VTAP100

Integration Guide - VTAP100 access control reader assembly with RS-485/OSDP interface

VTAP100-PAC-485-OEM

Revised August 2025 v1.01

DOT ORIGIN

If you need help to set up or use your VTAP100-PAC-485, beyond what is contained in this Integration 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 VTAP100-PAC-485 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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A VTAP100-PAC-485-OEM engineering drawing A-1

Safety instructions

WARNING: INTENDED USE

The VTAP100-PAC-485 equipment is intended for use by suitably qualified integrators, who will integrate the VTAP100-PAC-485-OEM (PCBs) into their own hardware, without any changes or modifications to the VTAP100-PAC-485-OEM device. (An optional enclosure can be supplied.) Components mounted on the VTAP100-PAC-485 PCBs are not user-serviceable and an assembly of two boards should never be separated. 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-PAC-485-OEM PCBs 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-PAC-485-OEM PCBs to a PC for power during configuration. In normal operation the VTAP100-PAC-485 model will be powered by connecting it to an access controller, via the RS-485 connector.

EMC emissions and immunity certifications are only valid when using the VTAP100-PAC-485-OEM reader board with the optional captive 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-PAC-485-OEM reader board assembly.

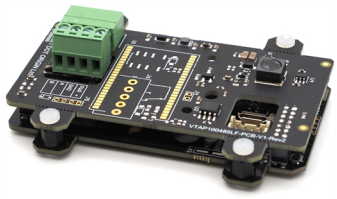


Figure 1-1 VTAP PAC 485 OEM reader assembly

It contains the information you need to connect your VTAP100-PAC-485-OEM hardware. Beyond initial default operation, all information about configuration can be found in the Configuration Guide.

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

2 How the VTAP100 works

With the VTAP100-PAC-485-OEM connected, simply tap your smartphone against the VTAP. Your mobile NFC pass will be read and data sent to the connected equipment. The VTAP100-PAC-485 model is designed to be connected to an access controller over RS-485, for transferring data or commands.

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 **Default operation on factory settings** before you begin customising any settings.

When the VTAP100-PAC-485-OEM is connected to a computer via USB cable, 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 reader. The VTAP100-PAC-485 will be able to receive and respond to commands over RS-485 on default settings, but must be configured over USB from a PC, if it is to send pass data over the RS-485 interface. 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 Default operation

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

These steps use a USB connection to 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-PAC-485.

1. If you don't already have one, obtain an OriginPass from Dot Origin by visiting **https://originpass.com/VTAP/** and add it to your NFC Wallet. (You will require a username and password - contact **vtap-support@dotorigin.com** to get these.)
2. Connect the VTAP100-PAC-485 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-PAC-485:
   - Pass contents will be displayed in the open text editor, through keyboard/barcode emulation.
   - The feedback LEDs on the VTAP100-PAC-485 PCBs 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 reader, 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

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. (There is a VTAP Application Note which explains more about ECC key pairs and how to generate your own keys.)

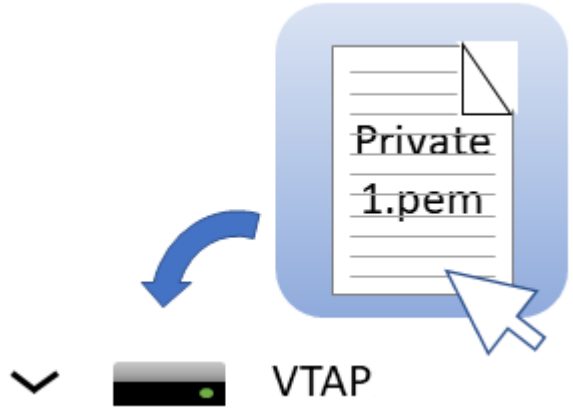
This first time, you will need to connect the VTAP100-PAC-485 to your PC, using a USB cable. (If needed, you can make changes remotely in future over a virtual COM port or serial port, see VTAP Serial Integration Guide.)

Step 1: Upload private key file(s) to your VTAP100-PAC-485

1. Ensure these are ECC private key(s). 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 Dot Origin demo passes.)

   Note: A VTAP reader cannot use more than 6 private key files.

2. Load your keys by copying these files onto your VTAP100-PAC-485, which shows up in the file system of your PC as a mass storage device.



Note: When you reboot the VTAP100-PAC-485 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-PAC-485 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. (There is a VTAP Application Note on Multiple Passes which explains more.)

   Put each parameter on a new line. Order of parameters does not matter to the VTAP100-PAC-485, but could help other people who need to edit the file. Start any comment lines in the `config.txt` file, that the VTAP100-PAC-485 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-PAC-485 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-PAC-485, only if the pass does not require authentication by the terminal.

2.3 Check status in BOOT.TXT

Inspecting BOOT.TXT will give you essential information about your VTAP100-PAC-485 set up, at time of last reboot, which might be helpful when troubleshooting.

```
VTAP100
Boot time: 2001/01/01 00:00:00
Firmware: V2.2.5.0
Storage: Dataflash
Status: 0
Hardware: 5.01
Expansion: VTAP100C-V1-a2
VCP enabled
NCI: 0471125005-8C00
Serial number: 563230-798AEC17D053C05ADE6F6C36C79A6B12
VTAP label: CC123456
API level: 4
AppKeys used: 123------
```

Figure 2-1 Example VTAP100 v5 BOOT.TXT file

You are most likely to need:

- 'Serial number' ('ATCA' on VTAP100 v4a or earlier) - the hardware serial number for your VTAP100-PAC-485.
- 'VTAP label' (if set) - the assigned serial number for your VTAP100-PAC-485, which matches that on its label. This will not show if not set.
- 'Firmware' - the VTAP100-PAC-485 core firmware version in use. You will find the latest firmware versions at **https://www.vtapnfc.com/download/**
- 'Hardware' - the VTAP100-PAC-485 hardware version in use.
- 'API level' - indicates which serial or OSDP API commands are supported.
- 'KeySlots used:' - Indicates the ECC private keys loaded on the VTAP reader, 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 reader for any other applications, such as keys 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 connected to the VTAP, for example: 'VTAP100W' for a Wiegand expansion board, 'VTAP100C' for a VTAP PRO BW expansion board, 'VTAP100E' for a VTAP PRO POE 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.

2.4 Using the RS-485 interface

The RS-485 interface on the VTAP100-PAC-485 can be used to send NFC mobile wallet pass payload straight to a control unit, such as an access control unit, just like sending data from any other card or pass reader. RS-485 is a half-duplex interface, which means that communication is only ever in one direction at any time. The hardware contains two data or signal lines (either A and B or + and –), which send balanced signals over the two lines. This means both lines contain the same signal but one is inverted with respect to the other. The RS-485 interface makes use of VTAP configuration settings starting `Serial2...`, described as the Serial2 interface.

The following steps will configure this interface (unless you will be **Using OSDP over RS-485**, see section **2.5**):

1. The Serial2 interface is enabled on the VTAP100 by default. Should you need to disable it, set `Serial2Mode=0` and/or `Serial2RS485=0` to disable the Serial2 interface and/or RS-485 transmission driver in the `config.txt` file.
2. By default, the VTAP100-PAC-485 is in active mode and any data read by the VTAP100-PAC-485 will be passed to the Serial2 interface, since `Serial2Source=A1`. To restrict this, so that only some types of data will be passed over RS-485, use another value for `Serial2Source` to suit your application. Refer to the VTAP Commands Reference Guide for options with this setting.
3. The Serial2 interface needs to be in passive mode to support uni-directional communications between the VTAP100-PAC-485 and the connected device. So use `PassiveInterfaces=4` in the `config.txt` to enable passive mode on the Serial2 interface.
4. When the VTAP100-PAC-485 is in passive mode, being polled for data by another system, it is important to realise that, by default, data is only retained for 3000 milliseconds after a pass, card or tag is read. After this period the data and information about this read can no longer be sent on any interface. Use the `InvalidDataCacheMS` setting if you need to change this to an amount of time that better suits your application.
5. The default port settings are 9600 baud rate, no parity, 8 data bits and 1 stop bit. If this does not match your RS-485 system, change these settings, using `Serial2Settings` in `config.txt`. Define the interface parameters in the sequence `<baud rate>, <parity>, <data bits>, <stop bits>`, as in the example `Serial2Settings=115200,n,8,1`.
6. If you only need a part of the full pass payload use `Serial2Pass...` settings to extract only that part. Refer to the VTAP Commands Reference Guide for more about these settings.

Example: Settings in Config.txt file to extract a part of the pass payload over RS-485 interface

```
VTAPConfig!

PassiveInterfaces=4     ; Enable passive mode for RS-485 interface
                        ; (Serial2)
Serial2PassMode=1       ; Enable extracting part of the entire pass
                        ; payload
Serial2PassSeparator=|  ; Set the separator character to divide the pass
                        ; payload on the basis of
Serial2PassSection=2    ; Sets the section of interest, based on the
                        ; Serial2PassSeparator character (starts from 0)
```

From a full pass payload of: `3|F6I53ZaPv2Ys2PAb|C699E142|Dot`

This is the output which will result using the above settings: `C699E142`

7. Prefix and postfix characters can be added to the data being sent over the RS-485 interface. Use `Serial2Prefix` or `Serial2Postfix` to set these (max 16 characters). URL encoding is supported.

Example: Adding prefix and postfix on a Serial2 RS-485 interface for pass and card/tag payload

```
Serial2Prefix=UID:

Serial2Postfix=%20Type:$t,Slot:$n
```

This will result in Google pass output:

`UID:3|F6I53ZaPv2Ys2PAb|Muhammad Faraz|Dot Type:G,Slot:16`

or MIFARE Classic card output:

`UID:0473816A831E80 Type:4,Slot:--`

After changing the `Serial2...` settings in `config.txt` and saving that file (if something other than default behaviour is required), you can start sending commands (queries) over the Serial2 RS-485 interface, to receive pass payloads in response.

The most commonly used commands are:

- `?r` to get the last read pass or card/tag payload (as long as it is within the `InvalidDataCacheMS` period).
- `?type` to get the pass or card type along with VAS merchant ID or ST Collector ID and ECC key slot.

Refer to the VTAP Commands Reference Guide for all the available commands for the Serial2 interface.

For more information about the VTAP100 RS-485 and other serial interfaces refer to the VTAP Serial Integration Guide.

2.5 Using OSDP over RS-485

OSDP defines a method for secure communication between an Access Control Unit (ACU) and all its Peripheral Devices (PDs). The VTAP100-PAC-485 RS-485 interface can be used for OSDP communications between the VTAP (PD) and an ACU, in an access control system.

The command interfaces on a VTAP100-PAC-485 are designed as human interfaces. Using the secure OSDP protocol on interfaces provides an ideal machine interface, with the necessary CRCs and integrity checks.

A VTAP100-PAC-485 will support basic and secure modes on OSDP.

Please refer to VTAP Application Notes about using OSDP over an RS-485 interface. If you need further support, please contact **vtap-support@dotorigin.com**.

3 Mechanical installation

The VTAP100 reader board assembly for integration comprises two PCBs with an integral antenna in the lower board. Power is connected to the main board, through a cutaway in the expansion board on top.

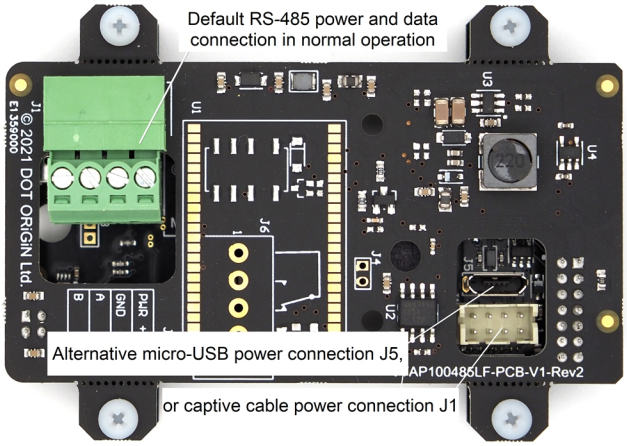


Figure 3-1 VTAP100-PAC-485-OEM connection options for power

WARNING: Observe all **Safety instructions** when installing the VTAP100 PCBs.

3.1 Power

For configuration - Connect the PCB assembly to a PC using **either** a MicroUSB to USB cable **or** a captive cable, as supplied with boxed models.

During normal operation the VTAP100-PAC-485 model will be powered by connecting it to an access controller, using the RS-485 connector. If the VTAP100 is being powered through its RS-485 connection, you can still make an additional USB data connection to a PC, provided that the PC is already powered. (This avoids the risk that the USB data connection is driven to too high a voltage.)

The VTAP100-PAC-485-OEM is rated at 5V DC (typ. 110mA, max 150mA) for power over USB. When powered over RS-485 it is rated at 8V-16V DC.

WARNING: Do not power the VTAP100-PAC-485-OEM reader assembly if the NFC antenna is damaged. Components can reach higher operating temperatures than normal when an antenna is not attached, which could damage the VTAP reader and cause injury if handled.

3.2 Environment

The VTAP100-PAC-485-OEM assembly 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

CAUTION: Always ensure sufficient clearance between the VTAP antenna and other RF transmitters, to avoid electromagnetic interference between equipment. Clearance required varies between antennas, depending on antenna size, power and sensitivity.

3.3 Mounting points

The PCB has 2.7mm diameter mounting holes, suitable for an M2.5 screw, spaced 50mm apart for fixing the unit. These will come with screws in place to hold the two boards of the assembly firmly together, but can be replaced with longer screws to connect the assembly into your housing.

CAUTION: Replace only one screw at a time, to keep the boards in contact at all times, if you need to replace the screws which hold the boards of an assembly together. Separating the boards of an assembly will invalidate your warranty.

Use 4 M2.5 nuts and bolts to mount the board securely.

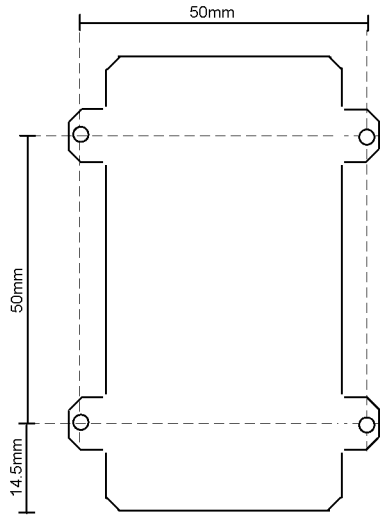


Figure 3-2 VTAP100 assembly mounting holes

The NFC antenna, which is in the lower PCB of the assembly, should not be mounted more than 10mm deep within your enclosure (measuring from the antenna surface to the enclosure surface), so that a user's smartphone will be able to come close enough to the antenna for reliable reading.

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.

There is an engineering drawing you may find useful at Annex A.

CAUTION: Mounting a VTAP board near metal can reduce performance of the VTAP100-PAC-485, because metal can distort the NFC field. Never allow a metal surface between the VTAP100-PAC-485 and the user's phone or card. If you have to mount the VTAP100-PAC-485 near metal, you should ensure the separation is:

- at least 6mm and insert a ferrite sheet (suitable for 13.56MHz) between the VTAP100-PAC-485 and any metal surface behind the reader, or
- at least 25mm separation between the VTAP PCB and any metal (in all directions).

Testing should be performed in the proposed mounting location, as other devices and structures in close proximity could affect pass reading performance.

3.4 Optional RS-232 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.

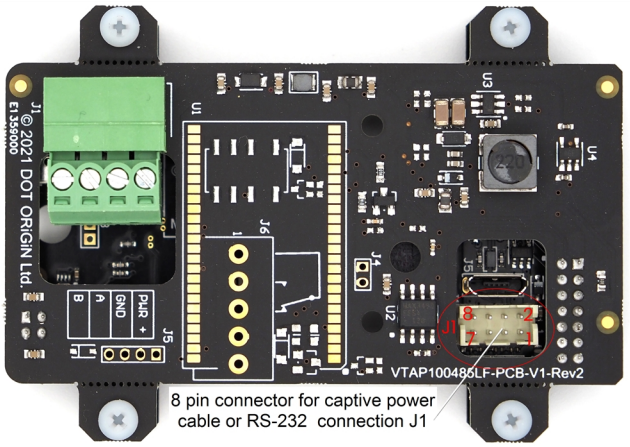


Figure 3-3 VTAP100100-PAC-485-OEM captive power cable or RS-232 J1 connection

The connector J1 includes both USB and RS-232 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)

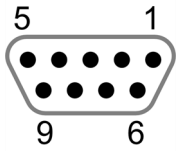


Figure 3-4 Typical RS-232 cable

A typical RS-232 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 RS-232 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 RS-232 devices have 5V on pin 9. Your options are:

- If your RS-232 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 RS-232 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 RS-485 wiring (for model VTAP100-PAC-485 only)

Use the RS-485 connector supplied to make an RS-485 wiring connection to a configured VTAP100-PAC-485 reader from your access controller, like any other reader.

Use 24AWG twisted pair shielded cable for the connection between VTAP100-PAC-485 reader and controller (for example Belden 82842).

Note: Screened cable should always be used to connect VTAP100 readers to door controllers, to avoid interference from other equipment. The cable screen must be connected electrically to GND at both the VTAP100 reader and controller ends of the cable, using the bare wire 'drain' conductor.

CAUTION: We strongly recommend that power is disconnected from the installation cable before wiring the VTAP100 connector.

Follow this figure and table to make the right connections in your access controller:

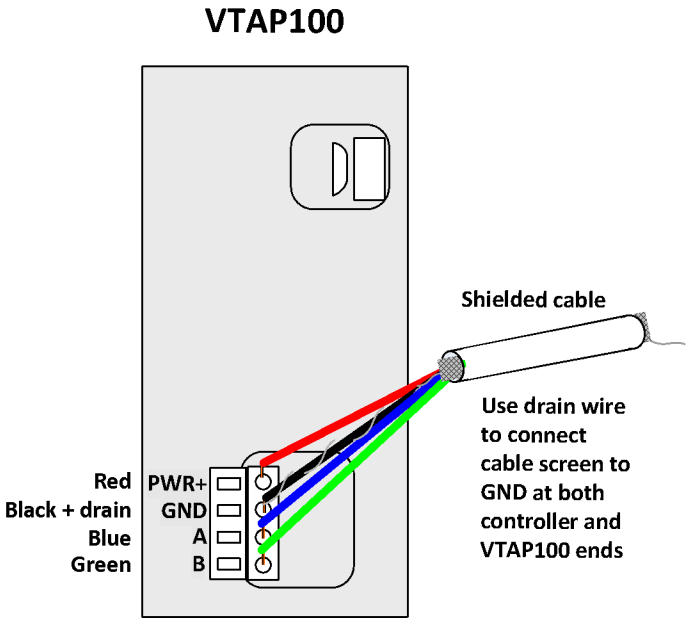


Figure 3-5 Connection to VTAP100-PAC-485 and access controller (for example)

Access Controller Signal Name (for example)	Wire colour (typical)	VTAP100 Signal Name (v5 hardware)
PWR+	Red	PWR+
GND	Black	GND
A	Blue	A
B	Green	B

Termination resistance is not required when connecting a VTAP100-PAC-485 over the RS4845 line, because it uses a low slew-rate RS-485 transceiver (commonly used in modern devices). The only scenario where termination resistance may be required is where impedance matching is required because a controller is using a termination resistance.

4 Module integration instructions - FCC/ISED

The VTAP100-OEM reader board is the part of any OEM assembly which carries the NFC antenna. This has received FCC/ISED modular approval. In order to maintain this approval for your integration, you must follow the instructions in this section. If your equipment contains another RF transmitter, that works in conjunction with the VTAP reader, you may want to request an FCC Permissive Change approval based on the existing VTAP100-OEM modular approval. Contact us early in the process if you need help with FCC/ISED testing and permissive change.

The VTAP100-OEM reader board 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 reader board, when it is integrated into a host system.

CAUTION: Changes or modifications made to the VTAP100-OEM reader board, 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 reader board operates at 13.56MHz and is therefore subject to FCC/ISED rules for radio frequency devices.

4.2 Specific operational use conditions

The VTAP100-OEM reader board 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 reader board complies with FCC/ISED RF radiation exposure limits set 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.

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

The end-user manual for the host equipment, that contains a VTAP100-OEM reader board, 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 reader board 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 reader board.

For FCC approval: 'Contains FCC ID: 2A282-VTAP100G2'

For ISED approval: 'Contains IC: 30458-VTAP100G2'

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 reader board:

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

4.7 Additional testing requirements

The VTAP100-OEM reader board 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 reader board installed, will still require Part 15 Subpart B compliance testing, to evaluate transmission effects when the VTAP100-OEM reader board 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**.

4.8 Maintaining Apple VAS(ECP1) or ECP2/Access compliance

There are some steps required in order to maintain Apple VAS(ECP1) and/or ECP2/Access compliance.

When you request an NFC entitlement and/or permission for an Apple Access deployment we recommend that you inform Apple that a Dot Origin VTAP OEM board or module has been used in your finished product. Apple are aware that our products are available both in finished form and as OEM modules.

- For VAS applications Apple reserves the right to review the final form factor of the reader, to ensure that satisfactory performance and user experience is maintained.
- For ECP2 applications it is essential that the new equipment hosting a VTAP reader board or module is tested and certified against Apple Access specifications. This includes ensuring that the read range meets their minimum distance requirements (40mm at various presentation angles, in Express and CDCVM modes) and that the reader is tested against all the different categories of iPhone and Apple Watch, as required by Apple. Apple may also require on-site functional testing as part of the end-to-end certification of an Apple Access deployment, which is usually conducted by the Credential Manager.

In both cases, our engineering team can advise and assist on certification issues, which could include taking a product through formal certification, if required.

5 Find your hardware version

If you need to report a problem with your VTAP100-PAC-485 or find the right reference diagram you will need to know your hardware version.

If you can connect your VTAP100-PAC-485 to a PC via USB, you can easily check the BOOT.TXT file.

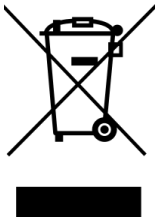
If you navigate to the VTAP100-PAC-485 in the computer's file system. It will appear as an attached mass storage device and list the files contained, including the `BOOT.TXT` file.

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

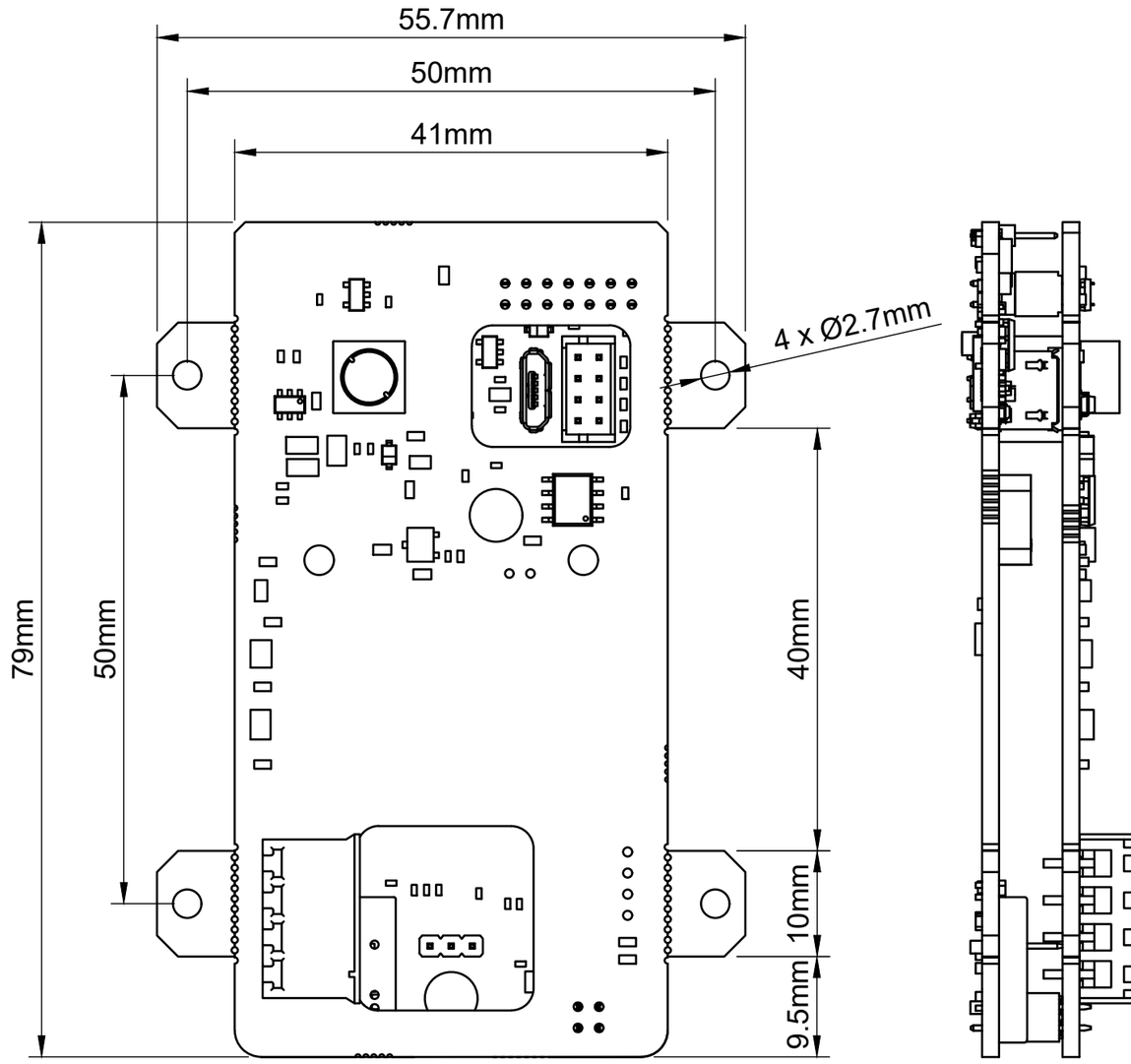
Alternatively, over a serial connection to the VTAP100-PAC-485, sending the `?b` command will return the `BOOT.TXT` information.

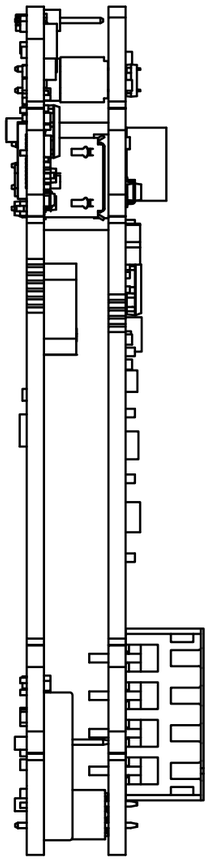
6 Disposal

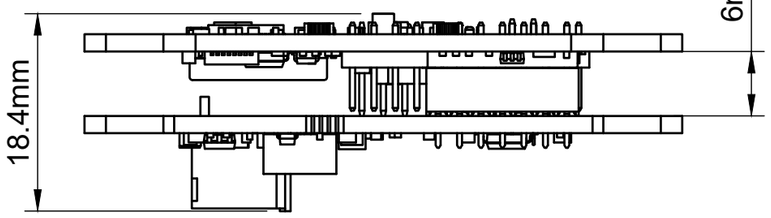
For safety and sustainability, it is the responsibility of the integrator to ensure that when equipment containing a VTAP100-PAC-485 reaches the end of its life, it is recycled in accordance with WEEE Regulations within the EU.



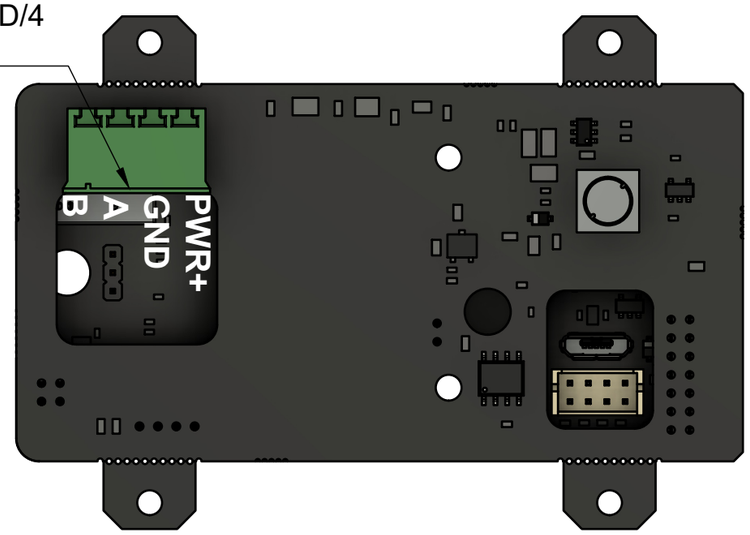
VTAP100-PAC-485 (PCB assembly) should not be disposed of in general waste. If you wish to discard electrical and electronic equipment (EEE), please contact your supplier for further information.

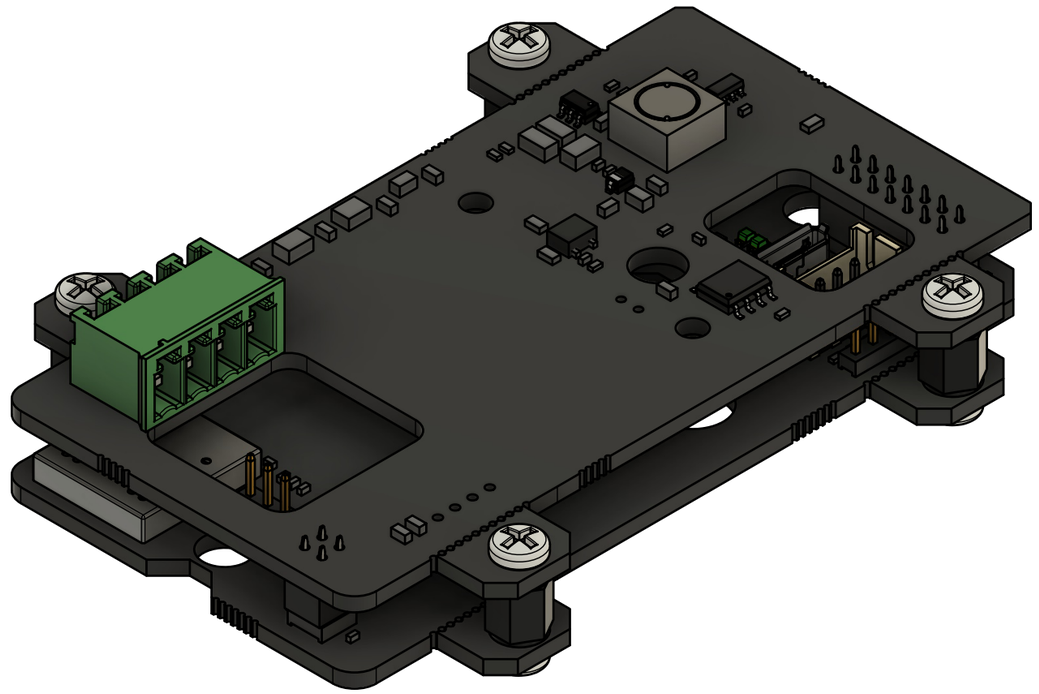






Mating female connector
(4-way, 3.5mm pitch)
Camden Boss CTBP93HD/4
TE 2350514-4





Title VTAP100-PAC-485 Reader Assembly		VTAP Model Ref. VTAP100-PAC-485-OEM	
	DOT ORIGIN LTD Unit 7, Coopers Place, Combe Lane Wormley, Godalming Surrey GU8 5SZ, UK vtap-support@dotorigin.com +44 (0) 1428 685861	Drawing No.	Date 12/02/2025
		ECN	Created By M FARAZ
		Status	