

# VTAP<sup>®</sup>

## Installation Guide - VTAP100 Embedded Reader Board

VTAP100 OEM module

Revised November 2023 v3.2

**If you need help** to set up or use your VTAP100, beyond what is contained in this Installation Guide, then please contact our support team.

Email: [vtap-support@dotorigin.com](mailto: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 VTAP100 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 equipment is intended for use by suitably qualified integrators, who will integrate the VTAP100 OEM module (PCB) into their own hardware, without any changes or modifications to the VTAP100 OEM module device. (An optional enclosure can be supplied.) Components mounted on the VTAP100 PCB are not user-serviceable. Product safety has been tested to comply with IEC 62368-1.



### WARNING: ESD PRECAUTIONS

We recommend careful handling and storage of Electrostatic Sensitive Devices (ESDs) during installation. The VTAP100 OEM module PCB should always be protected by static shielding bags for shipping or storage.



### WARNING: POWER SUPPLY

Use either a MicroUSB to USB cable, **or** the optional captive cable, if any, to connect the VTAP100 OEM module PCB to a PC. (**Never** connect both at the same time).

EMC emissions and immunity certifications are only valid when using the VTAP100 OEM module with the supplied cable.

**WARNING: FCC COMPLIANCE**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: 2A282-VTAP100G2 or Contains FCC ID: 2A282-VTAP100, in accordance with enclosed module ID.

Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the multi-transmitter procedures.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.



#### **WARNING: ISED COMPLIANCE**

This device contains licence-exempt transmitter(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference, and
- (2) this device must accept any interference, including any interference that may cause undesired operation of the device.

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

L'émetteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement est conforme aux limites d'exposition aux rayonnements de la ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et un corps humain.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains IC: 30458-VTAP100G2.

Si le numéro d'identification n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module fourni, Contient IC : 30458-VTAP100G2.

# 1 Using this guide

This guide is for first-time users of the VTAP100 OEM module.



Figure 1-1 VTAP100 OEM reader board

It contains the information you need about your VTAP100 OEM module hardware.

Consult the VTAP Configuration Guide for more about configuration and maintenance features for any VTAP100, including how to update the firmware on your VTAP100 OEM module, when a new release is available.

If you need help beyond what is contained in this guide please contact [vtap-support@dotorigin.com](mailto:vtap-support@dotorigin.com).

## 2 How the VTAP100 works

---

With the VTAP100 OEM module connected to a PC, simply tap your smartphone against the VTAP. Your mobile NFC pass will be read and data sent to the connected PC.

Of course, the data can only be read if your phone contains a mobile NFC pass, which has been issued in connection with the Merchant ID(s)/Collector ID(s) and ECC key(s) that are known to the VTAP. The unit comes with default values, so that you can test **Test using factory settings** before you begin customising any settings.

When the VTAP100 OEM module is connected to a computer it appears as a generic mass storage device (like a memory stick). To configure your VTAP, you simply edit or create text files. These will be read automatically, and control the operation of the VTAP. Consult the VTAP Configuration Guide for more detail.

By default the VTAP is fully upgradable in the field. However, the VTAP can be locked in software or hardware, before deploying the unit, so that operation is no longer easily changed.



## 2.1 Test using factory settings

Before anyone changes the configuration from its default, you can confirm that the unit is working.

These steps demonstrate that the hardware can detect and interact with an OriginPass demo mobile NFC pass, which is ready to work with the default configuration of your VTAP100.

1. Obtain an OriginPass from Dot Origin by visiting <https://originpass.com/VTAP/> and add it to Google or Apple Wallet. (You will require a username and password - contact [vtap-support@dotorigin.com](mailto:vtap-support@dotorigin.com) to get these.)
2. Connect the VTAP100 to your PC, using a USB cable.
3. Open a text editor, such as Windows Notepad.
4. When you tap the OriginPass on the VTAP100:
  - Pass contents will be displayed in the open text editor, through keyboard/barcode emulation.
  - The feedback LEDs on the VTAP100 PCB will flash green.
  - Your smartphone may signal with a buzz or beep.

**Note:** Some Android phones will only interact if their screen is on, although it does not need to be unlocked. You may need to enable NFC in the settings for the smartphone.

**Note:** If the pass detected does not match the key and ID on the VTAP, or is moved away too quickly to be read, the pass contents displayed may be an 8 digit random hex string, such as '08E22AC1', different on each presentation. OriginPass contents will be a consistent string, such as '3~ffymeK9f\_mziYtA6~53999301628695~Valued'. Any separator, such as '~' or '|', will depend on your keyboard language settings. (See VTAP Commands Reference Guide for option to ignore random UIDs if needed.)

**Note:** If local security settings prevent or limit the use of removable storage devices, or the connection of additional keyboards, an administrator may need to alter those permissions.

## 2.2 Start reading your own passes

If you navigate to the VTAP in the computer's file system, it will appear as an attached mass storage device and list the files contained, including the main `config.txt` file.

To read any mobile NFC pass, you will need to provide your pass reading parameters in the `config.txt` file. This means a collector ID or merchant ID and ECC keys. These allow you to read and decrypt pass data that is held by your users, on their smartphones.

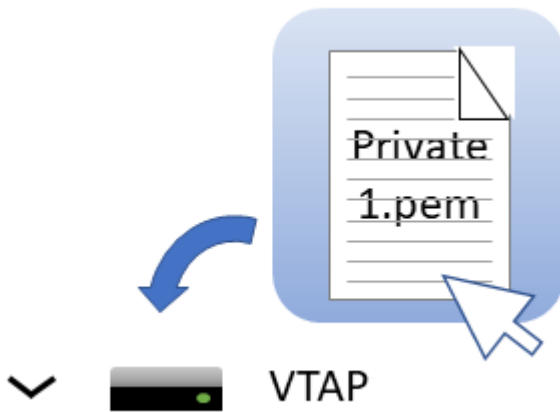
This first time, you will need to connect the VTAP100 to your PC, using a USB cable. (If needed, you can make changes remotely in future over a virtual COM port or serial port, see VTAP Serial Interface Guide.)

### Step 1: Upload private key file(s) to your VTAP100

1. Ensure these are ECC private key(s), and each is stored in a file with the name `private#.pem`, following the `.pem` format, where `#` is replaced with a number from 1 to 6, matching the key slot you will save it in. (The demo passes are accessed using the key in KeySlot 6, so don't overwrite this one unless you are finished with demo passes.)

**Note:** You cannot use more than 6 key files.

2. Load your keys by copying these files onto your VTAP100, which shows up in the file system of your PC as a mass storage device.



**Note:** When you reboot the VTAP100 your key will have been stored in hardware, and will no longer be listed as a file on the device. You can confirm key file(s) have been loaded when you Check status in BOOT.TXT. If the key file does not disappear and there is an error in `Boot.txt`, check your `.pem` file as it is likely it did not adhere to the standard - perhaps it was not an ECC key?

## Step 2: Declare Merchant ID(s)/Collector ID(s) in the `config.txt` file

1. Open the file `config.txt` in a text editor (such as Windows Notepad). It already contains parameters for accessing the demo passes, prefixed `VAS1` and `ST1`, both relying on KeySlot 6. You can overwrite these, or keep them in addition to your own pass reading parameters.
2. Add your pass reading parameters in the `config.txt` file to access up to 6 Apple VAS and up to 6 Google Smart Tap IDs, and identify the keys to be used in each case.

**Note:** Although the VTAP100 supports multiple IDs, Apple expect most users will only use one. Multiple collector IDs are not supported by Android, which means you cannot request more than one Collector ID from Google. Only one should be live at any one time. Multiple IDs is an advanced feature that should be used with care. The `VAS#` and `ST#` numbers define the order in which IDs will be requested from Apple or Android phones respectively. The lowest numbered ID will be requested first, then continuing in ascending numeric order.

Put each parameter on a new line. Order of parameters does not matter to the VTAP100, but could help other people who need to edit the file. Start any comment lines in the `config.txt` file, that the VTAP100 should ignore, with a semicolon. Each parameter should only appear once - if it accidentally appears more than once then only the last instance will take effect.

### Example: Settings in `config.txt` to interact with both Apple VAS and Google Smart Tap mobile passes

```
!VTAPconfig

VAS1MerchantID=<your merchant ID>
VAS1KeySlot=1
; This says use the key added as file 'private1.pem' to read and
; decrypt any pass connected to your merchant ID on an Apple iPhone

ST1CollectorID=<your collector ID>
ST1KeySlot=2
ST1KeyVersion=1
; This says use the key added as file 'private2.pem' at key version 1
; to read and decrypt any pass connected to your collector ID
; on an Android phone
```

3. Save the amended `config.txt` file and these changes will take effect immediately. (A small number of changes to the `config.txt` file require a reboot to take effect, for instance to the status of the virtual COM port, but these are highlighted in later sections).

**Note:** If a `VAS#KeySlot` parameter is omitted, or set to 0, then all available keys will be automatically tried to choose the right key. If the data received by the VTAP100 cannot be decrypted, the Apple iPhone will register a pass read, but the data will not be output.

**Note:** If an `ST#KeySlot` parameter is omitted, or set to 0, then authentication will be omitted and decryption will not be performed. In this case, Google Smart Tap data will be received and sent on by the VTAP100, only if the pass does not require authentication by the terminal.

## 2.3 Check status in `BOOT.TXT`

If you navigate to the VTAP100 in the computer's file system. It will appear as an attached mass storage device and list the files contained, including the `BOOT.TXT` file.

Inspecting `BOOT.TXT` will give you essential information about your VTAP100 set up, at time of last reboot, which might be helpful when troubleshooting.

```
VTAP100
Boot time: 1970/01/01 00:00:00
Firmware: V2.2.0.2
Storage: Dataflash
Status: 0
Hardware: 5.01
Expansion: None
NCI: 0471125005-0001
Serial number: 563230-798AEC17D053C05ADE6F6C36C79A6B12
AppKeys used: -23-
KeySlots used: ----56
```

Figure 2-1 Example VTAP100 v5 `BOOT.TXT` file

You are most likely to need:

- ('ATCA' on VTAP100 v4a or earlier) - the serial number for your VTAP100.
- 'Firmware' - the VTAP100 firmware version in use. You will find the latest firmware versions at <https://www.vtapnfc.com/download/>
- 'Hardware' - the VTAP100 hardware version in use.
- 'KeySlots used:' - Indicates the ECC private keys loaded on the VTAP to access VAS or Smart Tap passes. Helps you check whether you have uploaded the necessary ECC private keys, which can be unclear as the files are deleted when they are uploaded. These two examples show how to read this information:
  - 'KeySlots used:-----' shows that no keys have been uploaded.
  - 'KeySlots used: 12--56' shows that key files 1 and 2 have been successfully uploaded, in addition to the defaults 5 and 6.
- 'AppKeys used:' Indicates the application keys (if any) uploaded to the VTAP for any other applications. For example 'DESFire' if keys have been loaded to use with DESFire applications.
- 'VCP enabled', if included - indicates that the virtual COM port has been enabled.
- 'Status' - should be 0 if operating normally, anything else indicates an error state.

- 'Expansion:' shows the name of the expansion board (if any) connected to the VTAP, for example: 'VTAP100W' for a Wiegand expansion board.
- 'Boot time' - The time at boot, which defaults to 1970/00/00 00:00:00 if power is removed to reboot.

If the configuration has been locked the `BOOT.TXT` file will end with the words `LOCKED S/W` or `LOCKED H/W`.

### 3 Mechanical installation

The VTAP100 unit for OEM integration comprises a PCB with an integral antenna.

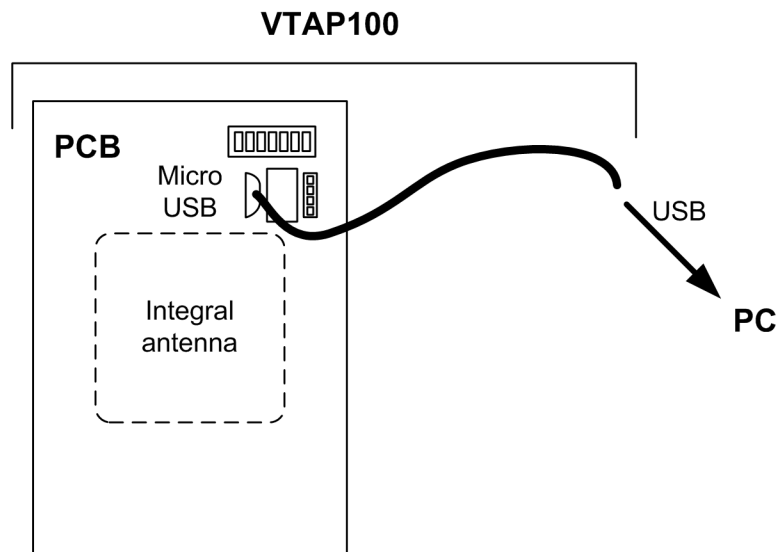


Figure 3-1 VTAP100 components - v4a or v5 Hardware

**Note:** If you have a VTAP100 PCB version 3a or earlier the connections will be different, please [contact us](#) for manuals specific to your hardware. (If you are not sure which version PCB you have, just follow the instructions in [Find your hardware version.](#))



**WARNING:** Observe all [Safety instructions](#) when installing the VTAP100 PCB.

There is more detailed information in section [3.5](#) about how to fit the VTAP100 unit inside the [Optional case](#), if used.

#### 3.1 Power

Connect the PCB to a PC using **only** a MicroUSB to USB cable.

The VTAP100 is rated at 5V DC (typ. 110mA, max 150mA) for power over USB.

#### 3.2 Environment

The VTAP100 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

### 3.3 Mounting points

The PCB has 2.7mm diameter mounting holes for fixing the unit. Either use the 50mm spaced holes on the snap-off tabs, or remove those tabs and make use of the holes on the body of the board. If you need to remove the tabs, we recommend carefully following the perforations provided to avoid damage to the board, using a vice and pliers, or a PCB cutter. Use 2-4 small nuts and bolts to mount the board securely.

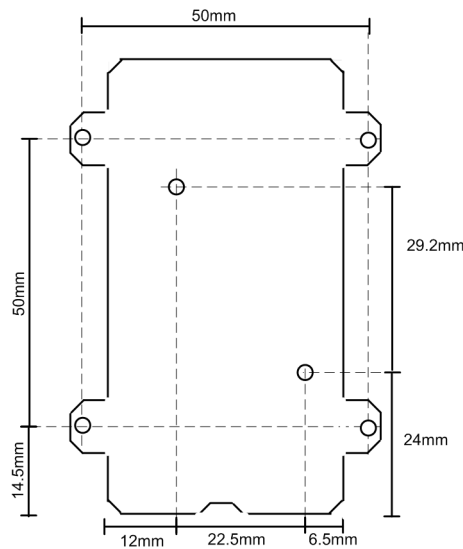


Figure 3-2 VTAP100 PCB mounting holes - v4a or v5 Hardware

The user's smartphone should be able to tap within 10mm of the antenna on the PCB. The antenna position should be clearly marked and easily accessed, so that users can position their smartphone appropriately. Be aware that antennas are positioned differently in different makes of smartphone. Apple iPhones often have antennas near the top and Android phones are more likely to have an antenna in the middle.

**CAUTION:** Mounting a VTAP board on metal can reduce performance of the VTAP100, because metal can distort the NFC field. Never allow a metal surface between the VTAP100 and the user's phone or card. If you have to mount the VTAP100 on metal, you should ensure the separation is:

- at least 6mm and insert a ferrite sheet between the VTAP100 and the metal surface, or
- at least 25mm separation between the VTAP PCB and the metal, which will be achieved if the VTAP100 is inserted in a compact case before mounting.



### 3.4 Optional RS232 connection

The PCB has a special connector J1 (an 8 pin, 2mm pitch header connector) which can be used to attach a captive cable with a matching crimp housing.

The standard connector fitted to the PCB is a Hirose DF11-8DP-2DSA male header plug with shroud. The matching crimp housing is the Hirose DF11-8DS-2C.

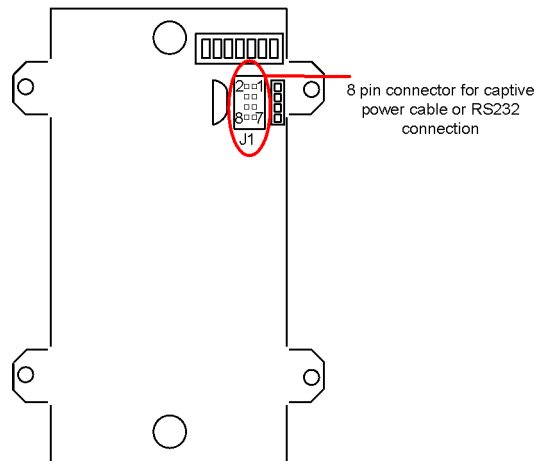


Figure 3-3 VTAP100 captive power cable or RS232 connection - v4a or v5 Hardware

The connector J1 includes both USB and RS232 signals, as follows:

Pin	Function
1	GND
2	USB D+
3	+5V supply
4	USB D-
5	RS232 RXD (input)
6	Reserved (sense input)
7	RS232 TXD (output)
8	Reserved (sense GND)

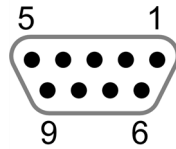


Figure 3-4 Typical RS232 cable

A typical RS232 cable has the following DB9 female connector pinout:

Pin	Function
2	TXD
3	RXD
5	GND
9	+5V supply (if any)

A PC or terminal RS232 connector is usually DTE (data terminating equipment), typically a male DB9 with transmit (TXD) on pin 3 and receive (RXD) on pin 2. The appropriate connecting cable is then a DCE (data communications equipment) female DB9. TXD and RXD pins are swapped between the DCE and DTE devices, so that the transmit pin on one connects to the receive pin on the other.

The VTAP100 requires a 5V power supply, but not all RS232 devices have 5V on pin 9. Your options are:

- If your RS232 connector provides 5V power on pin 9, disconnect the USB cable before making the serial connection, then power will be provided by J1 (pins 1 and 3) and the serial cable/host.
- If your RS232 connector does not provide 5V power on pin 9, retain a USB connection in addition to the serial connection.

Some serial cables have a separate DC 5.5/2.1mm barrel connector to supply power. In these cables, typically, the centre pin is +5V and the outer barrel is GND.

### 3.5 Optional case

The optional compact case for a VTAP100 is 97mm x 49mm and 40mm deep.



Figure 3-5 VTAP100 -CC compact case

We can design and affix your own branded label to the unit. If you would like to brand your VTAP readers do contact [vtap-support@dotorigin.com](mailto:vtap-support@dotorigin.com). We can take your CMYK, vector format images and design and supply labels manufactured to high standards using an advanced production method, where the printing is protected by a thick layer of clear plastic, making them scratchproof, waterproof and UV-proof. Apple guidelines require the standard contactless logo to be used, and so our standard label template includes this along with a design that highlights the location of the VTAP antenna, as that is the target location for a user to tap their phone.

The size of the label recess on a compact case (-CC) is 41mm x 57mm with 2mm radius rounded corners as shown below.

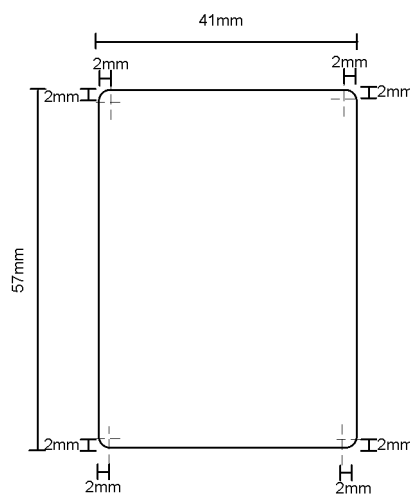


Figure 3-6 Dimensions of label recess in -CC compact case

## 4 Module integration instructions – FCC/ISED

The VTAP100 OEM module has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation

These instructions must be followed to maintain the FCC/ISED approval for the VTAP100 OEM module, when it is integrated into a host system.

**CAUTION:** Changes or modifications made to the VTAP100 OEM module, that have not been expressly approved by Dot Origin Ltd could void the user's authority to operate the equipment.

### 4.1 Applicable FCC/ISED rules

The VTAP100 OEM module operates at 13.56MHz and is therefore subject to FCC/ISED rules for radio frequency devices. When a pass is presented to the reader, a person comes within 10mm of the device, so the rules relating to 'portable' transmitters apply.

### 4.2 Specific operational use conditions

The VTAP100 OEM module 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

### 4.3 RF exposure considerations

This module complies with FCC/ISED RF radiation exposure limits set for an uncontrolled environment. It is expected that VTAP100 OEM modules will be mounted in places that make it possible for people to come within 10mm of the unit and it is therefore defined by the FCC/ISED as a 'portable' device.

Screened cable should be used, wherever possible, to connect VTAP100 OEM modules to other devices, to avoid interference from other equipment.

The end-user manual for the host equipment, that contains a VTAP100 OEM module, must clearly indicate the operating conditions to be observed, so that the user remains in compliance with current FCC/ISED RF exposure guidelines.

## 4.4 Antennas

The VTAP100 OEM module has been tested with its integrated loop antenna, printed on the PCB. There are no alternative antennas approved for use. If an external antenna is attached, the new arrangement would require a new FCC/ISED approval.

## 4.5 Label and compliance information

The integrator must attach a label to the new equipment, hosting the VTAP100 OEM module, which states 'Contains FCC ID: 2A282-VTAP100G2' or 'Contains FCC ID: 2A282-VTAP100', in accordance with enclosed module ID for FCC approval and 'Contains IC: 30458-VTAP100G2' for ISED approval.

## 4.6 Information on test modes

The following test modes are recommended to achieve states of maximum emission levels or susceptibility in the VTAP100 OEM module:

1. VTAP100 OEM module powered on. Communicating with PC over USB. Continuously reading tag.
2. VTAP100 OEM module powered on and tag present, but not communicating with external device.

## 4.7 Additional testing requirements

The VTAP100 OEM module is only FCC/ISED authorised for use in compliance with the specific FCC/ISED transmitter rules listed on the grant. The integrator is responsible for compliance to any other FCC/ISED rules that apply to the host, which are not covered by the modular transmitter grant of certification.

The final host product, with the VTAP100 OEM module installed, will still require Part 15 Subpart B compliance testing, to evaluate transmission effects when the VTAP100 OEM module and host equipment operate at the same time. Be aware that additional testing can be required on the final integrated system. We recommend integrators refer to further advice from the FCC OET Knowledge Base, such as [996369 D04 Module Integration Guide v02](#).

## 5 Hardware lock to disable USB mass storage device

You can lock the VTAP100 so that its firmware and configuration cannot be changed. You can either do this in software, or simply disable the mass storage device in hardware., which is described in the VTAP Configuration Guide

A software lock prevents changes but leaves the file system readable. A hardware lock means that the VTAP100 will no longer be detected as a USB mass storage device. (It will still behave as an HID keyboard device and, if enabled, the virtual COM port will behave as a composite USB device consisting of HID keyboard and USB virtual COM port.)

You can use a hardware lock provided the jumper labelled LOCK (close to the MicroUSB connector) remains accessible on a VTAP100 OEM module.

Connect a jumper across LOCK on the PCB to lock the device, preventing firmware or configuration changes via the mass storage device. (It may still be possible to update the firmware or configuration via the command interfaces of the virtual COM port or serial ports, if they are enabled.)

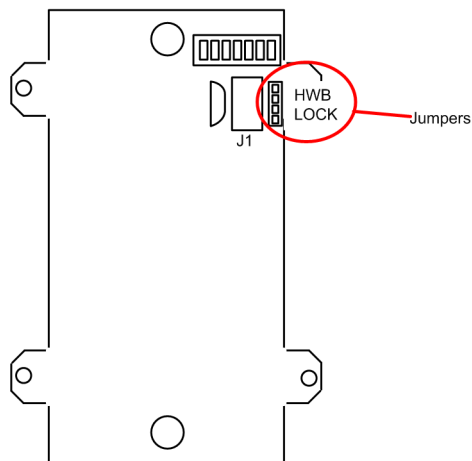


Figure 5-1 Jumper positions on VTAP100 PCB v4a or v5 hardware

**Note:** If you have a VTAP100 PCB version 3a or earlier the connections will be different, please [contact us](#) for manuals specific to your hardware. (If you are not sure which version PCB you have, just follow the instructions in [Find your hardware version.](#))

When you start the VTAP100, the presence of this jumper means the connected PC will not detect a USB mass storage device. The VTAP100 will only be detected by the PC as a keyboard (or keyboard and virtual COM port).

At any time you can remove the jumper across LOCK. When you restart the VTAP100, it will be detected as a USB mass storage device and you will be able to make firmware or configuration changes again.

## 6 Find your hardware version

If you need to report a problem with your VTAP100 or find the right reference diagram you will need to know your hardware version.

### **If you can connect your VTAP100 to a PC, you can easily check the BOOT.TXT file.**

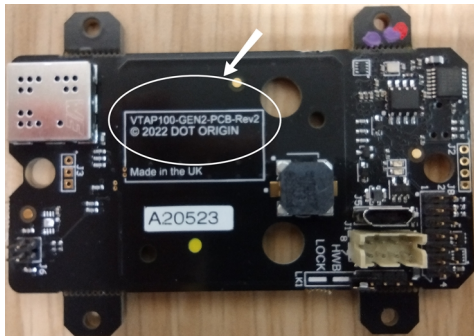
If you navigate to the VTAP100 in the computer's file system. It will appear as an attached mass storage device and list the files contained, including the `BOOT.TXT` file.

Inspecting `BOOT.TXT` you will find a number next to the word `Hardware:` such as `v5`. This is the Hardware version in use.

Alternatively, over a serial connection to the VTAP100, sending the `?b` command will return the `BOOT.TXT` information.

### **If you cannot power the VTAP100**

You will find the version number printed on the PCB, such as "VTAP100-PCB-V4a ©2021 DOT ORIGIN Ltd." which is VTAP100 v4a hardware. In the photo below is "VTAP100-GEN2-PCB-Rev2 © 2022 DOT ORIGIN" which is also known as VTAP100 v5 hardware.





## 7 Disposal

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For safety and sustainability, it is the responsibility of the integrator to ensure that when equipment containing a VTAP100 reaches the end of its life, it is recycled in accordance with WEEE Regulations within the EU.



VTAP100 (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.

