Cambrionix
CHARGE • CONNECT • MANAGE

User Manual

TS3-16

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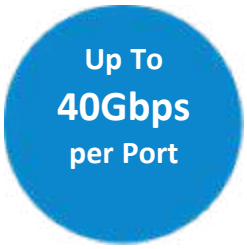
2.Your TS3-16 at a glance

The TS3-16 has been designed to provide high-speed data transfer to USB 3.2 compliant devices without being constrained by endpoint limits.

The TS3-16 can charge attached USB devices without using a local computer. The TS3-16 allows almost any device to be charged at its optimum rate (up to 2.4A). The firmware can be up-dated to ensure the TS3-16 can charge the latest devices. It is ready to charge out-of-the-box and to sync devices when attached to a host computer.

When a local (host) computer is attached the host can control the operation of each individual port using software provided by Cambrionix. Device charging and synchronisation can be monitored through Cambrionix's LiveViewer App, the Application Programming Interface (API) or Command Line Interface (CLI). Cambrionix's free monitoring and control software can be downloaded from www.cambrionix.com/products/api

2.1.Key Features



Transfer Data Seamlessly

Each high speed port can transfer data up to 40Gbps

Power

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

Scalability

Up to 96 devices can be connected at once using multiple hubs

3.Safety

This user manual is for informational purposes only, it contains information for 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 of the user manual.

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 conceivable 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
	Personal Injury and Damage to the product • Observe the safety instructions in this user manual

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
Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor (reversible) injury.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in damage to the product and/ or its functions or of a property in its proximity.

3.2.Safety alert symbol

Use of the safety alert symbol indicates a risk of injury.

Observe all measures that are marked with the safety alert symbol in order to avoid injury

3.3.Pictograms

Warning Signs	
 Electrical hazard	 Fire Hazard
Mandatory action signs	
 Read operating instructions	 Mandatory regulation

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 to relevant safety standards, which could result in injury or damage to the product.

	⚠CAUTION
	**Electric shock or personal injury may occur** • Do not modify the product in any way • Do not dismantle the product

⚠CAUTION

Fire or personal injury may occur

- Do not obstruct air vents on the product
- Do not cover the product in combustible material

CAUTION

Damage to your product may occur

- Do not bend or compress any part of the product

3.5.Power supply

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

⚠CAUTION

Electric shock or personal injury may occur

- Do not use a damaged power cord or plug, or a loose power socket
- Do not touch the power plug with wet hands
- Do not allow liquids to come into contact with the unit or power supply

CAUTION

Damage to your product may occur

- Do not short circuit the Power Supply Unit (PSU) supplied with your product
- Do not disconnect the power cord while the product is being used
- Do not bend or pull the power cord with excessive force

3.6.Storage and Installation

This section describes safety precautions you must follow when installing and storing your TS3-16.

	**⚠CAUTION** **Electric shock or personal injury may occur** • Do not place the power cord near heat sources • Connect the plug to an earthed socket

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

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

4.Getting Started

4.1.What's Included

- 2m Mains power cable (Country specified on order)
- Thunderbolt™ 3 Cable
- TS3-16 Hub

4.2.Connecting to the mains

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

4.3.Connecting to Host

Once the power is connected connect the TS3-16 to your host system using a Thunderbolt™ 3 cable, this is provided with your hub. Using an incorrect host cable may result in the hub and all subsequent ports not being recognised by your host.

4.4.Registration

You may register your product at www.cambrionix.com

4.5.Help and Support

FAQs and help can be found on the Help page here

- www.cambrionix.com/help_pages/help.

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

- www.cambrionix.atlassian.net/servicedesk/customer/portals

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

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

5.Using your TS3-16

In this section you can find information information on how to use your hub in a charge only or a charge and sync application. You can also find information on managing your hub and changing port modes, connecting multiple hubs to one host and using Cambrionix Software.

5.1.Using without connecting to a host computer

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

5.2. Using when connected to a host computer

5.2.1 Charging

When one of the Thunderbolt™ ports is connected to a Thunderbolt™ 2 or Thunderbolt™ 3 port of a local computer, the hub defaults to Sync mode and charge currents are determined according to USB Implementers Forum (USB-IF) SuperSpeed USB3.2 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 2.4A. If the connected device does not comply with BC1.2, the charge current will be limited to 500mA in compliance with USB specifications.

5.2.2 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 hub 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 Windows™. 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 hub using a Thunderbolt™ 3 compliant cable. A Thunderbolt™ 2 cable with a Thunderbolt™ 2-3 adaptor can also be used with consequently reduced data speeds. Any devices connected to the hub will now appear as if they were connected to the host computer's USB port. The hub is fully compliant with SuperSpeed USB3.2 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.

5.3.Scalability

USB controllers generally have 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 hub each port can handle up to 16 endpoints, meaning a total of 256 endpoints per hub. If you wish to synchronise more devices, multiple hubs 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 hub, each hub needs to be connected to mains power individually and the first hub in the chain should be connected to the local computer through one of the Thunderbolt™ ports. The next hub in the daisy-chain is then connected using one of its Thunderbolt™ ports to the remaining Thunderbolt™ port of the first hub. A third, fourth and fifth hub can be added in the same way, connecting the available Thunderbolt™ port of the previous hub to one of the Thunderbolt™ ports of the next device in the daisy-chain. Using this approach, a maximum of six hubs can be linked together, allowing a total of 96 devices to be synced from a single host computer.

5.4. Manage Ports & Your TS3-16

Each port on your TS3-16 can be managed either individually or all together. You can turn the ports off and on, change the port mode or change the charging profiles. This can be done either through LiveViewer 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
Sync	Turn specific ports or the whole hub to sync mode
Biassed	Detect the presence of a device but it will not sync or charge it.
Off	Turn specific ports on or off or switch the whole hub on or off.

5.4.2 Charging Profiles

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

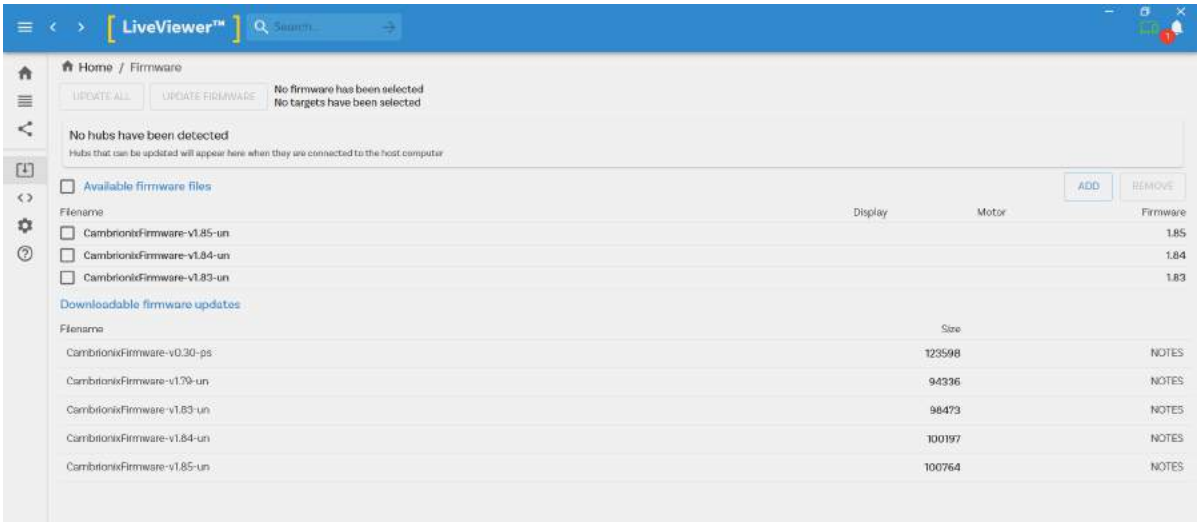
0	Intelligent charging algorithm which will select a profile 1-6
1	2.1A
2	BC1.2 Standard
3	Samsung
4	2.1A (Profile 1 but with a longer timeout)
5	1.0A
6	2.4A

5.4.3 Firmware

The firmware can be kept up to date using our LiveViewer software. As part of delivering an easy user experience our LiveViewer application is now a set-and-forget solution. The LiveViewer application will find out what firmware your USB hub has and present an update for you, ready to just hit install.

To update the firmware first go to the firmware updater section of LiveViewer. Here you can see the available Firmware versions available to download and install to the hub. To download a firmware file click on the version under the "downloadable firmware updates" section. once downloaded it will appear in the "Available firmware files" section.

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



To install the firmware onto the hub simply click the hub/ hubs connected that you want to update and then select the firmware version you want to upgrade to. Once selected press the update button at the top and the update will commence.

	CAUTION
	Your Cambrionix Firmware may get corrupted • Do not interrupt the Firmware update process • Do not disconnect the power during the update process

5.5.Software

More productivity, saving you time. Cambrionix provides three interfaces by which the Hub can be monitored and managed:

- LiveViewer
- Cambrionix API
- Command Line Instructions

5.5.1 LiveViewer

LiveViewer is an Application that can be downloaded from www.cambrionix.com/products/liveviewer . 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)

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 hub rail voltages, time since switched on, total instantaneous current and power, and temperature. Further information on LiveViewer is available on our website.

5.5.2 Cambrionix API

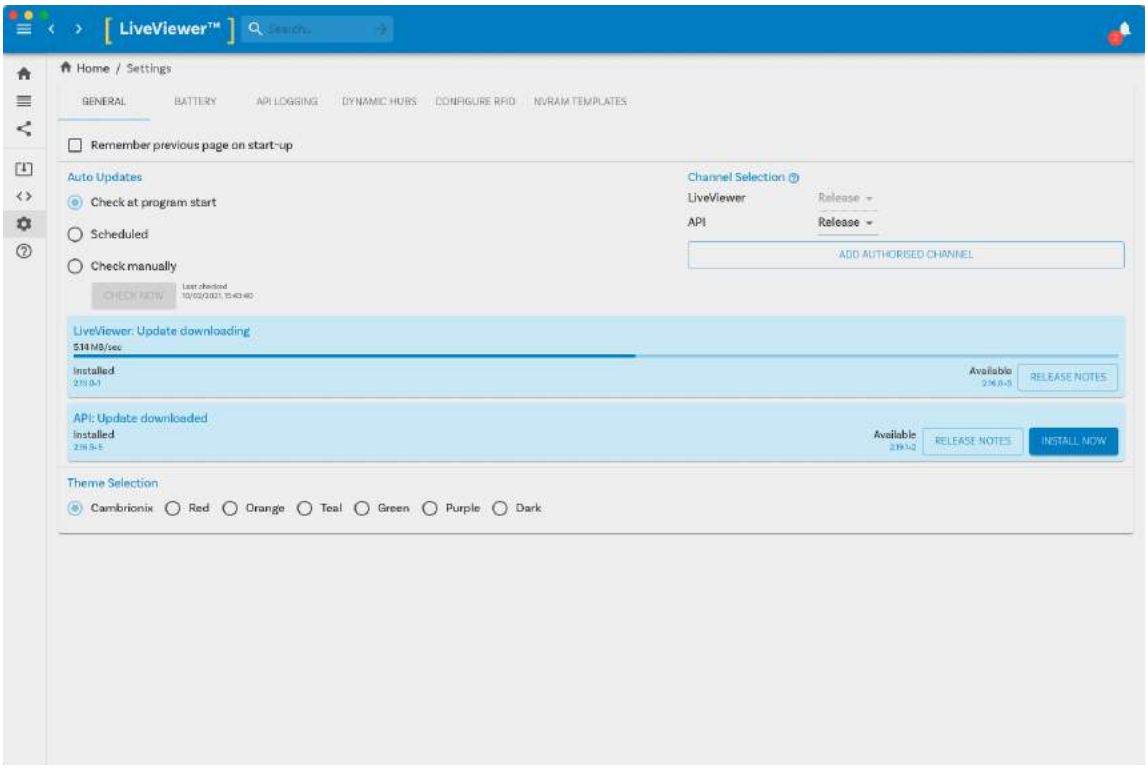
Cambrionix API allows you to monitor and control each port in more detail and to integrate these functions into your own workflow processes. The API comprises a daemon that can be downloaded from www.cambrionix.com/products/api and installed on the host machine. Port information and control can be provided 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 Hub information, or "Set" port functions (such as mode). A library of

sample Python code can be obtained from www.cambrionix.com/products/api to help you integrate many of these functions into your process workflow alongside the full User Guide.

5.5.3 Updating Software

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

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



You can select when you would like the automatic software checks to take place or if you prefer can change to a manual update selection. You can also select which version of the software you would like to use between the options of Alpha, Beta or Release.

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.

5.5.4 Command Line Instructions (CLI)

Command Line Instructions can also be used to control and monitor the functions of the hub 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. If you would like more information please look at our more in depth information here www.cambrionix.com/cli

Once you have installed your preferred terminal emulator, please connect to the hub's 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
state [p]	Show state for port [p] or all ports
system	Show hardware and firmware information
health	Show voltages, temperatures, errors and boot flag
cef	Clear error flags
sef [flags] ...	Set error flags. One of: 5UV 50V 12UV 120V
crf	Clear rebooted flag
limits	Show voltage and temperature limits
power [pwr [p]]	Show power totals or set board max to [pwr], or just port [p] in mW
host [auto|manual]	Show if USB host is present, and set mode change
id	Show id string
logp <s>	Report mA for each port every <s> seconds
loge <s>	Report events and state for all ports every <s> seconds
|	Live view (periodically updated screen showing system state)
remote [exit|kexit|auto]	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 patternof a string of LEDs on row <row> to string <ptnstr>

Command	Action
led <p> <colour> [ptnstr]	Set LED on port <p> to colour (name or hex)
cls	Clear terminal screen
reboot [watchdog]	Reboot (optionally by using watchdog timeout)
host [auto/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
Parameters	Optional parameters are shown in [ ] Compulsory in < >
Tab key	Re-runs previous command

Examples	
mode c 3	Set port 3 to charge mode
mode o	Turn off all ports
state 2	Reveal state of port 2
state	Reveal state of all ports

5.6.Cleaning your TS3-16

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
	Electric shock or personal injury may occur • 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 contact Cambrionix immediately

- 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
- Wet 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 and drying is complete

6.Product Specifications

6.1.Input Power Requirements

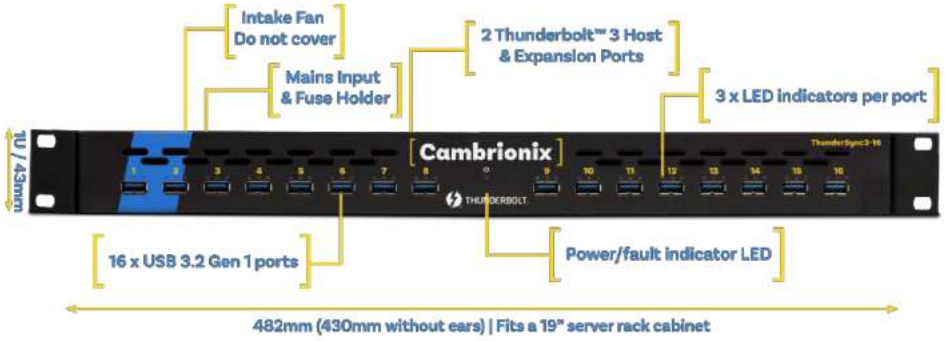
Input Voltage	100 - 250 VAC
Input Current	3.5A @ 115VAC
Input Connection	C14

6.2.Output Power

Output Voltage	5.0V +/-5%
Output Current (Max per Port)	2.4A
Output Power (Max per Port)	12W
Output Power (Total)	230W

6.3.Physical specifications

Input Connectors	2 x Thunderbolt™ 3
Output Connectors	16 x USB 3.2 Type-A
Maximum Data Speed	40Gbps
Ambient Operating Temperature range	10-35 °C
Relative humidity	5% to 95% non-condensing
Dimensions	482 x 270 x 42mm
Weight	3.7kg



7.Compliance and Standards

- CB Certificate
- CE Tested and marked
- China CCC Certification
- FCC Part 15 Tested and marked
- Housed within a UL94-VO specification fire enclosure
- Japanese PSE certification (pending)
- RoHS Compliant
- Independently safety tested by the Underwriters Laboratory (UL) under file #E346549

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