



ThunderSync3-16

USER GUIDE

[Charge] [Connect] [Manage]

Contents

1	ThunderSync3-16 at a glance	4
2	Getting Started	5
2.1	Registration	5
2.2	Connecting to the mains	5
3	Charging without connecting to a host computer	5
4	Using when connected to a host computer	5
4.1	Charging	5
4.2	Data Transfer	5
4.3	Scalability – Syncing more than 16 devices	6
5	Manage Ports & Devices using Cambrionix Software	7
5.1	LiveViewer	7
5.2	Command Line Instructions (CLI)	8
5.3	Cambrionix API	9
6	Advanced Usage	9
6.1	Updating the TS3-16 firmware	9
6.1.1	Update procedure for MacOS	9
6.1.2	Update procedure for Windows	9
6.1.3	Running Updater Instructions	9
7	Specifications	10
8	Certifications	10
9	Safety Guidelines and Precautions	11

1 ThunderSync3-16 at a glance



16
PORTS

40 Gbps
Thunderbolt™ 3
to USB 3

12
Watts (2.4A)
per port

SW Control
&
Monitoring

The ThunderSync3-16 (TS3-16) has been designed to provide high-speed data transfer to USB3-compliant devices without being constrained by endpoint limits.

Using an upstream Thunderbolt™ 3 interface, the TS3-16 is designed to provide up to 5 Gbps output on all 16 ports. By virtue of its Thunderbolt™ interface, the TS3-16 is able to avoid the endpoint limit usually observed when attempting to enumerate more than 15 USB3.2 devices, up to 96 devices to be charged and synced from a single computer, without hitting the endpoint limit.

TS3-16 provides 12 Watts of charging power to each of its 16 ports, allowing mobile devices to be charged safely and reliably at the manufacturer's recommended optimal rate (up to 2.4A per port). The two Thunderbolt™ 3 rear ports provide 15 Watts each.

When a local (host) computer is attached the host can control the operation of each individual port using software provided by Cambionix.

Device charging and synchronisation can be monitored through Cambionix's LiveViewer App, the Application Programming Interface (API) or Command Line Interface (CLI). Cambionix's free monitoring and control software can be downloaded from (<https://cambionix.com>). The TS3-16 firmware can also be updated to allow new charging profiles to be added, ensuring the TS3-16 can charge the latest devices. Further information on our software is provided below.

What's included

These items are required to use your TS3-16 and are included in the box:

- The TS3-16 unit (see Figure 1 below)
- Rack-mount fitting kit
- A mains cable appropriate for the country of use

Optional accessories available to purchase separately:

- 0.5m or 2.0m Thunderbolt™ 3 cables
- Feet for desktop use

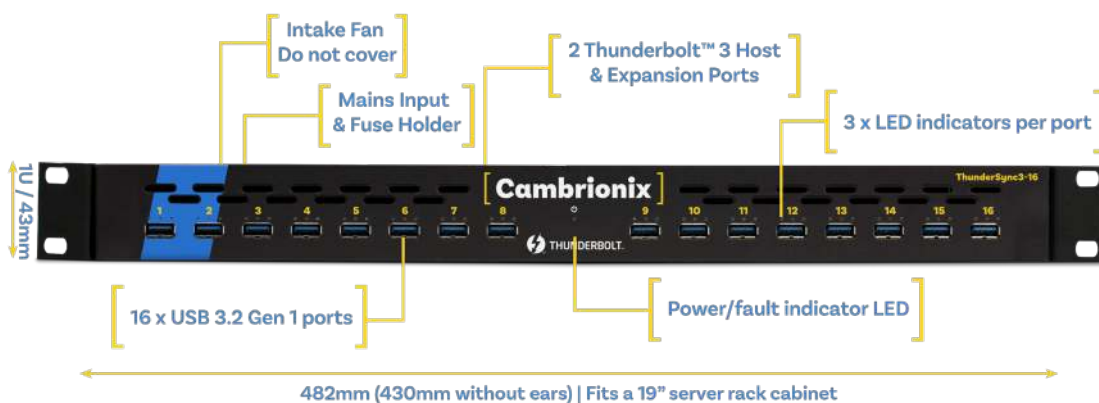


Figure 1
TS3-16 connections

2 Getting Started

2.1 Registration

You may register you and your product at <https://cambrionix.com> to download LiveViewer, our API and firmware updates. TS3-16 FAQs and support can be found on the Support page after logging in.

2.2 Connecting to the mains

Making sure you adhere to local safety regulations, connect the mains cable to the mains power supply and switch the mains supply on. The TS3-16 is now ready to charge attached devices.

3 Charging without connecting to a host computer

When the TS3-16 is switched on (and not connected to a local host computer) it is automatically configured to charge devices using its intelligent charging algorithm. Simply connect the devices to any of the available 16 ports using USB2.0 or USB3.2 compliant cables.

Once the devices are connected, the algorithm will detect the highest charge rate allowable for each attached device.

During profiling the LEDs will flash red. Charging at the optimum rate specified by the manufacturer (up to 2.4 Amps) 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 of time, the green LEDs will be illuminated.

4 Using when connected to a host computer

4.1 Charging

When one of the Thunderbolt™ ports is connected to a Thunderbolt™ 2 or Thunderbolt™ 3 compliant port of a local computer, the TS3-16 defaults to Sync mode and charge currents are determined according to USB Implementers Forum (USB-IF) SuperSpeed USB3.2 Gen 1 specifications. If the attached device complies with USB-IF Battery Charging specification BC1.2 and supports Charging Downstream Port (CDP), the TS3-16 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 500mA in compliance with USB specifications.

4.2 Data Transfer

If you wish to transfer data, install applications, restore or update attached mobile devices, a data connection to a local host computer is required. The TS3-16 works independently to the Operating System (OS) and data transfer can be performed on all common operating systems, such as iOS, Android, Chromebook and Microsoft. Many versions of Linux are also supported.

In order to transfer data, connect the Thunderbolt™ port of your local (host) computer to one of the Thunderbolt™ ports on the back of the TS3-16 using a Thunderbolt™ 3 compliant cable. A Thunderbolt™ 2 cable can also be used with consequently reduced data speeds. Any devices connected to the TS3-16 will now appear as if they were connected to the host computer's USB port. The TS3-16 is fully compliant with SuperSpeed USB3.2 Gen 1 and can provide up to 5Gbps data transfer speeds per port. A yellow LED above each port will illuminate when Syncing.

You can use the program of your choice to transfer data to and from your device. If the attached device has a BC1.2 compliant CDP port, the device can draw up to 1.5A while transferring data.

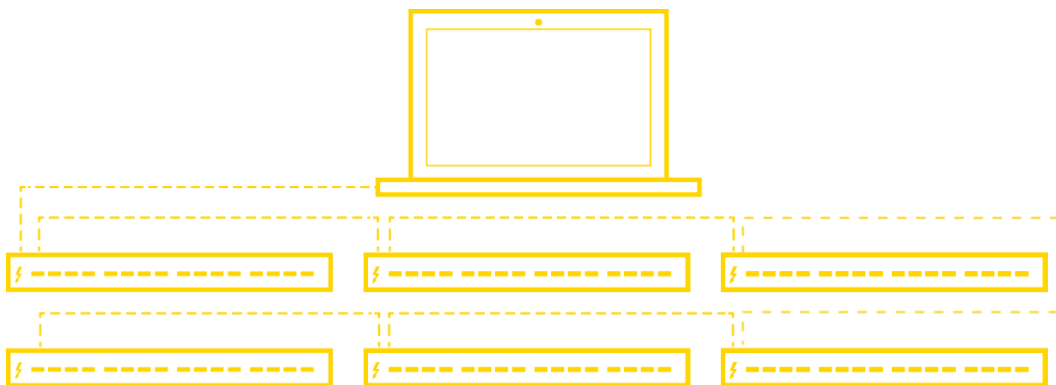
4.3 Scalability – Syncing more than 16 devices

USB3 hubs generally suffer from an endpoint limit, which limits the number of devices that can be enumerated when connected to the USB3 port of a local computer. USB3 port xHCI host controllers in most computers limit the number of endpoints that can be enumerated to between 64 and 128. Mobile devices enumerate as more than one endpoint, and complex devices with touch panels often enumerate as 5 or 6 endpoints. Consequently, the number of devices that can be successfully enumerated is typically limited to less than twenty.



By using Thunderbolt™ connectivity and incorporating host controllers inside the ThunderSync3-16 the endpoint limit is overcome, and if you wish to synchronise more than 16 devices, multiple TS3-16 can be daisy-chained to allow up to 96 devices to be managed from a single host computer simultaneously.

In order to daisy-chain multiple TS3-16, each TS3-16 needs to be connected to mains power individually and the first TS3-16 in the chain should be connected to the local computer through one of the Thunderbolt™ ports. The next TS3-16 in the daisy-chain is then connected using one of its Thunderbolt™ ports to the remaining Thunderbolt™ port of the first TS3-16. A third, fourth and fifth TS3-16 can be added in the same way, connecting the available Thunderbolt™ port of the previous TS3-16 to one of the Thunderbolt™ ports of the next device in the daisy-chain. Using this approach, a maximum of six TS3-16s can be linked together, allowing a total of 96 devices to be synced from a single host computer.



5 Manage Ports & Devices using Cambrionix Software

More productivity, saving you time.

Cambrionix provides three interfaces by which the TS3-16 can be monitored and managed:

- [LiveViewer](#)
- [Cambrionix API](#)
- [Command Line Instructions](#)

5.1 LiveViewer

LiveViewer is an app that can be downloaded from <https://cambrionix.com>. Once downloaded and installed on the host computer, LiveViewer allows you to switch the ports on and off, set the port to charge only, or to sync mode.

LiveViewer's home page shows 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 \(instantaneous charge current in mA\)](#)
- [Energy \(present energy rate in Wh\)](#)

Tick boxes adjacent to each port symbol allow that port mode to be changed. When the port is in Sync mode, only instantaneous current can be monitored through LiveViewer. When the port is in Charge mode, the charge profile, instantaneous current, energy rate, duration of charge and end time are displayed.

In addition to individual port information and control, LiveViewer displays the TS3-16 rail voltages, time since switched on, total instantaneous current and power, and temperature.

Full instructions on LiveViewer are available on our website.

5.2 Command Line Instructions (CLI)

Command Line Instructions can also be used to control and monitor the functions of the TS3-16 and attached devices over a VCP (Virtual COM Port). In order to use the command line interface a serial terminal emulator must be installed on the host computer.

Examples include Serial, ZTerm, PuTTY, and Minicom. Once you have installed your preferred terminal emulator, please connect to the TS3-16 COM port using 115,200 baud, 8 data bits, No Parity, 1 Stop Bit. Once you get a command prompt (>>), type “help” for a list of commands and their usage, as shown below:

Command	Action
mode <m> [p]	Set mode <m> for port [p] or all ports
mode c <p> [cp]	Set charge mode for a port <p> with optional profile [cp] to enter immediately
state [p]	Show state for port [p] or all ports
system	Show hardware and firmware information
health	Show voltages, temperature, errors and boot flag
cef	Clear error flags
sef [flags]...	Set error flags
crf	Clear rebooted flag
limits	Show voltage and temperature limits
list_profiles	List all profiles on system
en_profile <i> <l 0>	Enable (1) or disable (0) profile <i>
set_profiles <p> [l]	Set profiles <l> associated with port <p>
get_profiles <p>	List profiles associated with port <p>
sec [arm disarm]	Set or reveal security mode
host [auto manual]	Show if USB host is present, and set mode change
id	Show id string
bd	Board description
logc <s>	Report mA for each port every <s> seconds
loge [s]	Report state for all ports every [s] seconds and events as they occur
l	Live view (periodically updated screen showing system state)
remote [exit kexit]	Enter or exit mode where console is controlled by terminal
ledb <p> <row> <ptn>	Set individual LED on row <row>, port <p> to flash bit pattern <ptn>
leds <row> [ptnstr]	Set flash pattern of a string of LEDs on row <row> to string <ptnstr>
keys	Read key click event flags
lcd <row> <col> <str>	Write string <s> to LCD at row <row>, column <col>
clcd	Clear LCD
beep [ms]	Make console beep for [ms] milliseconds
cls	Clear terminal screen
reboot [watchdog]	Reboot (optionally by using watchdog timeout)
serial_speed [test fast slow]	Change serial interface speed
set_delays	Change internal delays
host [auto/manual/charge/sync/off]	Show if USB host is present, and set mode change

NOTES:	
[p] is port number.	Range 1...16. Omit for 'all'
<m> is port mode:	c=Charge, s=Sync, o=Off, b=Biassed
<l> is a list of profile IDs.	Blank to use all profiles.
<i> is a single profile ID.	
Parameters:	Optional parameters are shown in []. Compulsory in < >.
Tab key	Re-runs previous command.
Cursor up	recalls last command.

Typing “l” will give equivalent information to LiveViewer (to quit type “q”) and, using the command “logc X”, will output the data to the console every “X” seconds.

To cancel the control log at any time, please type “ctrl-c”.

For further advice on using CLI to control your TS3-16, please contact support@cambrionix.com.

5.3 Cambionix API

Cambionix API allows you to monitor and control each port in more detail and to integrate these functions into your own workflow processes. The API comprises a daemon that can be downloaded from <https://cambrionix.com> and installed on the host machine. Port information and control can be provided through the API using JavaScript

Object Notation (JSON) Remote Procedure Calls (RPC) over TCP. JSON-RPC calls send a request to the API to “Get” port, device or TS3-16 information, or “Set” port functions (such as mode).

A library of sample Python code can be obtained from <https://cambrionix.com> to help you integrate many of these functions into your process workflow alongside the full User Guide.

6 Advanced Usage

6.1 Updating the TS3-16 firmware

From time to time Cambionix updates the TS3-16 firmware to ensure the device incorporates the latest features. In order to update the firmware on your TS3-16, please download the Cambionix Updater and latest firmware file version appropriate for your host computer Operating System from <https://cambrionix.com>. Please follow these instructions to ensure your TS3-16 has the latest version of the firmware installed.

6.1.1 Update procedure for MacOS

Locate and double-click the Cambionix Updater file (which has a .dmg file extension) downloaded from <https://cambrionix.com>. Then follow the instructions in 6.1.3 below:

6.1.2 Update procedure for Windows

Locate the Cambionix Updater application file (which has a .zip file extension) downloaded from <https://cambrionix.com>. Right-click the .zip file and choose ‘Open with ‘Windows Explorer’ to show the contents of the compressed file. Double-click the .exe file within the compressed file to run the application and follow the below instructions:

6.1.3 Running Updater Instructions

MacOS: Double-click the Cambionix Updater file and drag into your applications folder.

Windows: Double-click the Cambionix Updater.

This will open the Cambionix Updater window.

Click ‘Scan’ to list the Cambionix products connected to your computer.

Click ‘File...’ to open a Finder/Explore window to allow you to navigate to and select the firmware file (which has a .enfir extension) previously downloaded.

The Cambionix Updater window will now show one or more Cambionix products as well as the firmware file selected to update the product(s). Please ensure each Update box is ticked for all products requiring updates.

Press “Go” once all the products to update have been selected.

Please Note: The “Reboot” checkbox should remain checked. This will reboot the Cambionix product once the programming is successful.

7 Specifications

TS3-16

Input Voltage:	100 ~ 250 Vac
Input Current:	3.5A @ 115 VacA
Input Frequency:	47 ~ 63 Hz
Input Connection:	C14
Output Voltage:	5.2V
Output Current:	2.4A Max per Port
Output Power:	12W Max per Port
Output Power (Total):	230W Maximum

Input/Output Connectors: 16 x USB3.2 Gen 1 Type-A,
2 x Thunderbolt™ 3

Ambient Operating Temperature Range: 10 ~ 35°C

Relative humidity: 5% to 95% non-condensing

Dimensions (approx.): 482 long x 270 wide x 42 high mm

Approximate weight: 3.7kg

8 Certifications

- Independently safety tested by the Underwriters Laboratory (UL) under file #E346549
- CE Tested and marked
- CB Certificate
- FCC Part 15 Tested and marked
- RoHS Compliant
- China CCC certification
- Japanese PSE certification (pending)
- Complies with the latest EN60950 safety requirements for ITE
- Housed within a UL94-V0 specification fire enclosure

Thunderbolt and the Thunderbolt logo are trademarks of Intel Corporation in the U.S and/or other countries.

9 Safety Guidelines and Precautions

Please read and understand these guidelines prior to installation or use.
Important Electrical and Safety Messages

The TS3-16 has ESD, over-voltage, over-current and over-temperature protection. However, to use the equipment safely you should follow all local regulations relating to the use of electrical equipment and note that:

- Failure to install and operate the equipment in accordance with all local and these safety guidelines may result in unit failure, electrical shock and personal injury.
- The plug on the power cord is considered the “disconnect device” and consequently the mains outlet should be located near the TS3-16, easily accessible in case the power supply needs to be isolated from the mains power.
- If there is a liquid spillage over a ventilation slot, external data/power connector or product aperture, remove power from the unit without contacting the liquid immediately.

Safety warning	Potential consequence if ignored
Do not modify the product in any way.	Fire, electric shock or personal injury may occur.
Do not dismantle the product.	Fire, electric shock or personal injury may occur.
Do not bend, compress or drill into any part of the product.	Damage, electric shock or personal injury may occur.
Parts of Cambrionix products may become hot during operation. Do not obstruct air vents on the product or operate the product in an environment where the ambient temperature is outside the recommended operating temperature region.	An increased internal temperature may cause a fire.
Cambrionix products are not reverse-polarity protected. The power connections MUST be connected correctly. If in doubt, please contact Cambrionix.	Damage to your Cambrionix product may occur. A fire or electric shock may result.
Do not short circuit the Power Supply Unit (PSU) supplied with your Cambrionix product.	Sparks, fire or electric shock may result.
Ensure dust does not collect around the power plug pins or power socket, or in or around the air vents to the extent it causes a reduction in air circulation.	A fire may result if there is combustible material within the power socket or around the power plug, or if the internal temperature increases due to lack of air circulation.
Do not allow liquids to come into contact with the unit or power supply.	Fire, electric shock or personal injury may occur.
Keep the mains power socket (where the power cord is connected) unobstructed.	The power cord must be disconnected to cut off power to the product when an issue occurs. Note that the product may not be completely powered down by only using the power switch on the product.
Do not use a damaged power cord or plug, or a loose power socket.	An electric shock or fire may result.
Do not power multiple products from a single power socket.	Overheated power sockets may cause a fire.
Do not touch the power plug with wet hands.	An electric shock may result.
Insert the power plug all the way into the socket so that it is not loose.	An unsecured connection may cause a fire.
Connect the power plug to an earthed socket.	Failure to connect use an earthed socket may result in an electric shock or injury.
Do not bend or pull the power cord with force. Be careful not to leave the power cord underneath a heavy object.	Damage to the power cord may result in fire or electric shock.
Do not place the power cord near heat sources.	A fire or electric shock may result.
Only use the power cord provided (if applicable).	A fire or electric shock may result.
Only use the power supply provided with the product (if applicable).	A fire or electric shock may result.
Do not disconnect the power cord while the product is being used.	The product may become damaged by electric shock.
Cambrionix OEM modules are susceptible to Electrostatic Discharge (ESD). OEM modules should be handled in an ESD safe area.	Damage to your Cambrionix OEM module may occur.
There are sharp edges, corners and components. Suitable protective equipment must be worn during handling of Cambrionix OEM modules.	Personal injury may occur.
No power supply is shipped with a Cambrionix OEM module. Please contact your power supply manufacturer directly for safety related information.	Fire, electric shock or personal injury may occur. Please see the installation instructions for your Cambrionix product for correct wiring requirements.
When mounting a Cambrionix OEM module, all mounting holes should be used with appropriate spacers, screws and a torque level of 1.1Nm.	Damage or personal injury may occur.



This product can expose you to chemicals, including Nickel, which is known to the State of California to cause cancer or birth defects or other reproductive harm. For more information, go to www.p65Warnings.ca.gov

If in any doubt about how to correctly operate or maintain your Cambrionix system product or OEM module, or if any part of this safety document is unclear or confusing, please do not use your product and contact Cambrionix before proceeding further.



Cambrionix Ltd

St Johns Innovation Centre
Cowley Road
Cambridge CB4 0WS
United Kingdom

T +44 (0) 1223 755 520

E enquiries@cambrionix.com

W www.cambrionix.com