to prevent the device overheating, you will need to validate your thermal position.

Number of outputs on	Max current through each (A)
1	.5
2	.5
4	.33
8	.25

4 Software

The software library is provided at [https://github.com/lawsonkeith/PiIO]. This is a python3 library and is designed to work on linux based systems such as Raspbian.

You can clone this repository and manually install it's dependencies as described in the following video:

github repo board page

A video on how to install the library and set up your Pi can be found here.

basic config

Various example projects are documented here:

node red control

node red and python

python only control

You will need to perform a number of tasks before your system is ready to use:

1. Update OS
2. Edit nano config file (if you're using nano as an editor)
3. Enable SPI / I2C and SSH in raspi-config
4. Clone the github repository
5. Install required Linux packages
6. Install required python packages
7. Test node red by importing a json flow into it.

4.1 Software structure

The repository is structured as follows:

- **PiIO** – Fundamental drivers written in python 3
- **Docs** – Markdown documentation
- **Examples** – Contains python3 examples
- **Images** – Contains pictures used in the repository
- **Manuals** – Contains all PDF manuals including this one
- **Install_packages**.sh – installs required linux packages
- **Install_py_packages**.sh – installs required python packages
- **Setup**.py – used to install the PiIO library

4.2 Basic_functs example

This example does not require any hardware but just shows the operation of some of the PiIO utility API.

- Alarm function
- Exponential moving average function
- Scale function
- Rising edge function
- Falling edge function
- Timed pulse function
- Timed on function
- Timed off function

You can run the program [python3 ./basic_fincts.py] and the program will step through and test each of these utility functions.

Definitions of these functions can be found in PiIO/PiIO.py.

4.3 Basic_DO example

This example sequentially writes to the 24 digital output ports.

5 Certification

This board is intended for either educational use or to be used as a subcomponent. If it is incorporated into a final product then the user is responsible for undertaking any required certifications.