# Cambrionix
CHARGE • CONNECT • MANAGE

# ThunderSync2-16

## USER GUIDE

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# ThunderSync2-16 at a glance

**THUNDERBOLT**™

**16** PORTS

**20** Gbps Thunderbolt™ to USB 2.0

**12** Watts (2.4 A) per port

**SW Control & Monitoring**

The ThunderSync2-16 (TS2-16) has been designed for High Speed syncing and data transfer, using an upstream Thunderbolt™ 2 interface and providing full 480Mbps output on all 16 ports simultaneously. The TS2-16 provides 12 Watts of charging power to each of its 16 USB2.0 ports, allowing mobile devices to be charged safely and reliably. Using Cambrionix software all ports can be controlled to allow charging and/or data transfer while monitoring important port and device information.

With an integral power supply, the TS2-16 can charge attached USB devices without using a local computer and our intelligent charging algorithm allows almost any device to be charged at its optimum rate (up to 2.4A per port). The firmware can be updated to allow new charging profiles to be added, ensuring the TS2-16 can charge the latest devices.

When a local (host) computer is attached, the host can control operation of the ports using our software. Devices can be charged, synchronised and monitored through Cambrionix's LiveViewer App, the Application Programming Interface (API)

or Command Line Instructions. Cambrionix's free monitoring and control software can be downloaded from (https://cambrionix.com/login). Further information on our software is provided below.

The TS2-16 is fully compliant with High Speed USB2.0, allowing data transfer at up to 480Mbps per port when connected to a local computer through a Thunderbolt™ 2 port. Multiple TS2-16 can be connected to a single host computer to allow up to 96 USB2.0-compliant devices to be charged and sync'd simultaneously. It can also be used with a Thunderbolt™ 3 Type-C host computer with the use of an adaptor.

## What's included

These items are required to use your TS2-16 and are included in the box:

• **The TS2-16 unit (see Figure 1 below)**

• **A mains cable appropriate for the country of use**

Optional 0.5m, 2.0m Thunderbolt™ 2 cables are available to purchase separately.



120mm
305mm
85mm

2 programmable LEDs per port

Thunderbolt™ Host & Expansion Ports

Power Input Connector

Power Switch

**Figure 1**
TS2-16 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.

TS2-16 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 outlet and switch the TS2-16 on using the power switch located adjacent to the power input connector on the TS2-16. The TS2-16 is now ready to charge attached devices.

## 3  Charging without connecting to a host computer

When the TS2-16 is switched on and is not connected to a local host computer it is automatically configured to charge devices using its intelligent charging algorithm. Simply connect the devices to be charged to any of the available 16 ports using USB2.0-compliant cables.

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 2.4Amps) specified by the manufacturer will commence once profiling is complete. Depending on the state of charge of the device attached, profiling may take tens of seconds.

## 4  Using when connected to a host computer

### 4.1  Charging

When the Thunderbolt™ Host Port is connected to a Thunderbolt™ 2 compliant port of a local computer, the TS2-16 defaults to Sync mode and charge currents are determined according to USB Implementers Forum (USB-IF) High Speed USB2.0 specifications.

If the attached device complies with USB-IF Battery Charging specification BC1.2 and supports Charging Downstream Port (CDP), the TS2-16 can provide high-speed charging at up to 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.

If higher charge rates are required to sync Apple products (only), Cambrionix's ChaSync+ programme allows up to 2.4A to be provided. This programme can be downloaded from **https://cambrionix.com**. Before ChaSync+ can provide 2.4A the NVRAM settings of the TS2-16 must be changed.

Please contact support@cambrionix.com for information on how to do this.

### 4.2  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 TS2-16 works independently to the Operating System (OS) and data transfer can be performed to all common mobile operating systems, such as iOS, Android, Chromebook and Microsoft. 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 TS2-16 will now appear as if they were connected to the host computer's USB port. The TS2-16 is fully compliant with High Speed USB2.0 and given its 20Gbps upstream connection can provide full 480Mbps data transfer speeds through each port simultaneously.

You can now use the software of your choice to transfer data to and from your devices. As indicated in 4.1 above, 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

If you wish to synchronise more than 16 devices, multiple TS2-16 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 TS2-16, each TS2-16 needs to be connected to mains power individually and the first TS2-16 in the chain should be connected to the local computer through one of the Thunderbolt™ ports.

The next TS2-16 in the daisy-chain is then connected, using one of its Thunderbolt™ ports, to the remaining Thunderbolt™ port of the first TS2-16. More TS2-16 are added in the same way. Using this daisy-chain approach, a maximum of five additional TS2-16s can be linked, allowing a total of 96 devices to be managed from a single host computer.

**Each unit**
**16**
PORTS

**Sync up to**
**96**
DEVICES
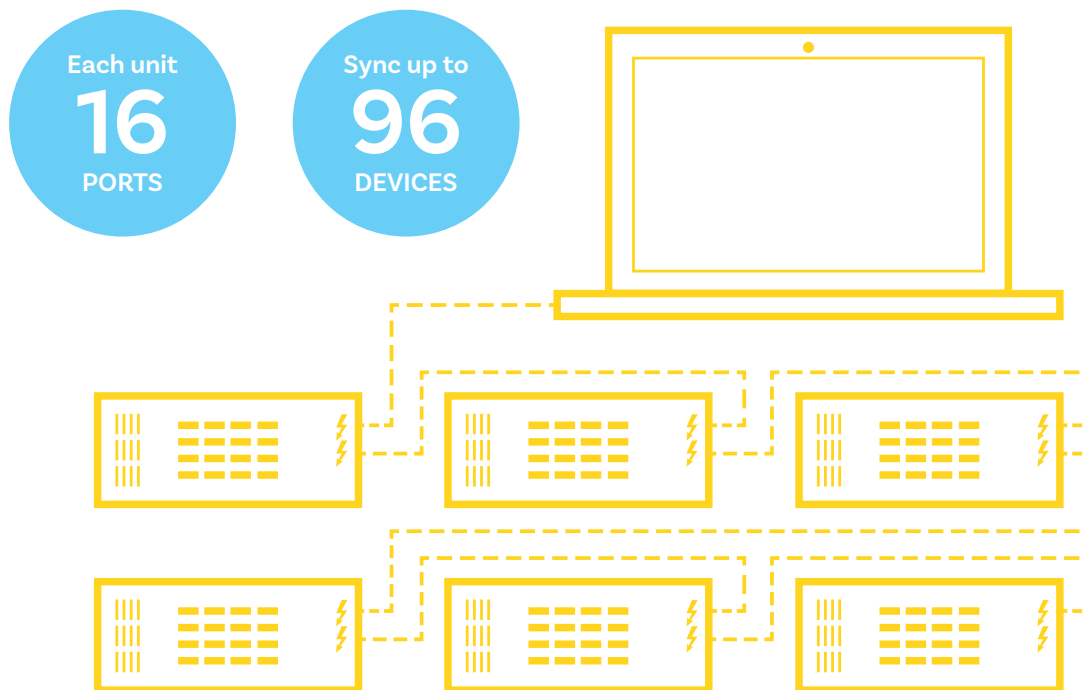
# 5  Manage Ports & Devices using Cambrionix Software

**More productivity, saving you time.**

Cambrionix provides three interfaces by which the TS2-16 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 TS2-16 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 TS2-16 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 TS2-16 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> <1|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 and, using the command "logc X", will output the data to a log file every "X" seconds. This allows live data to be captured in an Excel file for storage.

To return to the prompt at any time, please type "q".

For further advice on using CLI to control your TS2-16, please contact support@cambrionix.com.

## 5.3 Cambrionix API

Cambrionix 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 TS2-16 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 TS2-16 firmware

From time to time Cambrionix updates the TS2-16 firmware to ensure the device incorporates the latest features. In order to update the firmware on your TS2-16, please download the Cambrionix Updater and latest firmware file version appropriate for your host computer Operating System from **https://cambrionix.com**. Please follow these instructions to ensure your TS2-16 has the latest version of the firmware installed.

### 6.1.1 Update procedure for MacOS

Locate and double-click the Cambrionix Updater application 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 and double-click the Cambrionix 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 Cambrionix Updater file and drag into your applications folder.
Windows: Double-click the Cambrionix Updater.

This will open the Cambrionix Updater window.

Click 'Scan' to list the Cambrionix 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 Cambrionix Updater window will now show one or more Cambrionix 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 Cambrionix product once the programming is successful.

# 7  Specifications

**TS2-16**

| | | | |
|---|---|---|---|
| **Input Voltage:** | 100 ~ 250 Vac | **Input/Output Connectors:** | 16 x USB Type-A, 2 x Thunderbolt™ 2 |
| **Input Current:** | 3.5A @ 115 VacA | | |
| **Input Frequency:** | 47 ~ 63 Hz | **Ambient Operating Temperature Range:** | 0 ~ 35°C |
| **Input Connection:** | C13 | | |
| **Output Voltage:** | 5.2V | **Relative humidity:** | 5% to 95% non-condensing |
| **Output Current:** | 2.4A Max per Port | **Dimensions (approx.):** | 305 long x 120 wide x 85 high mm |
| **Output Power:** | 12W Max per Port | | |
| **Output Power (Total):** | 200W Maximum | **Approximate weight:** | 2.0 kg |

# 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.**

The TS2-16 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 TS2-16, 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.**

## Important Electrical and Safety Messages

| 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.**

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