

ThunderSync2-16

User Manual



*Please note this product has been discontinued

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2. Introduction

The ThunderSync2-16 has been designed to provide high-speed data transfer to USB compliant devices and expand the endpoint limits.

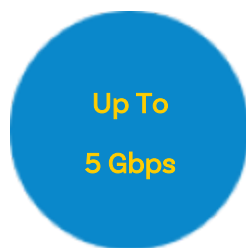
The ThunderSync2-16 can charge attached USB devices without using a local computer. The ThunderSync2-16 allows any USB compliant device to be charged at its optimum rate (up to 2.4A). The firmware can be updated to ensure the ThunderSync2-16 can manage the latest devices. It is ready to charge out-of-the-box and sync devices when attached to a host computer.

When a local (host) computer is attached, the host can control the operation of each port using software provided by Cambrionix. Device charging and synchronisation can be

monitored through Cambrionix's Connect Application, the Application Programming Interface (API) or Command Line Interface (CLI). Cambrionix's monitoring and control software can be downloaded from <https://www.cambrionix.com/software>

The ThunderSync2-16 includes a Thunderbolt™ 2 connection to the host. It supports speeds of up to 5 Gbps for devices capable of SuperSpeed USB operation. It also delivers up to 480 Mbps for devices that support Hi-Speed USB.

2.1. Key Features



Transfer Data Seamlessly

Each high-speed port can transfer data up to 5 Gbps



Power


Each port can charge devices up to 2.4 A at 12 (W)

3. Safety

This user manual is for informational purposes only, it contains information for the start-up and operation of this product. Note: the contents and the product described are subject to change without notice. To avoid injuries and damage, observe the safety instructions in the user manual.

This manual has been arranged to follow the IEC/ICEE 82079-1 standard. This is to facilitate the easier understanding and location of information relating to the ThunderSync2-16. Any errors or omissions can be reported using our support ticket system (see [Help and Support](#)). This way, any issues that are discovered can be acted on quickly and we can update the documentation to reflect this.

Understanding and observing the instructions in this user manual are prerequisites for hazard-free use and safety during operation. This user manual cannot cover all possible applications. If you would like additional information or if problems arise that are not sufficiently addressed in this manual, please ask your distributor or contact us directly using the means preferred, which are located on the back cover of this manual.

	⚠ CAUTION
	<p style="text-align: center; color: blue;">Personal Injury and Damage to the product</p> <p style="text-align: center;">Always observe the safety instructions in this user manual</p>


3.1. Signal word panel

Depending on the probability of serious consequences, potential dangers are identified with a signal word, the corresponding safety colour, and if appropriate, the safety alert symbol.

⚠ CAUTION
<p style="text-align: center;">Indicates a potentially hazardous situation that, if not avoided, may result in moderate or minor (reversible) injury.</p>



CAUTION
<p style="text-align: center;">Indicates a potentially hazardous situation which, if not avoided, may result in damage to the product and its functions, or to property in its proximity.</p>



3.2. Safety alert symbol

	<p>Use of the safety alert symbol indicates a risk of injury.</p> <p>Observe all measures that are marked with the safety alert symbol in order to avoid injury</p>
---	---

3.3. Pictograms




These symbols will be used throughout this documentation to alert to any potential dangers or any actions that must be taken.

Warning Signs	
 <p>Electrical hazard</p>	 <p>Fire Hazard</p>

Mandatory action signs	
 <p>Read operating instructions</p>	 <p>Mandatory regulation</p>


3.4. Product modification


Cambrionix products are designed and manufactured to meet the requirements of UK and international safety regulations. Modifications to the product could affect safety and render the product non-compliant with relevant safety standards, resulting in injury or damage to the product.

	<div data-bbox="772 241 1000 286">⚠ CAUTION</div> <p data-bbox="507 338 1275 383">An electric shock or personal injury may occur</p> <p data-bbox="676 425 1184 459">Do not modify the product in any way.</p> <p data-bbox="730 486 1129 519">Do not dismantle the product.</p> <p data-bbox="766 544 1094 577">Do not open the product</p>
	<div data-bbox="772 669 1000 714">⚠ CAUTION</div> <p data-bbox="614 766 1166 810">Fire, or personal injury may occur</p> <p data-bbox="655 853 1198 887">Do not obstruct air vents on the product.</p> <p data-bbox="510 911 1343 945">Do not cover the product in or place near combustible material.</p>
	<div data-bbox="798 1037 979 1081">CAUTION</div> <p data-bbox="592 1133 1189 1178">Damage to your product may occur</p> <p data-bbox="601 1220 1259 1254">Do not bend or compress any part of the product.</p>

3.5. Power supply


This section describes the safety precautions you must follow when using the external power supply.


	⚠ CAUTION
	<p style="text-align: center;">An electric shock or personal injury may occur</p> <p>Do not use a damaged power cord or plug, or a loose power socket.</p> <p>Do not touch the power plug with wet hands.</p> <p>Do not allow liquids to come into contact with the unit or power supply.</p>


	CAUTION
	<p style="text-align: center;">Damage to your product may occur</p> <p>Do not short circuit the Power Supply Unit (PSU) supplied with your product.</p> <p>Do not disconnect the power cord while the product is being used.</p> <p>Do not bend or pull the power cord with excessive force.</p> <p>Do not use a power supply that exceeds the power supply specifications within this manual</p>


3.6. Storage and Installation

This section describes safety precautions you must follow when installing and storing your ThunderSync2-16.

	⚠ CAUTION
	<p style="text-align: center;">An electric shock or personal injury may occur</p> <p>Do not place the power cord near heat sources.</p> <p>Connect the plug only to an earthed socket.</p>


	CAUTION
	<p>Damage to your Cambrionix product may occur</p> <p>Operate the product only in an environment where the ambient temperature is inside the operating temperature range.</p> <p>Operate the product only in an environment where the relative humidity is inside the operating range.</p> <p>Be careful not to leave the power cord underneath a heavy object.</p>

	⚠ CAUTION
	<p>Overheated power sockets may cause a fire</p> <p>Do not overload the power socket that your hub is connected to.</p> <p>Insert the power plug all the way into the socket so that it is not loose.</p>

	CAUTION
	<p>Overloading the brackets may cause failure</p> <p>The rack brackets for all our products are not designed to be used in a mobile application, bracket failure could occur if the units are not supported fully e.g Shock during road transport.</p>

3.7. Cleaning your ThunderSync2-16

Cleaning the product is generally not required, although in some instances it may be necessary if excess dirt/ dust/ hair has accumulated, or if minor liquid spillages have occurred on the module during operation or storage.

	⚠ CAUTION
	<p style="text-align: center; color: blue;">Electric shock or personal injury may occur</p> <p>If there is a dirt/ spillage over a ventilation slot, external data/ power connector or product aperture, please remove power from the unit without touching the liquid and seek advise before reapplying power</p>

- Ensure that the product is switched off and the power cord is removed from the product. Hold the power cable by the plug and do not touch either the plug or the power cord with wet or damp hands as an electrical shock may result
- Wipe the product with a clean, dry and soft cloth. Do not use detergents which contain alcohol, solvent or surface-active agents. Do not spray water or detergent directly onto the product
- Mildly dampen a soft and dry cloth in water and wring thoroughly to clean the product as required
- Dry the product thoroughly once the cleaning has finished
- Reconnect the power cord and use your product as advised once cleaning is complete

4. Getting Started


This manual provides a reference for end-users installing for the first time and using their hub afterwards. As well as a guide for product safety-related information.

The ThunderSync2-16 is intended to be used in an indoor static environment in which the environment falls within the tested specifications to provide charge, sync and management functionality. Please see the [Product Specifications](#) section of this manual for information on the environment specifications.

4.1. Unpacking your product

When you have received your product, please check the packing slip inside the box to ensure all contents and quantities are correct before opening. This is to avoid retesting and repackaging any items that are not required.

When opening the packaging, use a suitable method to open the box i.e, do not use a knife. This is to ensure the product is not damaged.

	⚠ CAUTION
	<p style="text-align: center; color: blue;">Personal Injury and Damage to the product</p> <p style="text-align: center;">There will be a label on the hub advising you to read the User manual before use. This will need to be removed before use as it may be covering host ports, vents etc.</p>

4.2. What's Included

- Thunderbolt™ 2 Cable (to provide communication between the host system and hub)
- ThunderSync2-16 Hub
- 2m Mains power cable (Country specified on order including fuse for the UK plugs)

4.3. Consumables and Placing Orders

If you require any spare parts, such as cables, these can be ordered by quoting the product part number listed in the [Product Specifications](#).

These can be ordered from the reseller or solution partner you purchased your ThunderSync2-16 from, or from Cambrionix directly.

To find one of our partners local to you please visit www.cambrionix.com/about-cambrionix/partners-distributors where you can learn about the local vendors and distributors that can assist you and find their contact information.

4.4. Connecting to the mains

Connect the Power Supply Unit (PSU) to the hub using the C13 plug. Connect the power cable to the PSU. Making sure you adhere to local safety regulations, connect the power cable to the 100 – 250 VAC mains power outlet and switch the hub on using the small power switch located adjacent to the power input connector on the hub. When the device is switched on, a LED next to the power input will be illuminated. The hub is now ready to charge attached devices.

Please note that USB specifications require a minimum 100 mA charge current to be available during data transfer. As indicated in above, if the attached device has a BC1.2 compliant CDP port, the device can draw up to 2.4A whilst transferring data.

4.5. Connecting devices to your ThunderSync2-16

Throughout this manual we will refer to "devices" this relates to the device you are connecting to the ThunderSync2-16 this could be any USB device such as a phone, tablet, USB drive or any other USB connected device.

Once you have your hub setup the next thing is to connect your devices to start using the ThunderSync2-16. We would always recommend using the OEM cable supplied by the manufacturer of the device, so whatever cable is provided with the device use that cable to connect to the hub.

If your device has a USB plug (male connector) on it already then you can connect the device directly into the hub.

If the cable (or plug fitted to device) is not the same USB type as the socket (female connectors) on the ThunderSync2-16 then you will require an adaptor or a different cable.

Cables

Some USB cables are data transfer only, and some are power delivery only. There are also options that can handle both tasks. Be sure to verify a cable's abilities before purchasing it and select a cable which can handle the speeds and power transfer that you require.

4.6. Charging

Your ThunderSync2-16 will allow your device to charge at the maximum rate possible up to 2.4A. The way that charging takes place is the ThunderSync2-16 will provide the device with a capability to charge and the devices USB charging controller will determine the maximum amount of charge it wants to draw down.

Although a maximum charge rate of 2.4A is possible, the device itself determines the exact rate and as such you may not see the maximum amount of charging on every device type that is connected.

4.7. Registration

You may register your product at www.cambrionix.com/product-registration

4.8. Help and Support

FAQs and help can be found on the Help page here

- https://www.cambrionix.com/help_pages/help.

You can raise a support ticket for more in depth support here

- <https://support.cambrionix.com>

You can also download any of our manuals and keep up to date at the link here

- www.cambrionix.com/product-user-manuals

When contacting support, please supply the product information for the hub in question. This can be found on the Device Information Plate which is either on the underside or back of the unit.

Providing serial and Purchase order numbers, can help identify your specific product and speed up the process.

5. Using your Cambrionix Hub

This section provides guidance on using your hub effectively, either in charge-only or sync-and-charge applications. You will also find detailed information on managing your hub, adjusting port modes, connecting multiple hubs to a single host, and utilising Cambrionix Software for enhanced functionality.

5.0.1 Port LED States

Your ThunderSync2-16 has inbuilt LEDs used to show the state of the ports, devices and the power state. These LEDs can be configured to support your use case; this can be controlled either by using the API to send commands directly or through separate software. When the hub is powered on all the available LED's will flash once and then revert to the default behaviour mentioned below.

Colour	Behaviour
Flashing Red	Port is in charge mode and is profiling the device
Red	Port is in charge mode and is charging
Yellow	Port is in sync mode and has a host connection
Green	Port is in charge mode and the device has reached the charged threshold
LED Off	No Device is detected

Table 5-1

5.0.2 Fan Behaviour

Your ThunderSync2-16 has an inbuilt fan used to cool the product when internal temperatures rise above a set threshold. On power up the fan will spin for approximately a second before turning off. For more information on the temperatures that trigger the fan please see the fan properties section in the [Hub Specifications](#).

When looking into the specifications you will see five different temperatures relating to fan speed and temperatures some information on how this relates to your product please see below table:

Start Temperature (°C)	The Temperature at which the fan will initially turn on
50% Speed Start Temperature (°C)	The Temperature at which the fan will increase to 50% speed
Max Airflow Temperature (°C)	The Temperature at which the fan will increase to 100% speed
Drop to 50% Speed Temperature (°C)	The Temperature at which the fan will decrease to 50% speed
Stop Temperature (°C)	The Temperature at which the fan will turn off

With the ThunderSync2-16 there is also an internal power supply which has its own fan which will continuously be active with a very low sound level (less than 47db at full load)

5.1. Using Without Connecting to a Host

When the hub is powered on and not connected to a local host computer, it automatically switches to charging mode using its intelligent charging algorithm. Simply connect your devices to any available port (excluding the Host Port) using USB-compliant cables to begin charging.

Once the devices are connected, the algorithm will detect the highest charge rate allowable for each attached device. Charging at the optimum rate (up to 2.4A) specified by the manufacturer will commence once profiling is complete. Depending on the state of charge of the device attached, this may take tens of seconds.

During profiling, the LEDs will flash red. Charging at the optimum rate specified by the manufacturer will commence once profiling is complete. At this point, the red LEDs will be constantly illuminated. Depending on the state of charge of the device attached, profiling may take tens of seconds. Once the device is nearly fully charged, and the current draw falls below a set limit for a given period, the green LEDs will be illuminated.

5.2. Using when connected to a host

5.2.1 Connecting the Hub to a host computer

You can use either Thunderbolt™ host port on the rear of the hub to connect to your host system; there are two ports on the rear, so you can use one port to connect the host and the other port to daisy chain multiple hubs.

Connect the ThunderSync2-16 to your host system using a Thunderbolt™ 2 cable. Using an incorrect host cable may result in the hub and all subsequent ports not being recognised by your host. You can use an optical cable to connect to your host as the ThunderSync2-16 is self powered. Thunderbolt™ 5 cables are backwards compatible, Also a Thunderbolt™ 2 cable with a Thunderbolt™ 2-3 adaptor can also be used with reduced data speeds

The ThunderSync2-16 must be connected physically to a host in order to communicate with the hub and devices. If you wish to connect to a hub remotely (not on the physical host it is connected to) it will still need to be connected to a host and have access to the Cambrionix Hub API which can then be connected to if the relevant steps have been taken, more information on remote access can be seen in the Cambrionix Hub API user manual, which can be viewed from the website. <https://www.cambrionix.com/cambrionix-api>

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5.2.2 Charging

When the Host Port is connected to a local computer, the hub defaults to Sync mode and charge currents are determined according to USB Implementers Forum (USBIF) Super-Speed USB3 specifications. If the attached device complies with USB-IF Battery Charging specification BC1.2 and supports Charging Downstream Port (CDP), the hub can provide high-speed charging at 1.5A. If the connected device does not comply with BC1.2, the charge current will be limited to Standard Downstream Port (SDP) which is 0.5A in compliance with USB specifications. Information on the different charging levels can be found in the [Port Specifications](#) section.

The ThunderSync2-16 also has an 'ALT Sync Charge' mode which is on by default, having this option selected will allow the ThunderSync2-16 to charge devices up to 2.4 A whilst syncing data.

If you wish to limit the charging to your devices whilst connected to your host system then you can disable CDP. You can disable CDP through Internal hub settings either by going through the advanced settings and turning "Sync charge" off or through the API and disabling it via code. For example, the instructions would be below using the command line.

The CLI commands for turning off the sync charge options, with a 1 or 0 per port.

```
settings_unlock
settings_reset
settings_set sync_chrg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
settings_set alt_sync_chrg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
reboot
```

This can also be done via the API if this is easier. Just supply that string (joined with \n) like:

```
cbrxapi.cbrx_connection_set(handle, "Settings", "settings_unlock\nsettings_reset\nsettings_set sync_chrg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0\nsettings_set alt_sync_chrg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0\nreboot")
```

Note that `settings_reset` clears any previous settings, so if you need to retain something else, it would be better to issue `settings_display` first, which gives you the entire settings which you can then modify and re-issue in entirety.

For more information on this please see the internal hub settings section of CLI manual, which can be viewed from the following link. www.cambrionix.com/cambrionix-cli

5.2.3 Data Transfer

If you wish to transfer data, change applications, restore or update your mobile device, a data connection to a local host computer is required. The Cambrionix Hub API and software is compatible with macOS®, Windows™ and Linux® operating systems and can transfer data between these operating systems and many mobile operating systems such as iOS™ and Android™.

In order to transfer data, connect the host port to your local (host) computer using a Thunderbolt™ 2 compliant cable. Any devices connected to the hub will now appear as if they were connected to the host computer's USB port.

5.3. Scalability

If you wish to maximise the amount of devices you can connect through one USB port on your host system it is possible to connect multiple hubs together.

To daisy-chain multiple hubs, each hub needs to be connected to mains power individually, then the first (parent) hub in the chain should be connected using the host port and then connecting directly to a USB port on the host system. The subsequent hubs can then be connected using the host port on the second (child) hub and any of the downstream ports from the parent hub.

If you connect too many devices to most computers' USB ports, you may hit what is known as the endpoint limit.

If you experience the endpoint limit, you are likely to see an error indicating you have “run out of USB resources” on your host computer, you may not see any error message at all, and (any of) your USB devices may randomly fail to operate correctly or become intermittent.

For more information on endpoints, connecting multiple devices and calculating how many devices you can connect to your host system please see our technical note on endpoints.

<https://downloads.cambrionix.com/documentation/en/Technical-note-endpoint.pdf>

Each USB device will use a different amount of endpoints and therefore a different amount of endpoint memory. This will need to be looked at on a case by case basis, you can find information on different products and how to calculate from our technical note linked above. Also another thing to consider when connecting devices is how you are connecting them, for example using a USB2 cable with a USB3 capable device will only connect the device with USB2.

You will also need to consider hub depth when chaining multiple hubs, more information can be found in the technical note.

Examples

Using the ThunderSync2-16 you will be able to connect the following amount of devices, through a standard USB host controller. It is possible to connect more devices and hubs but as a baseline this amount of devices should always be possible to connect at one time.

5.4. Managing Ports

Each port on your ThunderSync2-16 can be managed either individually, or all together. You can turn the ports off and on, change the port mode, or change various other settings applicable to the ThunderSync2-16 more information can be found in the [Cambrionix Connect](#) section under Internal hub settings. This can be done through Cambrionix Connect, the CLI or by connecting to the hub via the API.

5.4.1 Port Modes

Charge	Turn specific ports or the whole hub to charge only mode (no data connection, hub emulates an OEM charger)
Sync	Turn specific ports or the whole hub to sync mode
Off	Turn specific ports on or off or switch the whole hub on or off (no power and no data channels open, mimics unplugging the device)

Table 5-2

5.4.2 Switching port modes

You can switch between port modes by using Cambrionix Connect, the CLI or by connecting to the hub via the API. If you switch a port off then this will stop any connection taking place to the USB device and would mimic unplugging the USB device completely from the host system.

If you are in Sync mode and then switch to Charge mode the USB device will disconnect briefly whilst the profiling process takes place, during the profiling process the connection will disconnect and reconnect whilst the device settles on the optimum profile. Once the profiling has taken place, and a charging profile is selected, the device will then draw a charge rate, which will be defined by the charging controller within the USB device. The charging profile will limit the maximum amount that the device is able to draw.

If you are in Off or Charge mode and switch to Sync mode the USB device will disconnect briefly whilst a data connection is opened, the USB device will then become available to the host as if the USB device is connected directly to the host, and will be able to sync data. The ThunderSync2-16 will also charge the device whilst connected. It is impossible to have a data connection to a USB device without any power negotiating, you can reduce the charging rates available by disabling CDP (Charging downstream port).

5.4.3 Charging Profiles

To ensure attached devices charge at their optimum rate, our smart USB hubs come with the below intelligent charging profiles built in:

0	Intelligent charging algorithm which will select a profile 1-6
1	2.1A (Apple)
2	BC1.2 Standard (this covers the majority of Android™ phones and other devices)
3	Samsung
4	2.1A (Profile 1 but with a longer timeout)
5	1.0A (Typically used by Apple)
6	2.4A (Typically used by Apple)

Table 5-3

5.4.4 Firmware

The firmware can be kept up to date using our Cambrionix Connect software. As part of delivering an easy user experience, our Cambrionix Connect application is now a set-and-forget solution. The Cambrionix Connect application will discover your USB hub's firmware and present an update for you.

To update the firmware, first, go to the firmware section of Cambrionix Connect. Here you can see the available Firmware versions to install to the hub.

The current firmware version on the hub is displayed in the firmware section alongside the hub's name. This will appear red if a newer version is available or green if it is the most up to date.

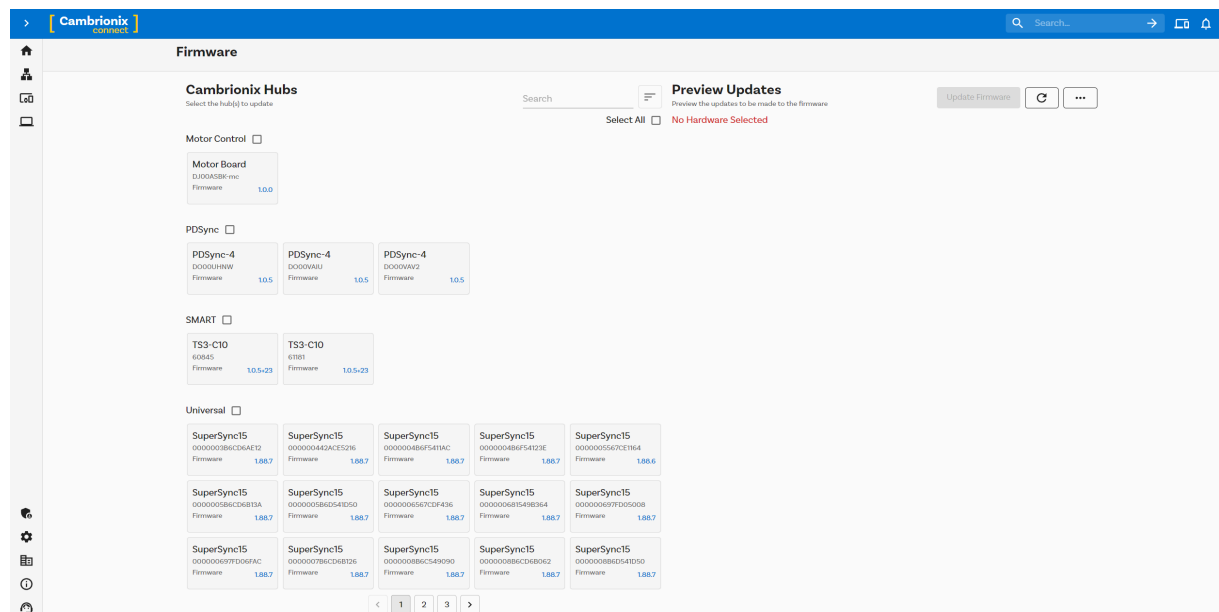




Figure 5.1

To install the firmware onto the hub click the hub(s) connected that you want to update, the latest firmware will be automatically selected, if you wish to change the firmware version you are updating to then this can also be done. Once selected press the update button at the top and the update will commence.

If you are running in an offline environment then there are other ways to update the firmware on your hub. One way would be to use the Command Line Updater, this can be downloaded from our website along the with user manual from the following link cambrionix.com/cambrionix-clu.

An alternative would be to download the firmware file and manually add this to the Hub API there is more information in the Cambrionix Hub API user manual which can be downloaded from the following link cambrionix.com/cambrionix-api.

	CAUTION
	<p>Your Hub may not function correctly</p> <p>Do not downgrade firmware onto a new product</p>

	CAUTION
	<p>Your Cambrionix Firmware may get corrupted</p> <p>Do not interrupt the Firmware update process.</p> <p>Do not disconnect the power during the update process.</p>

	CAUTION
	<p>Your Cambrionix Hub may not be visible or become unresponsive</p> <p>If you have older hardware with Firmware version number lower than 1.83 then the hub may not be compatible with the Cambrionix Hub API and will need to be updated to the latest version of Firmware using the Command Line Updater which can be downloaded and installed from the following link.</p> <p>https://www.cambrionix.com/cambrionix-clu</p>

CAUTION

A new version may be available

Ensure you have the latest version of Firmware installed on your hub. These updates will often contain new features, fixes for bugs and performance improvements

6. Software

Cambrionix provides interfaces by which the Hub can be monitored and managed:

- Cambrionix Connect
- Cambrionix Hub API
- Command Line Instructions

Cambrionix connect will use the Cambrionix Hub API to interact with the hub through a user-friendly application. The API can be used to provide other protocols that send translated string commands. The Hub uses string commands to communicate with the host system. These can be sent via the virtual serial port directly. If another piece of software is accessing the virtual serial port that the hubs is connected through the API will not be able to communicate with the hub.

There are different channels for both our Cambrionix Connect application and the API. The channels are Beta and Release. We would recommend using the release version of both the API and Cambrionix Connect.

We will push bug fixes and updates through Beta before it is merged into the Release version. If you have found a bug that we have a fix for, the Beta releases may already have addressed these and implemented fixes.

6.0.1 Installing Software

Cambrionix has software that can be used to manage the devices and your hub using different host systems. This section has instructions and information on using our software on three of the most popular host systems.

Our software is available to download from <https://www.cambrionix.com/software>, you will find software available for Windows™, Mac® and Linux® Systems.

Linux® OS systems tested with our software are Ubuntu 20.04 LTS or Debian 9; some other OS versions based on the two mentioned will work. Some different Linux® OS versions may work, but we dont test against other distributions.

To install on Mac® and Windows™ systems, download the install files from the above link, once downloaded run the install process and dialogue boxes will help you through installation and initial set-up.


For Linux® systems, download the Applmage file from the website at the above link. Once downloaded, you will need to make the file executable. This can be done by selecting the Applmage file, go to Properties > Permissions, and check the option to allow it to be executed as a program, or by making it executable via terminal `sudo chmod +x Connect(version-number).Applmage` once the file is executable run the Applmage by double-clicking it in your file manager or executing it from the terminal

6.0.2 Cambrionix Connect

Cambrionix Connect is an application that can be run from a browser by visiting <https://connect.cambrionix.com> or it can be downloaded from <https://www.cambrionix.com/connect>. Cambrionix Connect allows you to switch the ports on and off and set the port mode. Cambrionix Connect's home page shows the hubs available, by selecting a hub you can obtain the following information about all the ports:

- Status (Attached/disconnected)
- Mode (Charge/Sync/Off)
- Profile (Charging profile)
- Duration (How long the device has been attached)
- End time (Time the battery reaches a threshold (full) level)
- Current (Quick charge current in mA)
- Energy (Present energy rate)


Tick boxes adjacent to each port symbol allow that port mode to be changed when the "enable port controls" is selected. Cambrionix Connect shows the hub rail voltages, time since switched on, total current and power, and temperature. Further details on Cambrionix Connect are available on our website. <https://www.cambrionix.com/connect>

	CAUTION
	<p style="text-align: center; color: blue;">A new version may be available</p> <p>Ensure you have the latest version of Cambrionix Connect installed on your host system. These updates will often contain new features, fixes for bugs and performance improvements</p>

6.0.3 Cambrionix Hub API

The Cambrionix Hub API allows you to monitor and control each port in detail and to integrate these functions into your own workflow processes. The API comprises a daemon (which is a program running in the background) that can be downloaded from <https://www.cambrionix.com/cambrionix-api> and installed on the host machine. Port information and control can be provided through the API. Calls are sent as a request to the API to "Get" port, device or Hub information, or "Set" port functions. A library of sample code is downloaded along with the API from the following link <https://www.cambrionix.com/cambrionix-api> and can be found within the program files under

'examples'. These can help you integrate many of these functions into your process work-flow alongside the complete user manual.

	CAUTION
	<p>A new version may be available</p> <p>Ensure you have the latest version of API installed on your host system. These updates will often contain new features, fixes for bugs and performance improvements</p>

6.0.4 Updating Software

By using Cambrionix Connect you will be able to automatically download and install the most up to date software (Cambrionix Connect and the Cambrionix Hub API)

By going into the settings section on the left-hand side of Cambrionix Connect, you can navigate to the general tab, and under this can see the options for keeping both Cambrionix Connect and the API up to date.

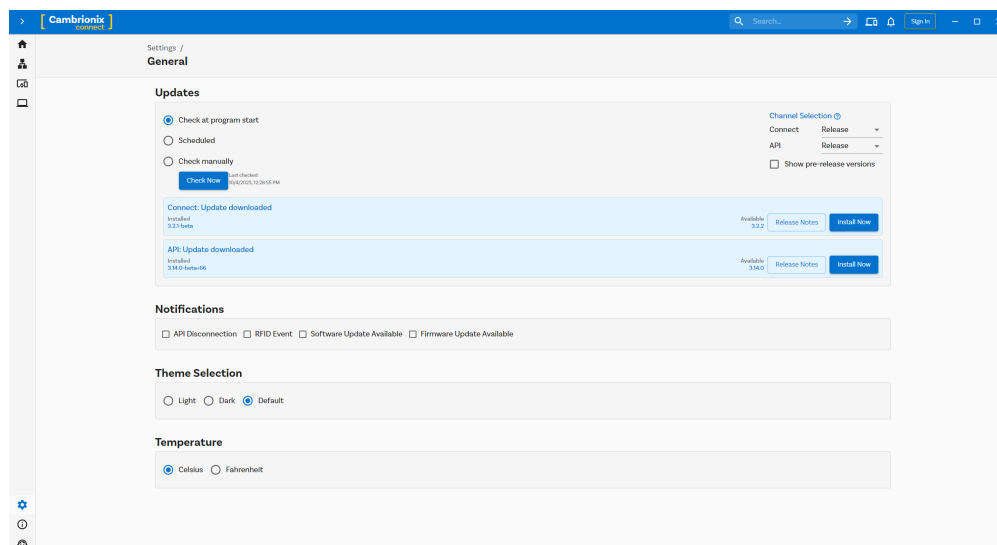


Figure 6.2

By default Cambrionix Connect will check for updates regularly or, if you prefer, you can change to a manual update selection. You can also select which version of the software you would like to use between the Beta or Release options. You can also select historic versions of the API and Cambrionix Connect to install.

When you have some software updates available, you can select install now to begin the installation process; a progress bar will appear to show the installation status. From this bar, you can also view the release notes for the version of the software you are looking at.

6.0.5 Removing Software

If you wish to uninstall the software (Cambrionix Connect, Cambrionix Hub API and the Cambrionix Recorder Service) from your host system, the following steps can do this.

Windows™

To remove the software from a Windows™ system, you can do so by going into "Add or remove programs" finding the software you wish to remove, selecting it and pressing "uninstall"

macOS®

To remove the software from a macOS® system, locate the application in the Finder, drag the application to the Trash, or select the application and choose File > Move to Trash. You may be asked to enter the name and password of an administrator account on your Mac®. Then to completely delete the application, choose Finder > Empty Trash.

Alternatively, use the below instructions.

```
sudo /Library/Cambrionix/ApiService/bin/CambrionixApiService --remove  
sudo /Library/Cambrionix/ApiService/bin/CambrionixRecorderService --remove
```

Linux®

To remove software on Linux® there are two options.

The first is to use the Software centre, then either the list of installed applications or the search bar to find the software you wish to remove. Once you have selected the application, click on the remove button and you will be prompted for a password, enter the password and the software will be removed.

The second way you can remove software is by using the command line. All you need to do is to use the command in the following fashion:

```
sudo apt remove program_name
```

Table 6-4

Variable	Description
<i>program_name</i>	The file name of the program including any version numbers

You'll be asked to enter your account password. When you enter it, nothing is visible on the screen. You will need to confirm removal, it will ask for your confirmation, press the enter key or Y key: Keep in mind that you'll have to use the exact package name in the apt remove command otherwise, it will show 'unable to locate package error'. You can type the first few letters of the program you want to uninstall, and then hit the tab key. It will show all the installed packages that match those letters at the beginning of their names.

6.0.6 Command Line Instructions (CLI)

Command Line Instructions can be used to control and monitor the functions of the hub and attached devices. To use the command-line interface a serial terminal emulator must be installed on the host computer. Examples include PuTTY, Serial, ZTerm, and Minicom. If you would like more information, please look at our more in-depth information here:

www.cambrionix.com/cambrionix-cli

Two example commands can be seen below, you can use these commands to check hub information and health.

Command	Action
system	Show hardware and firmware information
health	Show voltages, temperatures, errors and boot flag

Table 6-5

7. Product Specifications

7.1. Features

TS2-16Features	
19-inch Rack Mountable	no
Dedicated control port	no
Fan Assisted Cooling	yes
Selective upstream port	no
Internal Temperature Monitoring	yes
Indicator LED	no
User Replaceable Fuse	yes
Internal Battery	no

Table 7-1

USB Downstream Port Features	
Configurable enumeration delay	yes
USB BC 1.2 Support	yes
USB Type-C Rev 1.3 Support	no
USB Power Delivery 2.0 Support	no
USB Power Delivery 3.0 Support	no
Independent Hi-Speed Enable and Disable	no
Independent SuperSpeed Enable and Disable	no
Individual Enable and Disable	yes
Individual port voltage measurement, Vbus	no
Individual port current measurement, Vbus	yes
Individual CC voltage measurement, Vconn	no
Individual CC current measurement, Vconn	no
Link speed detection	no
Programmable port current limits	no
RGB Indicator LEDs	no
Individual Colour Indicator LEDs	yes

Table 7-2

7.2. Hub Specifications

TS2-16 Properties					
Colour	Nom	Black	Number of USB Upstream Ports	Nom	-
Control Port Connector Type	Nom	-	Number of USB Upstream Ports	Nom	-
Dimensions Depth (mm)	Nom	120	Number of USB2 Type-A Downstream Ports	Nom	16
Dimensions Height (mm)	Nom	85	Number of USB2 Type-A Expansion Ports	Nom	-
Dimensions Width (mm)	Nom	305	Number of USB2 Type-A Upstream Ports	Nom	-
Downstream Connector Type	Nom	Type-A	Number of USB2 Type-B Upstream Ports	Nom	-
Electrostatic Discharge, air (kV)	Max	-	Number of USB2 Type-C Downstream Ports	Nom	-
Electrostatic Discharge, Vesd (kV)	Max	-	Number of USB2 Type-C Expansion Ports	Nom	-
Enclosure Material	Nom	Plastic	Number of USB2 Type-C Upstream Ports	Nom	-

TS2-16 Properties					
Expansion Connector Type	Nom	-	Number of USB3 Type-A Downstream Ports	Nom	-
Form Factor	Nom	Desktop	Number of USB3 Type-A Expansion Ports	Nom	-
Fuse Type	Nom	-	Number of USB3 Type-A Upstream Ports	Nom	-
Host Connector Type	Nom	Thunderbolt™ 2	Number of USB3 Type-C Upstream Ports	Nom	-
Manufacturing Origin	Nom	UK	Output Power, Max (W)	Max	200
Mass (kg)	Nom	2.1	Part Number	Nom	-
Model Number	Nom	TS2-16	Power Efficiency at maximum load (%)	Min	-
Number of Thunderbolt 3 Expansion Ports	Nom	-		Nom	-
Number of Thunderbolt 3 Upstream Ports	Nom	-		Max	-
Number of USB Control Ports	Nom	-	Power Type	Nom	AC
Number of USB Downstream Ports	Nom	16	Product Name	Nom	ThunderSync2-16
Number of USB Expansion Ports	Nom	-	Vbus Source Power (W)	Max	200

Table 7-3

TS2-16 Environmental Properties		
Ambient Operating Temperature (°C)	Min	0
	Max	35
Relative Humidity Range (%)	Min	20
	Max	80
Storage Relative Humidity Range (%)	Min	5
	Max	95
Storage Temperature (°C)	Min	-20
	Max	60
Operating Altitude Max (m)	Max	2000

Table 7-4

Fan Properties		
Airflow (m3/hr)	Min	-
	Nom	-
	Max	-
Acoustic Noise (dB A)	Min	-
	Nom	-
	Max	-
Start Temperature (°C)	Nom	35
50% Speed Start Temperature (°C)	Nom	-
Max Airflow Temperature (°C)	Nom	-
Drop to 50% Speed Temperature (°C)	Nom	-
Drop to Minimum Fan Speed Temperature (°C)	Nom	-
Stop Temperature (°C)	Nom	35
Minimum Fan Speed (%)	Nom	-
Fan Diameter (mm)	Nom	-

TS2-16 Environmental Properties

Fan Properties

Table 7-5

Boxed Properties		
Dimensions, Depth (cm)	Nom	-
Dimensions, Height (cm)	Nom	-
Dimensions, Width (cm)	Nom	-
Mass (kg)	Nom	-

Table 7-6

7.3. Power Specifications

TS2-16 Power Input Properties		
Connector Type	Nom	C13
Voltage, Vsupply (V)	Min	-
	Nom	-
	Max	-
	Max	-
Voltage Measurement Rate (Hz)	Nom	-
Voltage Measurement Accuracy, Vsupply (%FSR)	Nom	-
Power, Psupply (W)	Min	-
	Max	-
Power, no devices attached (W)	Min	-
	Nom	-
	Max	-

Table 7-7

AC Power Input Properties		
Operating Current @ 115VAC (A)	Min	-
	Max	3.5
Operating Current @ 230VAC (A)	Min	-
	Max	-
Operating Voltage, Vsupply (VAC)	Min	100
	Max	250
Under Voltage Threshold (VAC)	Min	-
	Nom	-
	Max	-
Over Voltage Threshold (VAC)	Min	-
	Nom	-
	Max	-
Voltage Measurement Resolution, Vsupply (mVAC)	Nom	-
Frequency Range (Hz)	Min	-
	Max	-

Table 7-8

7.4. Port Specifications

USB Downstream Port Properties					
Short Circuit Detection Time (ms)	Max	-		Vbus Output Current, ALT CDP Mode (A)	Max 2.4
Short Circuit Response Time (µs)	Max	-		Vbus Output Current, CDP Mode (A)	Max 1.5
USB D Logic Low Voltage (V)	Min	0		Vbus Output Current, DCP Mode (A)	Max 2.4
	Max	0.3		Vbus Output Current, SDP Mode (A)	Max 0.5
USB D Logic High Voltage (V)	Min	2.8		Vbus Output Power (W)	Max 12
	Max	3.6		Vbus Output Voltage (V)	Min 4.8
USB Hi-Speed Data Rate (Mbps)	Nom	480			Nom 5
USB SuperSpeed Data Rate (Gbps)	Nom	5			Max 5.2
Vbus Current Measurement Accuracy (%FSR)	Min	-		Vbus Source Power (W)	Max -
	Max	-		Vbus Voltage Measurement Accuracy (%FSR)	Min -
Vbus Current Measurement Range (A)	Min	-			Max -
	Max	-		Vbus Voltage Measurement Range (V)	Min -
Vbus Current Measurement Rate (Hz)	Nom	-			Max -
Vbus Current Measurement Resolution (mA)	Nom	-		Vbus Voltage Measurement Rate (Hz)	Nom -
Vbus Current Setpoint Resolution (mA)	Nom	-		Vbus Voltage Measurement Resolution (mV)	Nom -
Vbus Output Current (A)	No	2.4		Vbus Voltage Ripple (mV)	Max -
				Vbus Voltage Setpoint Resolution (mV)	Nom -

Table 7-9

Table 7-10

Upstream Port Properties		
Vbus Input Current (mA)	Min	-
	Nom	-
	Max	-
Vbus Input Power (W)	Min	-
	Nom	-
	Max	-
Vbus Input Voltage (V)	Min	-
	Nom	-
	Max	-
Connection speed (Gbps)	Nom	20

Table 7-11

Ports Lifetime

Standard USB connections have a minimum rated lifetime of 1,500 cycles of insertion and removal. USB-C receptacles have a minimum rated lifetime of 10,000 cycles of insertion and removal. This is an industry-standard.

One thing you can do to prolong the lifetime of the ports on your ThunderSync2-16 is to use "sacrificial cables" in between the hub and your charging cables so when you repeatedly connect/ disconnect you are only going to wear the cables rather than the hub.

7.5. Drawings

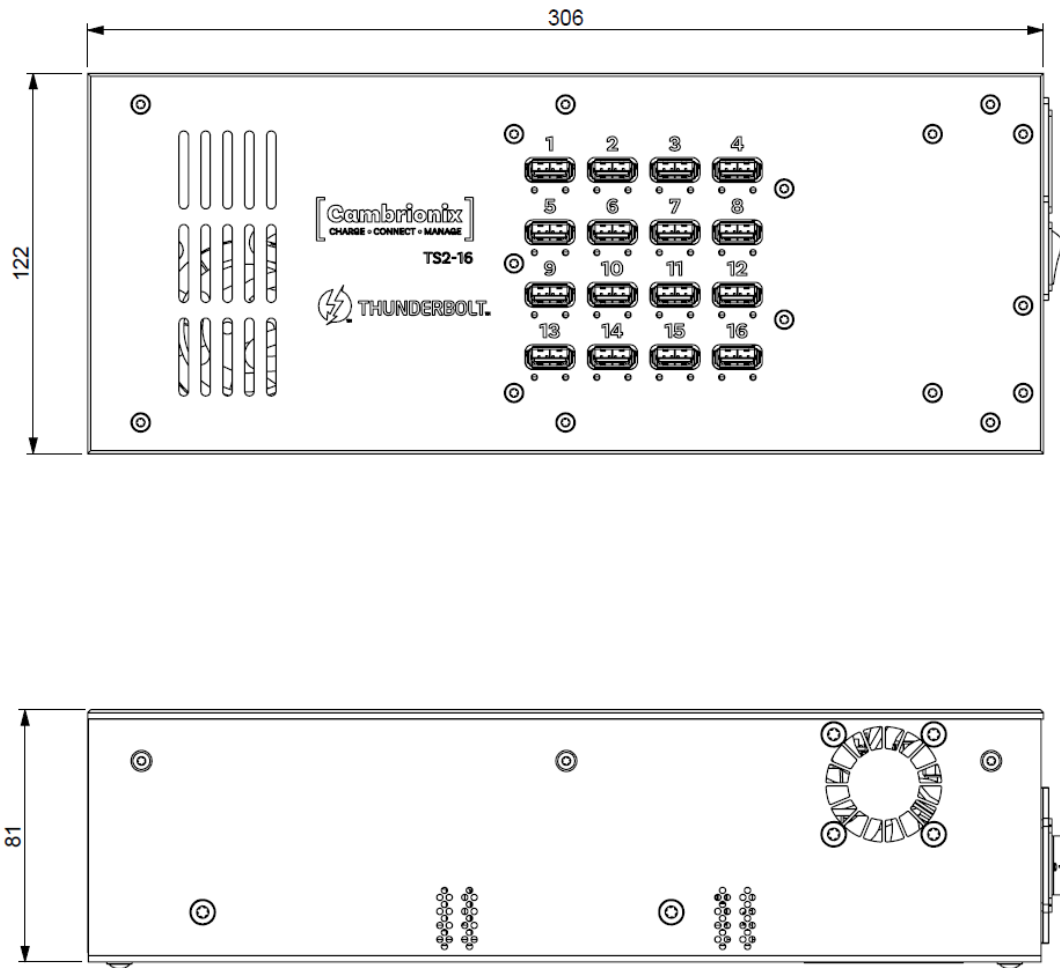


Figure 7.1

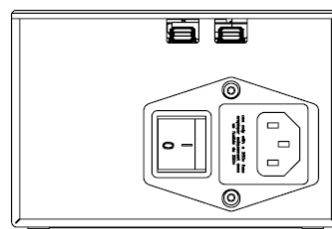


Figure 7.2

8. Troubleshooting

If you experience any issues with your ThunderSync2-16 ; please try the following troubleshooting steps, if the issue is not addressed in this section, please get in touch with your local vendor or Cambrionix. To contact Cambrionix Support please see [Help and Support](#).

8.1. Common troubleshooting tips

Some tips and information to check first.

- If you directly connect the same device to the port the hub is in, does it appear to the OS.
- If you plug a device (phone, USB stick) into the hub, does it appear to the OS (device manager/ system info etc.).
- Try switching the cables with ones that are working/ use cable from a hub that is working.

8.2. Logging through Cambrionix Connect

If you are experiencing a bug or an issue, we may ask you to obtain some logs of the behaviour, to see in more detail what is happening. To get logs of the behaviour use the following steps to get a zip file of the logs.

1. Open Cambrionix Connect (if this is not already downloaded, then go onto our website and download both the API and Cambrionix Connect)
<https://www.cambrionix.com/software>
2. Once inside, select the Computers tab.
3. Select localhost or the name of the local computer you are obtaining logs from
4. Then, click on the “Hub API”
5. From here, you should see a section titled 'API Logging Sections'. Expand the 'Advanced logging settings' downwards.
6. Click the “select all” tick box and then the save button.
7. After this is enabled, use the hub in a way that causes the issue you are seeing.
8. Wait for the issue to occur
9. Note the time and date that the issue occurs. Then, go back to the API page in Cambrionix Connect and press the zip logs.

10. Once you have the logs un-tick the “select all” box and save your settings.

11. Send the logs to us for us to take a look at

The API keeps a maximum of 20 logs at 256 Mb each, so the latest one is usually smaller. If a crash occurs, you would see a smaller log file and the next instance of API shuffles the existing ones

Default locations

Log messages generated by the CambrionixApiService go to syslog.

Using Windows the logs will default to the below location

```
C:\ProgramData\Cambrionix
```

Using macOS the logs will default to the below location

```
Library>Logs>Cambrionix
```

Using Linux the logs will default to the below location

```
/var/log/cambrionix
```

8.3. Hardware Failure

If the Hardware fails, the LEDs can flash in a pattern to determine the type of failure. If no LEDs are on the downstream ports, this will be the red power LED flashing in a pattern.

The unit will blink(B) four times, followed by eight long(L) or short(S) flashes, which then repeat. The flashes are a number in binary which match a number in our error code list.

i.e if the LED flashes the following - BBBB SLSSSLSS, the binary number is 01000100.

8.4. Device connection

If you are seeing any device connection issues please read through the following trouble shooting steps to see if this resolves the observed behaviour.

Device Detection

Lightning cables have the capacity to draw a small amount of current, even when no device is connected to them. This behaviour can cause a USB hub to interpret the cable as a device with

a low power draw, resulting in the hub's LEDs turning on. Additionally, in the case of a Cambrionix Connect system, this may lead to the appearance of an "unknown device" in the interface.

This current draw is a characteristic of lightning cables, as they negotiate power automatically upon connection, regardless of whether a device is attached or not. Consequently, the hub may mistakenly identify the cable itself as an active device, despite the absence of any connected peripherals.

Device issues when updating

We have found that during updates on some devices the connection can be dropped or lost on the device, this is due to devices going in and out of the bootloader and requiring different power levels. In most instances disabling CDP has resolved this issue for our customers.

You can disable CDP through Internal hub settings either by going through the advanced settings and turning "Sync charge" off or through the API and disabling it via code. For example, the instructions would be below using the command line.

```
settings_unlock  
settings_set sync_chrg 0000000000000000
```

Unstable device connection

Some devices can have unstable connections with your host system through USB hubs. We have only observed this behaviour in a very few amount of devices, disabling CDP and setting the ports to always be on has resolved all issues and the connections are stable.

You can disable CDP through Internal hub settings either by going through the advanced settings and turning "Sync charge" off or through the API and disabling it via code. For example, using the command line, the instructions would be as below.

```
settings_unlock  
settings_set sync_chrg 0000000000000000
```

You can set the ports to always be on through Internal hub settings through the advanced settings and turning "Ports On" settings to always on for each port. When you set the port to always be on you will need to set a default profile on each port for when the port(s). There is a description for each profile within Cambrionix connect.

Battery information for Android

If you are observing an issue displaying battery information on Android devices ensure firstly you have ADB tool installed and open then try these things in order.

1. Check that developer options are enabled on the android device, and then that USB debugging is also enabled.
2. If you have done this step and it still does not work, go to Developer Options and click 'Revoke USB debugging authorisations'. Unplug the cable and reconnect.
3. If this still doesn't work, turn off the developer options at the top, re-enable it, and re-enable 'USB Debugging'.
4. You can get detailed info directly from ADB at each step to diagnose things:

```
adb.exe shell dumpsys battery # Use -s SERIAL_NUMBER as first options  
if you have more than 1 Android attached
```

Unknown devices

Sometimes, within Cambrionix Connect and device manager, the connected device may show up as an unknown device.

This can be due to the host system needing to be trusted on the device. This can be done on the device itself on the initial connection.

This could also be due to an insufficient number of endpoints available on the USB controller in the host system. This limitation within the USB controller can only be resolved if you connect fewer USB devices to the controller in question.

For Apple devices there is a setting called "USB accessories" which can be activated, Once activated it will reduce the amount of times a device will need to be unlocked/ trusted. More information can be found at the link <https://support.apple.com/en-gb/HT208857>.

Cannot connect any more devices

Sometimes, you may reach the endpoint limit of your USB controller and this may stop you from being able to attach any more devices to your host system.

You can create more space is to change connections from USB3 to USB2. You can change the connection by disabling USB3 in the BIOS on startup.

A much simpler way is to use USB2 cables instead of USB3 cables, limiting the connection to USB2.

Port overcurrent behaviour

When a port encounters an overcurrent event, the port is shut down and an error flag (e) is applied to the port, the port stays disabled until the device is removed or the port state is reset (turned to off mode then back to charge) if the short isn't removed the port will shut down again

The error flag for the port can be seen in the state command see the example below where port 4 had overcurrent applied.

```
>>state
1, 0000, D I, 0, 0, x, 0.00
2, 0000, D I, 0, 0, x, 0.00
3, 0000, D I, 0, 0, x, 0.00
4, 0000, e D I, 0, 0, x, 0.00
5, 0927, A C, 1, 15, x, 0.00
6, 0000, D I, 0, 0, x, 0.00
7, 0000, D I, 0, 0, x, 0.00
8, 0048, A P, 2, 2, x, 0.01
```

8.5. Hub connection issues

If you there are issues with the hub and connecting to your host system, please see below troubleshooting solutions.

Hub not connecting to host

If you see that the ThunderSync2-16 is not connecting to the host system, one of the issues may be caused by the USB drivers on your host system not being up to date. It is good practice to ensure you have the latest drivers and updates installed on your host system, which is usually handled by the OS, but sometimes may require an update directly from the USB host controllers manufacturer, which will be found on their website.

USB drivers required are FTDI drivers, which can be found on the site <https://ftdichip.com/drivers/>.

Cannot access the COM port

You may get an error message stating "COM (and then a number) could not be opened (Access is denied)".

This is because an application has control over the COM port that the hub is connected to, and no subsequent application can access the hub. To resolve this, you will need to close any other applications that are using the COM port before trying to use the COM port.

8.6. Using with a headless system

If you are using a headless system with no GUI, then and you require to enable logging for support issues, you can use the following command to create the logging cfg file manually:

```
echo*=DEBUG>/etc/opt/cambrionix/cambrionix.log.cfg
```

Then after re-producing the problem, you can zip the logs from the folder

```
/var/log/cambrionix
```

You may delete the file below when you are finished with it.

```
/etc/opt/cambrionix/cambrionix.log.cfg
```

8.7. Software troubleshooting

Some users have noted that the API can cause a high level of CPU usage. This can sometimes be linked to the API recorder service. If you are finding this and you are not using it then we would recommend to uninstall it from your system entirely. Information on how to uninstall programs can be found in the [Removing Software](#) section.

Firmware Update

If you have older hardware with Firmware version number lower than 1.83 then the hub may not be compatible with the Cambrionix Hub API and will need to be updated to the latest version of Firmware using the Command Line Updater which can be downloaded and installed from the following link.

<https://www.cambrionix.com/cambrionix-clu>

9. Returns and Damaged Products

If you wish to return or fix a damaged product first look at the terms on our website

www.cambrionix.com/terms-conditions

Before a product is returned please contact support using the methods detailed in the [Help and Support](#) section.

9.1. What if my order arrives with an issue?

- If you have received your order in a damaged box and/or the product has physical damage please contact Cambrionix Customer Support or your distribution partner. Please provide photos of the damaged box and/or product when contacting Customer support.
- If an item in your order does not have physical damage but is not functioning properly or will not power on, please contact Customer Support or your distribution partner and provide as much information as possible and including any steps followed to troubleshoot internally.
- Please include photos of the damaged box and product when contacting Customer Support.

Note: If you have received your order in a damaged box and the damage was indicated to the courier, please provide us with a copy of the delivery note detailing this.


9.2. What happens after I have requested a Return?

- If you have not purchased the Product(s) direct from Cambrionix please contact the vendor the item was originally purchased from for their returns process.
- Once you have notified Cambrionix of your return, Cambrionix will arrange for the collection of the product(s), or provide instructions and details for you to return the product direct.
- When returning your product(s), please only send back the items that were advised through the support process.
- Return your product(s) in the original packaging where you can. Where original packaging is not available, use suitable packing methods, which will ensure that the product cannot be subject to impact damage. i.e. double-walled cardboard box with 50mm of soft material.
- Product(s) not returned in their original condition may result in additional costs, please refer to the warranty and terms section on our [website](#).

- Where Cambrionix arranges collection, return shipping will be free, unless Cambrionix notified you otherwise.
- When contacting us about returning a product please provide the following information.
 - Collection Address
 - Weights and Dimensions WxDxH (m) of shipment
 - Preferred collection date and time.
 - Product serial number(s) (this can be found on a label on the rear or underside of the unit)
 - Purchase order number(s)

9.3. Waste Electrical and Electronic Equipment (WEEE)

Disposal of Old Electrical & Electrical Equipment (Applicable in the European Union and other European countries with separate collection systems)

	<p>This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on the waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 12, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.</p>
--	--

Cambrionix PRN (Producer Registration Number) For the UK is "WEE/BH191TT".

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- Source Code: The source code of our software is proprietary and cannot be provided.
- Proprietary Methods: Detailed descriptions and implementations of our proprietary methods are also protected.

As such, requests for access to the source code or other protected information will be respectfully declined. We appreciate your understanding and cooperation.

Cambrionix Patents

Title	Link	Application Number	Grant Number
Syncing and Charging Port	GB2489429	1105081.2	2489429
CAMBRIONIX	UK00002646615	2646615	00002646615
CAMBRIONIX VERY INTELLIGENT...	UK00002646617	2646617	00002646617

Terms and Conditions

The use of Cambrionix hubs is subject to the Cambrionix Terms and Conditions, the document can be downloaded and viewed using the following link.

<https://downloads.cambrionix.com/documentation/en/Cambrionix-Terms-and-Conditions.pdf>

Cambrionix Limited
The Maurice Wilkes Building
Cowley Road
Cambridge CB4 0DS
United Kingdom

+44 (0) 1223 755520
<https://www.cambrionix.com>

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with the company number 06210854