User Guide -
VTAP100 PRO I/O Expansion Board User Guide

VTAP100-PRO-EXP1

Revised January 2026 v1.1

DOT ORIGIN

If you need help to set up or use your VTAP PRO I/O expansion, beyond what is contained in this User Guide, then please contact our support team.

Email: **vtap-support@dotorigin.com**

Download the latest documentation and firmware from **https://vtapnfc.com**

Telephone UK and Europe: +44 (0) 1428 685861

Telephone North America and Latin America: +1 (562) 262-9642

If you have any feedback on setting up or using your VTAP PRO I/O expansion or this documentation, then please contact our support team. The product is constantly being reviewed and improved and we value feedback about your experience.

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Safety instructions

WARNING: INTENDED USE

The VTAP100-PRO-EXP1 I/O expansion board is a boxed product for end-users. The enclosure is not intended to be opened by an end-user. Components mounted on the PCB inside the enclosure are not user-serviceable.

WARNING: POWER SUPPLY

The VTAP100-PRO-EXP1 I/O expansion board is only to be powered through the 2 pin Molex connector marked Power, rated 9-15V DC (typ 600mW).

WARNING: CONTROLLED POWER SUPPLY (IF ANY)

If a VTAP100-PRO-EXP1 I/O expansion board is being used to control mains voltages, the installation should be undertaken by a qualified electrician.

1 Using this guide

This guide is for first-time users of the VTAP PRO I/O expansion board.

Figure 1-1 VTAP PRO I/O expansion board

It contains all the information you need to connect your VTAP PRO I/O expansion board to a VTAP PRO reader, and to attach any digital input, external loads or serial LEDs you need to start work.

You configure the operation of this device through the VTAP PRO reader to which it is connected. So a VTAP PRO reader which is in Cloud mode will be configured through the VTAP Cloud platform, but a VTAP PRO reader in Local mode will require edits to its `config.txt` file or commands sent over its serial interface.

This guide contains some examples to help with typical use cases involving the VTAP PRO I/O expansion board. Consult the User Guide your VTAP PRO reader and the VTAP Commands Reference Guide for more detailed information about commands and configuration.

If you need help beyond what is contained in this guide please contact **vtap-support@dotorigin.com**.

2 Using VTAP PRO I/O expansion board

The VTAP100-PRO-EXP1 expansion extends the I/O (input/output) connectivity from the VTAP PRO reader to an external board. It can be used to:

- switch external loads using the 2 relays,
- drive external serial LEDs, and/or
- take in a digital input to trigger an event, such as relay operation, LED sequence or a beep.

It can be used in various different ways, depending on the use case and whether the VTAP PRO reader is in Local mode or Cloud mode. Your VTAP PRO reader user guide has more information about Local mode or Cloud mode.

When you tap your smartphone on a VTAP PRO reader, with a VTAP100-PRO-EXP1 connected and connection to the VTAP Cloud, your mobile NFC pass will be read and data sent to the VTAP Cloud platform. (Remember that the data can only be read if your mobile NFC pass was issued in connection with the Merchant ID(s)/Collector ID(s) and ECC key(s) on the VTAP PRO reader.) Default values on the VTAP reader are associated with a demonstration pass, so that you can test the operation using factory settings before you begin customising any settings.

On receiving a valid pass payload, the VTAP Cloud platform will trigger any response application (or script) set for that reader. That script may request an LED pattern, a beep and/or a relay output from the VTAP PRO reader. Since it is connected to a VTAP PRO I/O expansion board, that VTAP PRO reader will action the beep, but pass any LED sequence or relay output requested to the connected VTAP100-PRO-EXP1. The VTAP PRO I/O expansion board will then drive external serial LEDs and toggle the relay coil ON or OFF, following the script.

2.1 Connect the I/O expansion board to a VTAP PRO reader

To open the VTAP PRO reader case, follow the instructions in your VTAP PRO reader user guide.

> ⚠ **CAUTION:** We strongly recommend that power is disconnected before you open the VTAP reader case.

Use the supplied I/O expansion board cable to connect into the your VTAP PRO reader as shown in the diagram.

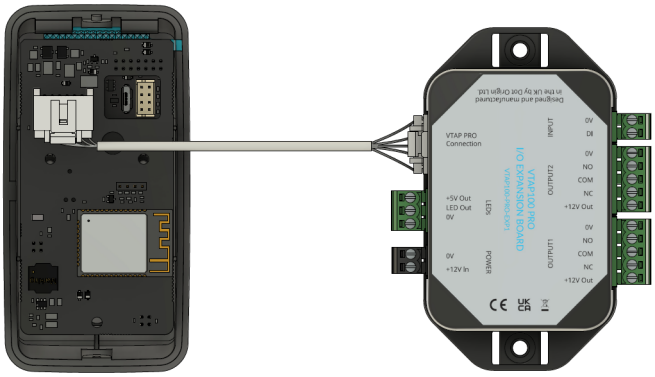


Figure 2-1 Connecting VTAP100-PRO-EXP1 expansion to the VTAP100-PRO-BW daughter board

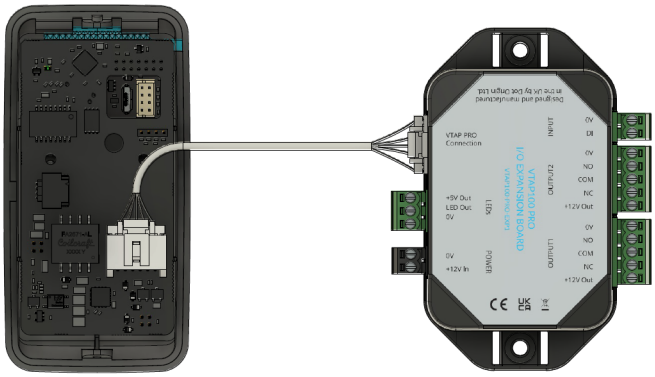


Figure 2-2 Connecting VTAP100-PRO-EXP1 expansion to the VTAP100-PRO-POE daughter board

The cable can be routed out through the hole in the back of the VTAP case, and pressed into a guide channel when the product is reassembled. To do this you may need to break or remove a sticker on the rear of the case.

Other lengths of cable are available on request. The maximum length of cable between the VTAP reader and the I/O expansion board is 3m.

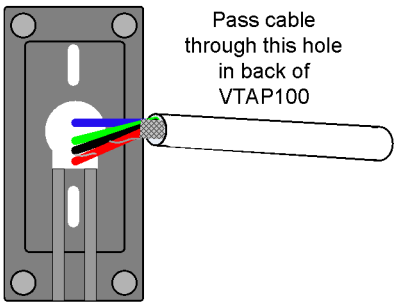


Figure 2-3 Where to insert a cable through the VTAP reader compact case

If you plan to fix the case to a surface, we recommend that you screw the back of the VTAP reader case to that surface before connecting the EXP cable.

The VTAP PRO I/O expansion board is only suitable for indoor use.

The VTAP100-PRO-EXP1 supports I/O options which are labelled as follows:

- INPUT - DC low voltage sense (+/- 30V DC)
- OUTPUT 1 & 2 - Dry contact changeover relay (NO and NC), max 5A @ 50V AC
- LEDs - 5V DC at up to 1.5A, max 255 serial RGB LEDs

The VTAP100-PRO-EXP1 is rated at 9 - 15V DC (typ 600mW) for power over the 2-pin input labelled POWER.

Figure 2-4 Diagram showing I/O connectors on VTAP100-PRO-EXP1

2.2 Input

A switch, such as a Request to Exit button, can be connected across the DI and 0V signal INPUT connections.

The INPUT connection is on the 2-way 3.5mm pitch connector highlighted in the diagram.

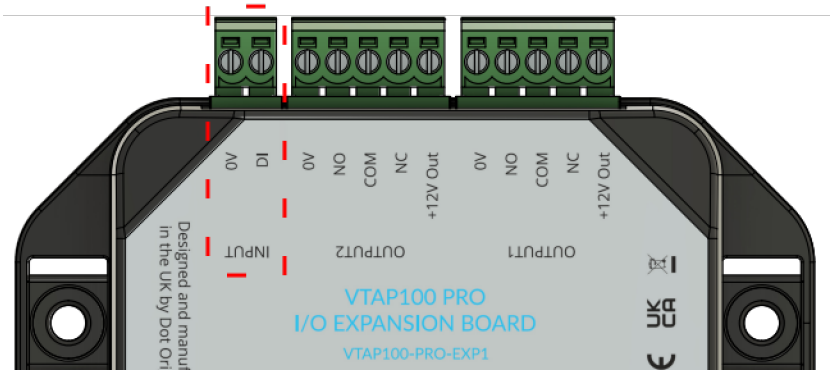


Figure 2-5 INPUT connector on VTAP100-PRO-EXP1

The circuit can detect a change of state between input voltage of <1V (input low) and input voltage of >4V (input high). And this input change can trigger a custom script, to perform tasks such as a beep, an LED sequence, or trigger an output.

In Local mode, this input can be monitored by custom software or a script, which will trigger defined operations or perform tasks such as running an LED sequence, buzzer or relay output.

CAUTION: Ensure that there is always a common ground between the VTAP100-PRO-EXP1 (via 0V pin on the INPUT connector) and the connected equipment.

2.3 Relays (Output 1 and 2)

Two OUTPUT relays can be used to switch loads up to 5A @ 50V AC. Normally open (NO), Common (COM) and normally closed (NC) contacts are available, and the outputs can be set to: ON, OFF, timed ON/OFF, or delay ON/OFF. These options support a wide range of scenarios.

Both output connectors provide +12V and up to 1A to power the equipment connected. If the connected equipment requires a higher current, the power must be supplied by using a different wiring scheme.

OUTPUT1 and OUTPUT2 connection is via the two 5-way 3.5mm pitch connectors highlighted in the diagram.

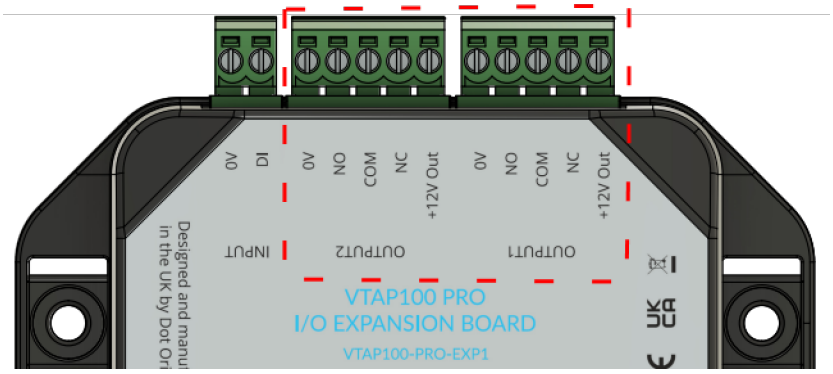


Figure 2-6 OUTPUT 1 and OUTPUT 2 connectors on VTAP100-PRO-EXP1

For a VTAP PRO reader in Cloud mode, a script could trigger either of these output relays, on any of the following events:

- VTAP reader successful read of an NFC Wallet pass, supported card/tag, or barcode/QR code.
- VTAP reader failed read (`NFCReportReadError`) for an NFC Wallet pass or NFC Forum type 4 card/tag.
- Change in state of the VTAP I/O expansion digital input.
- Control JSON from a third-party cloud, with which the VTAP PRO reader is linked through VTAP Cloud.

In Local mode, the VTAP command interface can also be used to drive the relays (OUTPUT1 and OUTPUT2) using free software such as TeraTerm or PuTTY, or your own custom software or script.

Note: Barcode/QR code reading requires a scanner connected to the VTAP PRO reader, either over Bluetooth (VTAP100-PRO-BW only) or RS-232 serial.

2.4 Serial LED output

VTAP PRO readers can drive external serial LEDs using the VTAP100-PRO-EXP1 expansion board. The serial LEDs can be configured to show a default colour or sequence. Alternatively, they could change colour, flash or run an animation in response to events. Those events could be a successful pass or card/tag read, VTAP reader start-up or certain error conditions.

The serial LEDs connection is on the 3-way 3.5mm connector highlighted in the diagram.

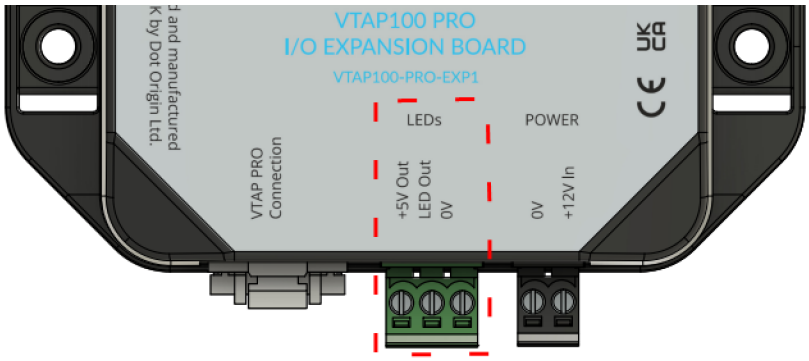


Figure 2-7 LEDs connector on VTAP100-PRO-EXP1

If you are using VTAP PRO readers in Cloud mode, please contact **vtap-support@dotorigin.com** to define an LED sequence and triggering event in VTAP Cloud.

In Local mode, the VTAP command interface can be used to drive serial LEDs from a free terminal emulator such as TeraTerm or PuTTY, or your own custom software or script. (Refer to VTAP Application Note on External LED control with VTAP50 for example LED control sequences).

External LED output can be used in VTAP reader applications which require LED feedback, such as:

- Kiosks;
- Turnstiles
- Arcade gaming machines (VTAP PRO readers with a VTAP PRO I/O expansion board replacing the coin mechanism)

Depending on the application, a serial LED matrix, a serial LED strip or combination of the two could be used.

The LEDs output can be configured to drive up to 255 serial LEDs. It uses the Neopixel protocol for driving serial LEDs.

The VTAP100-PRO-EXP1 will supply +5V and up to 1.5A to power an LED strip or matrix. The power drawn by your chosen LEDs (and the way you intend to use them) can restrict the number of serial LEDs that can be supported. The number of LEDs will be most restricted when each RGB LED is being run at full power (white) continuously. If your use only requires

red, blue or green, or if a pattern on a matrix will only use a subset of LEDs, then a larger number of LEDs can be supported.

Serial LEDs are typically specified in terms of the current drawn by a single red, green or blue LED. Common LED current specifications are 5mA, 12mA and 20mA. Test results for the number of LEDs of each type that can be powered are given in the following table:

Max current per single red, green or blue LED	5mA	12mA	20mA
Voltage	5V	5V	5V
Single LED max current drawn at full RGB brightness (white)	15mA	36mA	60mA
Max number of LEDs that can be powered at full RGB brightness (white) - 100% duty	73	30	18
Max number of single colour (red, green or blue) LEDs that can be powered at full brightness - 100% duty	220	91	55
Text on black background - assumed 30% duty	243	100	60

Table 2-1 Test results for the number of LEDs of each type that can be powered

Any theoretical maximum number of LEDs, using lower power LEDs on a lighter duty cycle, would still be restricted by the 255 maximum number of LEDs that can be configured.

CAUTION: Ensure that there is always a common ground between the VTAP100-PRO-EXP1 (via 0V pin on the LEDs connector) and the connected equipment.

2.5 Control I/O expansion in Cloud mode

The input, relay and serial LED output settings for the VTAP PRO I/O expansion board are configured on a VTAP PRO reader in Cloud mode through the VTAP Cloud platform, to suit each customer's I/O application requirements. If you need changes to settings please contact our support team at **vtap-support@dotorigin.com**.

2.6 Control I/O expansion in Local mode

The VTAP100 PRO I/O expansion board can be used with a VTAP PRO reader in Local mode, using serial interface commands, to switch the two relays or to read the input status. (It is not possible to use serial LEDs on the expansion board with a VTAP PRO reader in Local mode.)

Command to switch relays

Use the `?relay` serial command.

Syntax required is:

```
?relay <relay_num> <action>[=param1[,param2][…]] [action[=params]]
```

`<relay_num>` is currently either `0` or `1` to refer to the two available relays

`<action>` can be one or more in a series of actions, as required, each separated by a space.
Actions can be one of:

```
on
off
timed=ontime[,offtime][,count]
delay=<time in ms>
```

If the off time is not specified, the on time is used. If the count is not specified, 1 is used. Delay is in milliseconds but can specify time in seconds or minutes with 's' or 'm'.

Examples:

```
?relay 0 on
;Switch ON relay 0

?relay 1 delay=60000 on
;Switch ON relay 1 after 60s (60000ms)

?relay 0 timed=100,200,2
;Switch ON relay 0 twice for 100ms, with OFF interval 200ms

?relay 0 on delay=100 off delay=200 on delay=100 off
;Same result as previous example

?relay 0 on delay=5m timed=10s,20s,3
;Switch ON relay 0 after 5 mins, repeat 3 times 10s ON, 20s OFF
```

Command to read input status

Use the `?input` serial command to receive the current state of the input as either open (1) or closed (0).

Extending the command, for example to `?input 0 notify=open`, will record the change of input status, in a way which can be retrieved as bit 16 in the response to an `?events` command.

For further detail about serial commands refer to the VTAP Commands Reference Guide.

If you would rather use configuration settings that can be included in `config.txt`, `PassRelay` and `TagRelay` will trigger a relay in direct response to either a successful mobile pass or a successful card/tag read respectively. Both settings use the same syntax as the `?relay` command above for describing the required relay action.

Setting to trigger relay in response to successful mobile pass read

Use the `PassRelay` setting in `config.txt`.

Syntax required is:

```
PassRelay=<relay_num> <action>[=param1[,param2][…]] [action[=params]]
```

`<relay_num>` is currently either `0` or `1` to refer to the two available relays

`<action>` can be one or more in a series of actions, as required, each separated by a space.
Actions can be one of:

```
on
off
timed=ontime[,offtime][,count]
delay=<time in ms>
```

If the off time is not specified, the on time is used. If the count is not specified, 1 is used. Delay is in milliseconds but can specify time in seconds or minutes with 's' or 'm'.

Examples:

```
PassRelay=0 timed=6000
;Switch ON relay 0 for 6000ms
```

Setting to trigger a relay in response to successful card/tag read

Use the `TagRelay` setting in `config.txt`.

Syntax required is:

```
TagRelay=<relay_num> <action>[=param1[,param2][…]] [action[=params]]
```

`<relay_num>` is currently either `0` or `1` to refer to the two available relays

`<action>` can be one or more in a series of actions, as required, each separated by a space.

Actions can be one of:

```
on
off
timed=ontime[,offtime][,count]
delay=<time in ms>
```

If the off time is not specified, the on time is used. If the count is not specified, 1 is used. Delay is in milliseconds but can specify time in seconds or minutes with 's' or 'm'.

Examples:

```
TagRelay=1 timed=1000,1000,2
;Switch ON relay 1 for 1000ms on, 1000ms off, repeated twice
```

2.7 Use case for the I/O expansion board

2.7.1 Access control

An example use of the VTAP100-PRO-EXP1 expansion board with the VTAP PRO reader would be door or turnstile control in an access control scenario. In this case the I/O expansion board might be used to connect to a door lock:

- The VTAP PRO reader, on reading a valid mobile pass or card, energises the relay coil via the VTAP100-PRO-EXP1 expansion board to open the door.
- Meanwhile the input on the expansion board can monitor the status of a 'request to exit' button, which is connected to a bell or an indicator at reception, so that on pressing the button, an attendant is alerted to unlock the door.
- The serial LED output can be used to drive sequences or animations on an LED matrix (such as an arrow, tick or cross) to provide user feedback.

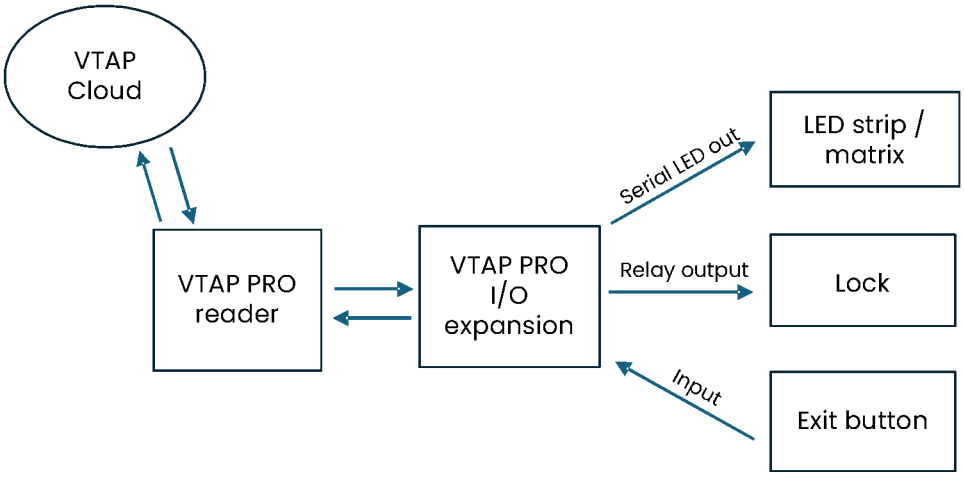


Figure 2-8 VTAP PRO I/O expansion interfaces for access use case

CAUTION: We recommend you use an access control system specialist to plan and install any access control system. There are many country-specific local regulations, which demand certain behaviour from access control systems, particularly in emergency situations, such as power failure or fire. It is the responsibility of the installer to ensure the applicable regulations are followed by their access control system design.

The following diagram shows where to connect a VTAP100 PRO I/O expansion board for this type of application, with normally open (NO), common (COM) and normally closed (NC) connections from the relay.

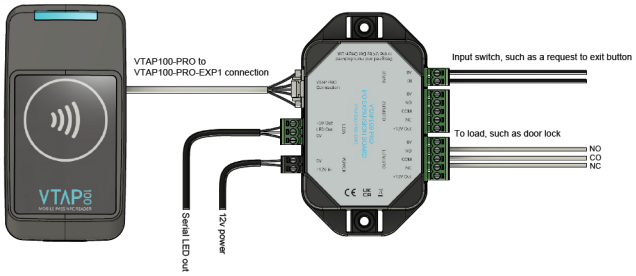


Figure 2-9 Connecting a VTAP100-PRO-EXP1 I/O expansion board for a supervised access control application

Typically, power to the door lock monitor would flow through the COM and NC connectors on the VTAP100 PRO I/O expansion board. In this case, choosing NO and COM would produce a fail secure alternative. However, this behaviour depends entirely on your door lock design. Please study the recommendations from the door lock manufacturer carefully.

2.7.2 Arcade gaming

Most arcade gaming machines use a coin-based credit loading system. Each time the correct coin is inserted in the slot, the coin sensor sends a pulse to the main controller/CPU which in turn adds a credit. A VTAP PRO reader with a PRO I/O expansion board can replace the coin based mechanism, with an NFC Wallet pass or NFC card based system for credit loading. This can send pulses to the main controller/CPU, in the same way as the coin mechanism, upon reading a suitable mobile pass/card.

If the mobile pass contained multiple credits, the return payload from VTAP Cloud to the VTAP PRO reader could signal this by including a corresponding number of pulses for the relay output.

A serial LED strip or matrix can be connected to the VTAP100-PRO-EXP1 to enhance the user experience with default, valid/invalid pass read animations or sequences. These settings can be configured on the VTAP PRO reader either over VTAP Cloud, if the reader is in Cloud mode, or if it is in Local mode by updating a configuration file. Configuration can be updated using ZModem (over serial comms) or by direct text editing (USB mass storage drive).

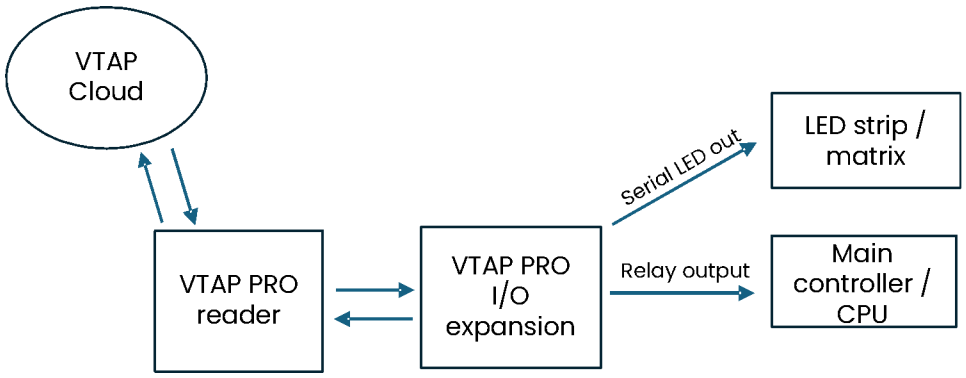


Figure 2-10 VTAP PRO I/O expansion interfaces for arcade gaming use case

3 Power

The VTAP PRO I/O expansion board is powered through its 2 pin Molex connector, rated 9-15V DC (typ 600mW). (The VTAP PRO reader cannot be used to power the expansion board.)

The POWER connector is on the 2-way 3.5mm connector highlighted in the diagram.

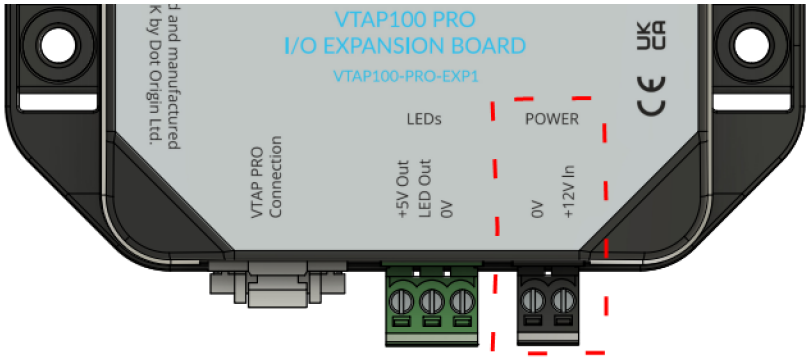


Figure 3-1 Power connector on VTAP100-PRO-EXP1

If the optional VTAP100-PRO-EXP1 expansion board is used, then the VTAP100 PRO reader can be powered from the I/O expansion board, using the cable provided. It does not matter whether the VTAP PRO reader is already receiving power in another way.

4 Mounting

The VTAP PRO I/O expansion must be stored and operated under the following conditions:

- Ambient temperature -25 to +70°C (-13 to 158°F)
- Humidity 0 to 95% RH non-condensing
- Pressure 86-106kPa

The connecting cable between the VTAP PRO I/O expansion board and VTAP PRO reader allows you to mount the VTAP100 PRO reader and the I/O expansion board at a distance from each other, for instance with the VTAP PRO reader mounted on counter top and the I/O expansion board under the counter. The maximum length of cable between the VTAP reader and the I/O expansion board is 3m.

The VTAP100-PRO-EXP1 has two mounting holes on its base plate for fixing.

The following diagram shows the location of mounting holes in the base plate of its case:

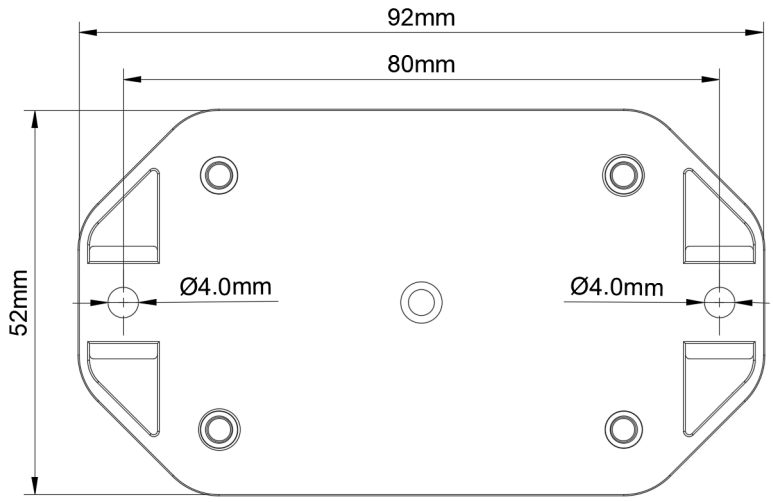
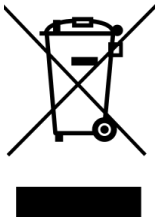


Figure 4-1 Dimension and location of mounting holes in VTAP100-PRO-EXP1 base plate

5 Disposal

For safety and sustainability, it is the responsibility of the integrator to ensure that when equipment containing a VTAP PRO I/O expansion reaches the end of its life, it is recycled in accordance with WEEE Regulations within the EU.



VTAP PRO I/O expansion (PCB and cables) should not be disposed of in general waste. If you wish to discard electrical and electronic equipment (EEE), please contact your supplier for further information.