



# eSynC Product Family Reference Manual

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## Abstract

The eSynC family of products (formally known as LAVASynC+) permits the charging of select Samsung mobile devices while simultaneously interacting with USB 2.0 accessories.

The eSynC products share the core set of features present in all nSynC products, as well as providing “extended” features such as battery modulation, screen brightness management, and improved network operation. All devices supported use the USB-C interface.

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## Introduction

The eSynC products allow select Samsung mobile devices to operate as a USB Host while simultaneously being charged. LAVA calls this feature SimulCharge, for simultaneous charging of a mobile device while working with USB 2.0 accessories.

This document describes the features of the eSynC products in detail.

In addition to the features of the nSynC Product Family, the eSynC products provide extended features such as battery modulation, screen brightness management, and improved network operation.

The eSynC features use a combination of hardware and software. The LAVA Tablet Manager (i.e. LTM) application **must** be installed to support an eSynC product.

The eSynC products use features specific to a group of Samsung mobile devices.

eSynC Product Family Overview						
Product	USB 2.0 Ports [Type A]	Ethernet Adapter	Power over Ethernet	5 VDC Input [USB-C]	9-36 VDC Input [Barrel]	Description
eSynC-PE	-	YES	YES	Auxiliary [Micro-B]	-	Ethernet Adapter with PoE
eSynC-PE-F	-	YES	YES	-	-	Fast-Charging Ethernet Adapter with PoE
eSynC-E	-	YES	-	YES	-	Ethernet Adapter
eSynC-P2UE	2	YES	YES	Auxiliary [Micro-B]	-	2-port USB Hub & Ethernet Adapter with PoE
eSynC-P2UE-F	2	YES	YES	-	-	Fast-Charging 2-port USB Hub & Ethernet Adapter with PoE
eSynC-2UE	2	YES	-	YES	-	2-port USB Hub & Ethernet Adapter
eSynC-3U	3	-	-	YES	-	3-port USB Hub
eSynC-vc5UE	5	YES	-	-	YES	5-port USB Hub & Ethernet Adapter
eSynC-vc3U	3	-	-	Auxiliary	YES	3-port USB Hub
eSynC-vc3U-F	3	-	-	-	12-36 VDC	Fast-Charging 3-port USB Hub
eSynC-vc2UE	2	YES	-	-	YES	2-port USB Hub & Ethernet Adapter
eSynC-vc2UE-F	2	YES	-	-	12-36 VDC	Fast-Charging 2-port USB Hub & Ethernet Adapter
eSynC-vc1U	1	-	-	Auxiliary	YES	1-port USB Hub
eSynC-vcE	-	YES	-	-	YES	Ethernet Adapter
eSynC-vcE-F	-	YES	-	-	12-36 VDC	Fast-charging Ethernet adapter
eSynC-1U-OEM	1	-	-	YES	-	1-port OEM Adapter (board only)
eSynC-BM-OEM	-	-	-	YES	-	Charging-Board Adapter (board only)

Note: eSynC products **require** the installation and activation of the LAVA Tablet Manager application.

## System Requirements

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The eSynC products operate with a group of USB-C mobile devices. These devices must implement specific aspects of the USB-C Power Delivery (USB-C PD) specification. Please contact LAVA Sales or Technical Support for the current list of tested devices.

The mobile device **requires** the installation of the LAVA Tablet Manager application, which is provided by LAVA. The "eSynC Quick Start Guide" describes the setup procedure for the eSynC product and the LTM application.

The mobile device must use Android 5.1 or newer for compatibility with LTM v4.\*\* and v5.\*\*.

The eSynC product is connected to a mobile device using a standard USB-C to USB-C cable provided by the user. The USB-C cable **must support both data and charging**. The cable may be up to 1.5 meters (5 feet) in length. The cable need not be electronically marked, as the current levels are always less than 3 amperes.

The eSynC products work with unrooted mobile devices.

The eSynC Power-over-Ethernet (PoE) models require a suitable Network Switch with PoE support. A non-PoE Network Switch can use a PoE Power Injector for each port to operate with an eSynC PoE product. A PoE Power Injector is a standard add-on available from many Network Switch vendors. LAVA also offers fast-charging PoE adapters (eSynC-P2UE-F and eSynC-PE-F), which can charge the mobile device at 9 volts, 1.1 amps.

The eSynC models without PoE require a USB Power Supply with a USB-C plug. The Wall/USB Charger provided with the tablet or mobile phone is an ideal choice. Any USB Power Supply with sufficient power for the combined requirements of the compatible mobile device and USB accessories can be used. The USB Power supply should be able to provide 5 volts with at least 2 amperes.

The eSynC "vc" products require power to be supplied through a DC barrel jack with a 2-millimeter positive center pin. The power cable and power supply are supplied by the user. Any unregulated DC power source can be used from 9 to 36 volts. These products are ideal for automotive based installations which are based on a 12-volt or 24-volt battery. LAVA also offers fast-charging "vc" adapters (eSynC-vc2UE-F, eSynC-vc3U-F and eSynC-vcE-F), which can charge the mobile device at 9 volts, 1.1 amps. These units require a DC power supply capable of at least 12 volts to operate.

LAVA only has access to models from the Canadian market and some U.S. models for internal testing. A tablet or mobile phone integrator must perform a verification of the device model and build targeted for their application. LAVA will assist in the testing of other devices provided a sample is made available. The sample device must be delivered with the intended firmware build already installed.

The mobile device features used by the LAVA products are not universal. Samsung, for example, tailors the mobile device firmware to a world region or country. Tablet versions created by Samsung for mobile carriers do not behave the same as the standard products. You must verify the behaviour of the model of mobile device and firmware build to be used before committing to any deployment.

***Note:** LTM v4.\*\* and v5.\*\* are exactly the same. The only difference is LTM v4.\*\* must be side loaded, while v5.\*\* is available in the Google Play Store.*

***Note:** LTM v4.\*\* and v5.\*\* do not require Samsung Knox support, unlike the earlier versions of LTM.*

## Product Features

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### Overview

The eSynC and nSynC products share the following core features:

- ❑ USB Host operation with simultaneous mobile device charging
- ❑ Available with multiple USB-2.0 receptacles
- ❑ Wired networking (10/100 Ethernet) support
- ❑ Option for Power over Ethernet (PoE) support
- ❑ Option for fast charging
- ❑ Option to be powered from standard USB Power Adapters
- ❑ Option to be powered from any regulated 5-volt power supply
- ❑ Option to be powered from a 12 or 24-volt unregulated DC power source

The eSynC products include the above core features as well as the following extended features:

- ❑ Support for installations running 24/7
- ❑ Battery modulation for the tablet and mobile phone longevity
- ❑ Enhanced Network Management for reliable network operation
- ❑ Screen brightness control for reduced heat generation
- ❑ Up to 5 USB-2.0 receptacles

The eSynC extended features rely on the LAVA product working in unison with the LAVA Tablet Manager application. Installation of the LTM application is mandatory before using an eSynC product.

### USB Host Operation with Simultaneous Charging

The primary feature of all eSynC and nSynC products is to allow the charging of select Samsung mobile devices while interacting with USB accessories. The LAVA products do not draw power from the Samsung mobile device and only allow USB accessory operation while being powered by an external power source.

The compatible mobile devices have been verified to support USB Host operation while also allowing the device to be charged. The USB-C specification allows for many levels of functionality to be implemented by each manufacturer. Not all aspects of USB-C and USB-C PD (Power Delivery) are implemented on a device just because it has a USB-C receptacle.

**Note:** *If your use case requires USB accessories to be operated with and without an external power source, please contact LAVA Sales as other LAVA products not described in this document are designed for this situation.*

## USB 2.0 Ports for User Accessories

The LAVA products include an internal USB 2.0 Hub, which is used to connect integrated and user-supplied USB accessories. Up to five user-accessible USB 2.0 ports are available depending on which LAVA product is selected.

User accessories are attached to USB 2.0 ports with a standard A-type receptacle. Each receptacle provides power to each USB Accessory up to a maximum of 500 mA, as per the USB specification. The power supply used must have sufficient capacity for the mobile device, LAVA hardware, and USB accessories.

A LAVA product must be powered for a USB-A receptacle to function. The LAVA products have a dedicated power input and are not intended to draw power from the tablet or mobile phone.

A power budget must be developed for a system to handle additional USB accessories and the related cables. Power loss in each cable results in lower voltages at each device. Using self-powered USB Hubs may be required in some systems, to offload the power supply responsible for the tablet or mobile phone.

## LAVA Tablet Manager (LTM) Application

The LAVA Tablet Manager application must be installed on the mobile device to manage each LAVA product. The LTM application runs in the background on the mobile device. LTM works with Android v5.1.1 and newer.

LTM is available through the Google Play Store (LTM v5.\*\*\*) and is also distributed as part of a LAVA Software Release Package (LTM v4.\*\*\*), which includes a copy of the eSynC Installation Manual. LTM must be used with a LAVA product that is matched to the mobile device being used. Please contact LAVA sales or technical support for further details at [www.lavalink.com/lavasimulcharge](http://www.lavalink.com/lavasimulcharge).

Once LTM is installed, the Product Family, Protection Type, and Ethernet usage are configured through the built-in setup manager. All other configuration parameters are optional. These steps are described in detail in the installation manual. No other license or special activation is required.

During normal operation, the application launches automatically when it detects the LAVA hardware and is intended to run quietly in the background. If the application is accidentally shut down, it is woken up within 7 minutes by the recovery timeouts that are built into the LAVA hardware.

LTM typically operates in a "Background Mode" to ensure that only the customer applications are seen by the device user. Clicking on the application icon four times within a few seconds forces the application into the "Configuration Console", which allows the configuration to be reviewed or modified. The "Force to Background" option in the overflow menu places LTM back into its preferred state.

If LTM is not running, one click of the application icon launches it with the “Configuration Console” enabled. All LTM protection features are active in both application states. The configuration portion of LTM allows all common parameters to be set. Specialized parameters require the configuration file be manually edited on a separate device.

*Note: The LTM application is not a standalone product and requires a LAVA product to function.*

*Note: LTM must be configured with the correct Product Family and Protection Type.*

*Note: Failure to install LTM results in USB accessories being briefly disconnected every 7 minutes when the eSynC Timeouts are active.*

*Note: Although LTM v4.\*\* and v5.\*\* are the same, the application package names for them are different. If you wish to switch between versions, you must uninstall the app from the mobile device before installing the other version. Otherwise, there will be a conflict between the two versions installed. The config file will also be deleted when the app is uninstalled, so please make note of your settings in the GUI, especially the Product Family and Protection Type, before switching versions.*

## Battery Modulation

The Battery Modulation feature helps reduce stress on the device’s battery. Battery Modulation is a feature in which the battery is charged up to an upper set point, and then allowed to discharge to a lower set point. This feature electronically mimics the process of charging a battery and then disconnecting the charger. This behaviour follows the expected use case for a mobile device. After a set number of user-defined charge/discharge cycles, the device is briefly allowed to charge to 100% to reset the battery calibration.

The LTM application works with the eSynC product to implement the Battery Modulation feature.

Battery Modulation ensures the device battery never remains at the 100% level for more than a few minutes over a month, thus preventing overcharging. This behaviour makes the LAVA products ideal for enclosures that run 24 hours a day, 7 days a week. All parameters associated with the modulation feature are customized in the LTM configuration.

The LTM application presents several battery modulation schemes to deal with the unique capabilities of each mobile device model. **Setting the correct Product Family and Protection Type is critical for LAVA Battery Modulation to work.** The LTM configuration help will identify which option to use for a given mobile device. The default configuration parameters associated with Battery Modulation are:

```
product-family=2
bttty-protection-type=1
bttty-upper-threshold=75
bttty-lower-threshold=45
bttty-cycle-limit-on-start=2
```

```
bttc-cycle-limit=50
```

The “product-family=2” is always used for eSynC products.

The “bttc-protection-type” keyword selects between two possible battery protection schemes, to adapt to the capabilities of the mobile device. The “LTM Configuration Help” will identify which option to use for a given mobile device.

The above sample sets the upper and lower battery charge thresholds at 75% and 45% respectively. Every 50 charge cycles the battery is allowed to charge to 100%. Within a few minutes of reaching the 100% level, the device starts discharging down to the 45% level. Periodically charging to 100% permits recalibration of the battery level to battery voltage by the device.

The "bttc-cycle-limit-on-start=2" results in the device being allowed to charge up to 100% two cycles after the LTM application is started. The "bttc-cycle-limit-on-start" command allows for an early battery calibration for situations where the device might have been turned off for some time. Using "bttc-cycle-limit-on-start" is optional.

Only the “bttc-protection-type=1” option can be used with eSynC Mk1 products. Using “bttc-protection-type=2” with an eSynC Mk1 results in the battery charging to 100%.

Use of “bttc-protection-type=1” and “bttc-protection-type=2” is supported by eSynC Mk2 products.

The eSynC Mk1 and Mk2 can be identified by the LED startup sequence, the Hardware Information section of LTM, or through the optional LAVA Device Info utility.

*Note: The LAVA-Device-Info utility is a useful addition for LTM 3 users. However, it is redundant for users of LTM v4.\*\* and v5.\*\*. Its features are built into the app.*

## Wired Network Operation

Many eSynC products provide a 10/100 Fast Ethernet wired interface. This feature relies on standard support built into the tablet or mobile phone. A wired networking solution is more reliable than Wi-Fi and has greater security.

Devices supporting Wired Ethernet operation provide options for dynamic address setup (DHCP) and static address setup. The choice of address management is a Network system issue. The Ethernet addressing configuration is performed within the device setup menu.

The device setup and status for the Ethernet port are located in the Connections > More networks > Ethernet menu. The Ethernet menu can only be entered when a powered Ethernet adapter is present. The standard device options permit the use of static address assignments or dynamic address assignments via DHCP. The menu reports if the Ethernet adapter is active.

When using DHCP, the device attempts to fetch the network addressing information from a DHCP server. If the addressing information is not located within the timeout period, the device makes no further attempts. The user must manually retrigger the Ethernet interface to start the DHCP process. The retrigger is a simple matter of pressing the Ethernet "box" again in the "More networks > Ethernet" menu. The eSynC Network Recovery automates the network restart, which is critical for embedding a device in an enclosure or kiosk.

When the user disables the Ethernet adapter via the Connections > More networks > Ethernet menu, the adapter remains disabled until enabled again by the user.

In some cases, an installation may choose to use Wi-Fi for network access rather than the wired Ethernet support of the eSynC product. The eSynC product's Ethernet interface can be disabled when Wi-Fi is enabled using the configuration command "wifi-overrides-ethernet=1".

The "permit-ethernet=0" command disables the Ethernet interface. Ethernet is permitted by default.

## Network Recovery Operation

The eSynC products and the LTM application help a tablet or mobile phone recover from failures to establish a network connection when using a wired network connection. The typical failure is due to the inability to establish a network address from a DHCP server.

When a DHCP lookup or lease renewal fails, the device turns off the Ethernet interface and makes no further attempts. In a typical situation, the user would go to the configuration menu and enable Ethernet to restart the connection. The alternative is to unplug the network cable and plug it in again to reset the connection. Until the process is restarted, the device has lost the wired network connection. The DHCP behaviour is a serious issue for an enclosure-based system. There is no software-only solution for a non-rooted device.

The LTM application monitors the wired network connection. If the connection is lost, LTM automatically restarts the Ethernet hardware to establish a connection.

When a reset takes place the Android Toast message “LTM – RESET ETHERNET” is reported.

The initial restart takes place if no network connection is seen for about 1 minute. If the connection is not restored, repeated attempts are made until a connection is restored. There are two options for the handling of subsequent attempts. Option 1 gradually backs off the time-out used. The timeouts are 2, 3, 5, and 8 minutes. After the first three reset attempts, subsequent attempts are made every 8 minutes. Option 2 repeats subsequent attempts every 2 minutes.

If the Network Recovery feature is not desired, it can be disabled using the “dhcp-recovery=0” command in the LTM configuration.

## Screen Brightness Management

The LTM application has a configurable option to manage the screen brightness. The tablet or mobile phone screen is a significant power consumer and heat generator within the device. If the screen is too bright, the device may not be able to charge the battery.

Using the screen brightness management feature is recommended, however it is disabled as a default to simplify first-time setup of new mobile device.

For a given application, the optimal screen brightness must be established by the system designer. The LTM application can then ensure this maximum is never exceeded.

The Brightness Management feature has two windows for day and night operation. The "time 1" is assumed to be the start of the night-time operation. The "time 2" is assumed to be the start of the daytime operation. A brightness level can be configured for each of these time windows.

During the daytime window, selecting the lowest possible screen brightness reduces heat generation and improves the ability to charge the battery. In many instances, a device screen level of 85% to 90% has a minimal change to the apparent brightness compared to a level of 100%, yet significantly reduces heat generation.

During the night-time window, selecting a very low screen level reduces heat generation dramatically. Setting a level of 15%, allows the screen to be seen. Turning the screen off during night-time is preferred.

Reducing heat generation over the life of the tablet or mobile phone helps improve the longevity of the battery and other internal components.

The Brightness Management feature is recommended but remains optional. The feature requires that auto-brightness of the device is turned off, and that the time is correct on the device.

This feature requires that LTM be permitted to change system settings. The only system setting manipulated is the screen brightness setting. This advanced permission must be selected in the Application Information screen. If the permission is not checked when LTM is installed, the required setup screen is presented shortly after LTM runs for the first time. If screen brightness managed is disabled, the permission is not required.

The sample configuration file located later in this document has the following settings included:

```
brightness-level1-time=1:00  
brightness-level2-time=6:00  
brightness-level1=15  
brightness-level2=85
```

Using these settings, at 1:00 AM the device brightness is set to 15%, and at 6 AM the brightness is set to 85%. From 1:00 AM to 5:59, the level 1 brightness is enforced. From 6:00 AM to 00:59 AM, the level 2 brightness is enforced. If the screen brightness is manually changed, the configured values are restored within a minute.

## Power Options

Most eSynC products can be powered using a standard USB Power supply, such as the one provided with the tablet or mobile phone. The typical power supply provided with a mobile device is rated at 5 volts nominal output voltage with a 2-ampere capacity.

Any 5-volt regulated power supply is permitted, provided at least 5 volts is present at the input to the eSynC. The preferred voltage is 5.1 to 5.25 volts. The input voltage must never exceed 5.25 volts. Exceeding the maximum input voltage violates LAVA's Manufacturer Warranty.

The eSynC-PE, eSynC-P2UE, and their fast-charging variants (eSynC-PE-F and eSynC-P2UE-F) support Power over Ethernet (PoE) and therefore can operate using power provided over the network cable. Using PoE can resolve the problem of getting power to a device when an AC outlet is not accessible.

Using a PoE injector is a method of supplying power to an eSynC PoE adapter-based system, even when wired Ethernet is not required by the customer application.

The eSynC “vc” products are designed to operate from a 9 to 36 VDC unregulated power supply. This power option is ideal in vehicle-based applications or any standalone unit running from a storage battery. In a retail or business environment, this option permits the power brick to be placed a considerable distance away from the eSynC when a wall outlet is not in a convenient location.

Please see the “Connection Descriptions” section of this document for additional details on each of the power options summarized here.

**Note:** *Fast-charging eSynC products can charge the mobile device at either 9 volts, 1.1 amps or 5 volts, 2 amps.*

**Note:** *The fast-charging eSynC “vc” products require a DC power supply capable of at least 12 volts. If charging at a distance, use a 36-volt power supply.*

## Power-over-Ethernet Support

Power over Ethernet (PoE) is a standard for passing electrical power through a network cable along with the data. The eSynC PoE-capable products always support an Ethernet adapter for wired network communications.

The eSynC products with PoE resolve the problem of getting power to a mobile device and peripherals. The PoE specification allows the powered device to be up to 328 feet (100 meters) from the Network Switch or PoE Injector.

Deploying network cabling with PoE support can be significantly cheaper than installing dedicated power lines through a facility.

The Ethernet RJ-45 provides the input power to the eSynC product. These eSynC products require a suitable Ethernet Switch with PoE support. Deploying network cabling with PoE support can be significantly cheaper than installing dedicated power lines through a facility.

The eSynC PoE provides 10.4 watts of power for the device, the eSynC, and attached USB accessories. The 10.4-watt limit allows the unit to be treated as a PoE Class 0 device by a PoE switch.

The eSynC PoE Power Supply is capable of supplying 13.5 watts. However, this requires the Network Switch to supply more power to the Ethernet cable than is permitted for Class 0 devices. The eSynC **does not** prevent the attached devices from attempting to draw more than 10.4 watts. The accompanying device and USB accessories must be designed to work within the design limits.

The system designer must budget for the charging requirements of the device and the power required by USB accessories. The eSynC products **do not** provide diode protection between the module and the peripheral ports.

The eSynC PoE products do not function if power is not available from the PoE-Ethernet interface or the “Aux. Power Adapter” input. The eSynC products are not intended to draw power from the tablet or mobile phone. The “Aux. Power Adapter” input can only be used if power is not being provided over the Ethernet cable. The “Aux. Power Adapter” input is intended only for initial testing of an eSynC module. The “Aux. Power Adapter” input is described in a separate section of this document.

The PoE models include the eSynC-PE, eSynC-P2UE products and their fast-charging variants (eSynC-PE-F and eSynC-P2UE-F).

## System Watchdog Handling

The Android system was designed to conserve battery power and memory resources of a mobile device such as a tablet or mobile phone. The Android system limits how long a user-installed application can run. Smartphones and tablets are consumer market devices, and running one for an extended period of time is not the intended use case. The standard device behaviour can result in the LAVA Tablet Manager being shut down after a period of time. The LAVA product has several safeguards to ensure LTM will continue to function.

The LTM application sends information to the eSynC on a regular basis. If the LAVA product does not receive a message for seven minutes, the USB connection to the device is shut down for 30 seconds and then restored. Removing and restoring the USB connection forces Android to wake up the LTM application. The 7-minute Recovery Timeout can be disabled, but this is not recommended as it is an important feature used to ensure continuous operation of LTM.

Additional "watchdog" features include the Low-Level Detect (LLD), Low Voltage Detect (LVD), and Stuck Level Detect (SLD) mechanisms. These features add an extra level of protection for some rare conditions seen in a few device models.

The Low-Level Detect (LLD) monitors the device battery level. In some rare cases, the device may refuse to start charging. This mechanism prevents the device from discharging. The configuration commands use an "lld-" prefix. If the signal drops below the danger threshold ("lld-threshold" - "lld-offset") for three samples, then a recovery operation is started. The signal must have been above or at the activation threshold ("lld-threshold") on a previous sample in order to enable the detection feature. This feature is active as a default.

The Low Voltage Detect (LVD) monitors the device battery voltage. In some rare cases, the device may refuse to start charging when using Battery Modulation. This mechanism prevents the device from discharging. The configuration commands use an "lvd-" prefix. If the signal drops below the danger threshold ("lvd-threshold" - "lvd-offset") for three samples, then a recovery operation is started.

The Stuck Level Detect (SLD) feature monitors the device battery level. In some rare cases, the device charge level gets stuck. After many hours the device recovers. This mechanism ensures the recovery time is controlled. The configuration commands use an "sld-" prefix. If the battery level does not change for 'x' minutes, then a recovery operation is started. This feature is disabled as a default. This feature can be problematic if the mobile device screen timeouts are used.

## Samsung Knox Configure

LTM can be installed using Samsung's "Knox Configure", which is a cloud-based service permitting IT administrators to configure Samsung Galaxy devices in bulk remotely.

The service pushes out customer provided applications and files to a mobile device through the \Contents folder created in the Internal Storage folder. The "Knox Configure" service creates the \Contents folder, which is not present on the device as a default. LTM searches for its LTM\_CFG.txt configuration update file in the \Download folder as well as the \Contents folder.

The first time LTM tries to access the Contents folder, a File Selection dialogue is presented to the user to locate the file and grant LTM the ability to read the file. Subsequent updates do not require the File Selection dialogue. This is a requirement of the Android operating system.

*Note: This only applies to LTM 3, which is legacy now. LTM v4.\*\* and v5.\*\* do not use Samsung Knox.*

## Product Versions

Every eSynC product shares a core set of features. Each product integrates a different combination of peripherals to provide the optimal configuration for a customer use-case.

There are two generations of products referred to in this document as the eSynC Mk1 and eSynC Mk2. The eSynC Mk1 is the original series of products. The second generation products are referred to as eSynC Mk2 and were introduced in early 2020.

Product generations can be identified by observing the two status LEDs upon power-up. The MK1 products pulse the two status LEDs on for ½ second then off for ¾ second once upon startup. The Mk2 products flash the status LEDs four times on startup, with each pulse being approximately 1/3 of a second in duration.

If LTM is operating with the Configuration Console active, the Hardware Information option can be used to verify which product is being used. The optional LAVA-Device-Info utility can also be used to verify which product you are using. The utility reports “LAVASynC+” for the Mk1 products and “LAVASynC+ Mk2” for the Mk2 products.

The Mk1 products only support one battery modulation scheme, while the Mk2 products support two battery modulation schemes to deal with variations in compatible mobile devices.

The Mk2 products contain additional support for recovery management. When the recovery mechanism resets the USB peripherals, the power contract with the mobile device is also renewed as an additional procedure to ensure seamless operation.

The “bttty-protection-type” option in the LTM configuration file determines which battery modulation scheme is to be used.

*Note: The LAVA-Device-Info utility is a useful addition for LTM 3 users. However, it is redundant for users of LTM v4.\*\* and v5.\*\*. Its features are built into the app.*

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## Connection Descriptions

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### USB-C “Mobile Device” Data & Power Output

The “Mobile Device” receptacle is a standard USB-C receptacle, which is used for the connection between the eSynC and a tablet or mobile phone. This connection provides a power and data connection to the device.

When the eSynC is not powered, the device is not expected to provide power to the eSynC. This behaviour is deliberate to avoid the device accidentally being drained of power by the eSynC and attached peripherals.

The cable should not exceed the 2 meter (6.6 foot) limit defined by the specifications. The cable need not be electronically marked due to the current levels involved.

The USB-C cable **must support both data and charging.**

It does not matter which end of the cable is attached to the device or the eSynC product.

### USB-C “Power Adapter” Input

The “Power Adapter” input is a USB-C receptacle on eSynC products without Power over Ethernet or a built-in voltage converter. This input provides power for the eSynC product, the device, and for attached USB accessories.

The eSynC product does not function if power has not been applied to the Power Adapter input. The eSynC products are not intended to draw power from the mobile device.

A standard USB 5V DC Power Supply is attached to the Power Adapter input. A standard USB power supply is rated at 5 volts nominal, with a 5.25 volts maximum. The typical current rating is 2 amperes for a device with at least a 10-inch screen. A typical USB Power supply is rated at 10 watts (2 amperes at 5 volts DC).

The USB Power Supply provided with most Samsung devices is rated at 5.3 volts and 2 amperes. When using the charge cable provided by Samsung, the voltage delivered to the end of the cable will typically be from 5.0 to 5.1 volts. Some power supplies compensation for wire losses.

The voltage at this input should not be much below 5 volts. The preferred level is 5.1 to 5.25 volts.

The Adaptive Fast Charger being shipped with many Samsung devices is fully compatible. These adapters are rated at 5 volts 2 amperes and 9 volts 1.6 amperes. The eSynC products automatically use the 5-volt option.

The Power Adapter input on the eSynC products can be used with an external USB Power Bank (aka. USB Battery Pack). This ability can be useful in some deployments. The USB Power Bank must be physically removed for recharging.

The cable length between the power supply and the eSynC product must be as short as possible. The cable experiences power loss proportional to the cable length and wire thickness. The voltage present at the eSynC receptacle will be lower than the supply output due to cable power loss. There is power loss in the cable which connects the eSynC to the device. If the voltage at the device is too low, the device will not charge.

The USB specification defines the minimum voltage of 4.75 volts for USB accessories operating at a full unit load. When connecting some accessories to the device via an eSynC product, the cable quality and length must be selected to ensure that the voltage reaching each accessory is at least 4.75 volts as a general rule. Many devices such as mice operate at a lower voltage than 4.75. A power budget must be carefully evaluated for the system if reliable operation is to be ensured.

The models with the Power Adapter input include the eSynC-1U, eSynC-1U-OEM, eSynC-BM-OEM, eSynC-3U, eSynC-E, and eSynC-2UE.

#### **“Aux. Power Adapter” input**

The “Aux. Power Adapter” input is a Micro USB-B receptacle on eSynC PoE products and a USB-C receptacle on certain products with voltage converters.

This input is used for system testing when PoE power **is not** present. The eSynC product will be fully functional, including the 10/100 Ethernet, when this power input is used.

This receptacle **is only** for providing power to the eSynC product.

This power input has the same specifications as the “Power Adapter” Input.

The PoE models include the eSynC-PE and eSynC-P2UE products. The adapters with built-in voltage converters that offer an “Aux. Power Adapter” include the eSynC-vc1U and the eSynC-vc3U.

**Warning:** *When supplying power using the “Aux. 5 Volt” input, you must not use PoE-supplied power or the “9-36 VDC In” receptacle.*

## Barrel Jack “9-36 VDC In”

The eSynC "vc" products require power to be supplied through a DC barrel jack with a 2-millimeter positive center pin. This receptacle is labelled “9-36 VDC In.” The power cable and power supply are supplied by the user.

Many use cases require up to a 24-watt power supply (12 volts at 2 amperes or 24 volts at 1 ampere). The permitted input range is 9 to 36 volts. Any unregulated power supply can be used. This range of supported voltages permits the power supply to be placed up to 50 feet away from the LAVA product when a suitable wire gauge is used.

The minimum power specification for a use case requires developing a power budget based on the USB peripherals to be used and the mobile device. When no external USB peripherals are used, or a few low power peripherals are used, the power supply requirements can drop down to 12 watts (12 volts at 1 ampere, or 24 volts at 0.5 amperes). The internal power converter within the LAVA product is 80% efficient at full load, therefore 12 watts into the product results in 10 watts for system use.

A power supply with a higher power rating than the required minimum is always permitted, and has the benefit of running cooler. As an example, if your system ideally required a 12-volt, 2-ampere power supply, then a 12-volt, 2.5-ampere supply is acceptable.

The length and gauge of wire used to connect the power supply to the LAVA product results in a loss of voltage and therefore power reaching the LAVA product. This additional loss must also be factored into the power budget. A higher power supply voltage is always preferred to minimize the power loss in the wire.

When connecting the eSynC to the supply, ensure the wiring is such that the center pin is positive. If the polarity is reversed, the damage to the eSynC is immediate. Application of the wrong input voltage violates LAVA's Manufacturer Warranty.

The attached power supply and wiring are responsible for providing short circuit protection.

*Note: Fast-charging eSynC “vc” products require at least 12 volts of DC power to operate. On these products, the barrel jack port is labelled, “12-36 VDC In.”*

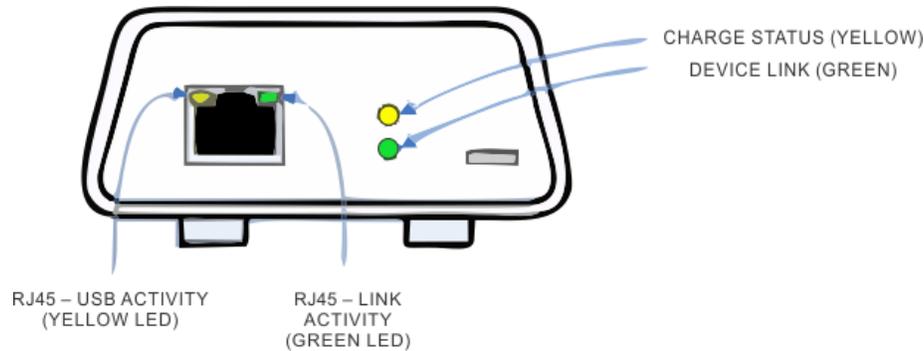
*Note: Since fast-charging eSynC “vc” products require additional power for charging, you should use a 36-volt power supply if you want to power the product from a distance.*

## USB-A receptacles

Several eSynC products support one or more USB 2.0 ports with a standard A-type receptacle. Each receptacle allows a USB Accessory to be accessed by the tablet or mobile phone. Each receptacle provides power to a USB Accessory up to a maximum of 500 mA, as per the USB specification.

## Status LEDs

Each eSynC has 2 primary Status LEDs. The mounting location varies. The eSynC products in a casing always have the 2 primary Status LEDs mounted as shown in the following diagram.



**Figure 1:** Typical eSynC Case

Units with Ethernet support also have two status LEDs mounted in the RJ45 receptacle, which are described in the Ethernet RJ45 section. USB Hub units without Ethernet support have a “USB connect” LED which indicates if a peripheral is connected to the adapter. The "Charge Status" and "Device Link" LEDs are pulsed as a start-up test. The LEDs are pulsed once for an Mk1 device, and 4 times for an Mk2 device.

STATUS LED STATES (for “extended” Mode enabled)			
Name	Colour	State	Description
DEVICE LINK	Green	Rapid blink	See the Charge Status LED description for “rapid blink”.
		1-second blink	See the Charge Status LED description for “1-second blink”.
		On solid	A mobile device has been attached and detected.
		OFF	No mobile device attached.
CHARGE STATUS	Yellow	Rapid blink	The LAVA unit is in the bootloader. When the J15 jumper is installed, the unit remains in the bootloader after power up. All “extended” features are suspended while the bootloader is active.
		1-second blink on both LEDs, and both LEDs are synchronized	The LAVA product is waiting for a mobile device to be attached.
		1-second blink on both LEDs, and when one LED is on the other is off	The LAVA product has detected a mobile device and is waiting for LTM to communicate. If the LTM application was not installed, this LED state does not end and the “extended” features are not functioning.
		Flashing every 1.5 seconds.	Once LTM is running and communicating, the “Device Link” is on solid and the “Charge Status” LED pulses every 1.5 seconds. When the mobile device is being charged, the LED is mostly on. When the mobile device is being discharged, the LED is mostly off. This behaviour is used to diagnose the battery modulation feature and confirm that LTM is operational.
		OFF	The LAVA product has no power.
Note: The 2-pin internal jumper is left open to permit the “extended” features of the eSynC to function. The LTM application must be installed on the mobile device. This is the manufacturing default for all eSynC products.			

STATUS LED STATES (for “extended” Mode disabled)			
Name	Colour	State	Description
DEVICE LINK	Green	On solid	A mobile device has been attached and detected.
		OFF	No mobile device attached.
CHARGE STATUS	Yellow	1-second blink	Power has been applied to the LAVA product.
		Off	The LAVA product has no power.
Note: The 2-pin internal jumper is shorted to disable the “extended” features of the eSynC to function. The LTM application is not required in this state. If the LTM application was present on the mobile device, it will not run and does not harm remaining on the device. In this state, the unit operates with only the “standard” features of the core nSynC products.			

## “Ethernet” RJ45 Port and Indicators

The Ethernet port is an IEEE 802.3 10BASE-T / 100BASE-TX compatible Fast Ethernet interface. The Ethernet port accepts a standard RJ45 connector. The Ethernet port is present on the eSynC-E and eSynC-2UE.

The Ethernet port only functions when the eSynC product is powered. The eSynC products have a dedicated power input and are not intended to draw power from the tablet or mobile phone.

The Ethernet port has two status indicators labelled “USB Activity” and “Link/Activity”.

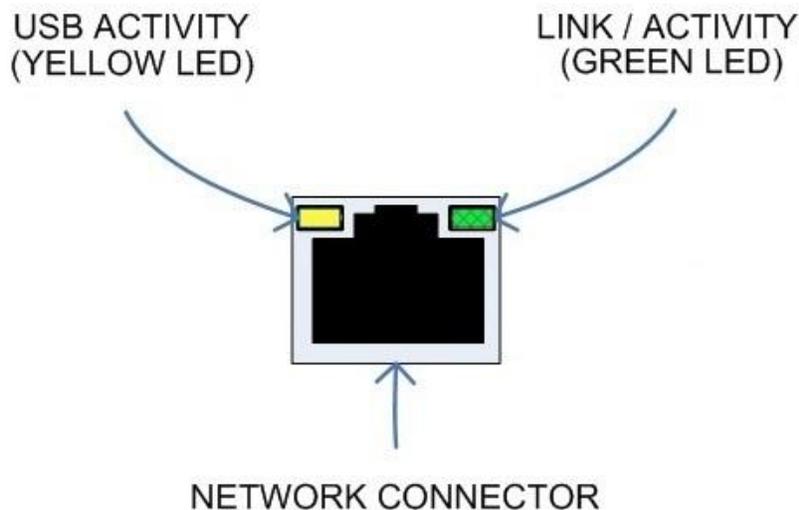


Figure 2: RJ45 Status Indicators

The USB Activity is a yellow indicator. The USB Activity is solid yellow when the eSynC is powered and connected to the device. The USB Activity flashes when there is traffic between the device and an eSynC product.

The Link/Activity is a green indicator. The Link/Activity is solid green when the Ethernet Link has been established. The Link/Activity flashes when there is network traffic through the Ethernet interface. The Link/Activity indicator remains off when the device is not attached.

Both indicators remain off when power has not been applied.

The device setup and status for the Ethernet port are located in the Connections > More networks > Ethernet menu. The Ethernet menu can only be entered when a powered Ethernet adapter is present. The standard device options permit the use of static address assignments or dynamic address assignments via DHCP. This menu reports if the Ethernet adapter is active and serves as the adapter enable.

When using DHCP, the device attempts to fetch the addressing information from a DHCP server. If the addressing information is not located within the timeout period, the device makes no

further attempts. The user must manually retrigger the Ethernet interface to start the DHCP process. The retrigger is a simple matter of pressing the Ethernet "box" again in the "More networks > Ethernet" menu. The eSynC Network Recovery automates the network restart, which is critical for embedding a tablet or mobile phone in an enclosure

When the user disables the Ethernet adapter via the Connections > More networks > Ethernet menu, the adapter remains disabled until enabled again by the user.

### “PoE-Ethernet” RJ45 Port and Indicators

The PoE Ethernet port has all the features of the Ethernet port described in the previous section, as well as the ability to receive power from the network cable. All power for the eSynC product, device charging, and attached USB accessories are provided by the PoE-Ethernet port.

A “PoE-Ethernet” port is present on the eSynC-PE and eSynC-P2UE products.

This port is attached to a Network Switch, which has been configured for PoE operation. Use of a PoE Injector allows a non-PoE switch to be used with the eSynC-PE and eSynC-P2UE.

**Warning:**        *When supplying power using the “Aux. 5 Volt” input, you must not use PoE-supplied power.*

### Internal Jumpers

Each eSynC product has a pair of internal 2-pin jumpers. The jumpers are not installed as a manufacturing default. These jumpers handle special conditions. In practice, most users will never use these jumpers.

Internal Jumpers	
Label	Description
MODE	This 2-pin jumper is used to disable all the extended features of the eSynC, including Battery Modulation. With the jumper installed there is no need to install the LTM application. If the LTM application is present, it does not run.  No jumper permits all extended features to function, and the LTM application must be installed on the tablet or mobile phone. This is the manufacturing default.
J15	The 2-pin J15 jumper forces the Bootloader to be run on power up and remain active. The installed application is not affected. This jumper is used to recover from an upgrade application image which is not behaving correctly. <b>Do not</b> install a jumper on J15.

## Using USB Serial Ports

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An interface once commonly used to access external hardware is an RS232 serial port. This type of interface was once used to connect a variety of devices to a desktop PC such as printers, mice, barcode scanners, and NFC readers. The low hardware and software cost of adding this type of device makes this type of interface still attractive in many devices.

The majority of serial ports use a device referred to as a Universal Asynchronous Receiver Transmitter, or UART for short. This device manages the sending and receiving of data.

There are many standards for serial communications. The RS232 standard defines the most common electrical levels and types of connectors used.

There are several USB UART Adapters available on the market compatible with Android.

The LAVA Tablet Manager v4.\*\* and v5.\*\* have special support for single and multiple user-supplied serial ports. If your system is using a USB serial port, please contact LAVA for additional information.

## Modules: eSynC-1U-OEM and eSynC-BM-OEM

The eSynC-1U-OEM and eSynC-BM-OEM are single-board OEM products intended for system integrators. These are board-only products. It is expected that a system integrator will incorporate the board into a casing.

The eSynC-1U-OEM allows select USB-C devices to work with USB accessories while power is being supplied to the device. A single USB 2.0 Type-A receptacle is available.

The eSynC-BM-OEM provides the battery modulation features of the eSynC Family of products at a very low cost. This board does not support USB accessories.

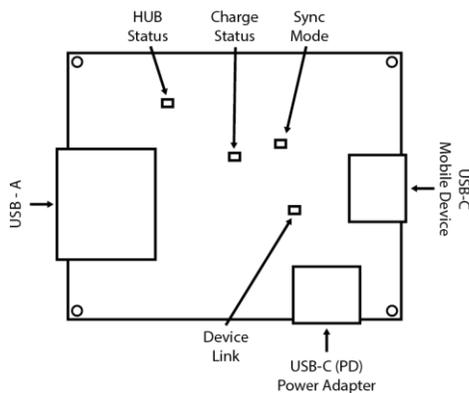


Figure 3: eSynC-1U-OEM

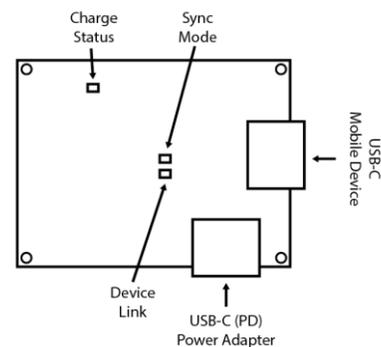


Figure 4: eSynC-BM-OEM

The LAVA Tablet Manager application **must** be installed on the mobile device (tablet or smartphone). When combined with the LTM application, both products support the extended features of Battery Modulation and Screen Brightness Management.

The eSynC-1U-OEM has an internal USB 2.0 Hub which isolates the device from any attached USB accessories. The attached accessories are not permitted to draw more than 500 milliamperes, as per the USB specification.

The “Charge Status” and “Device Link” LEDs are described earlier in this document. These LEDs function in the same manner as the eSynC products that are provided in a case.

The “HUB Status” LED indicates when the USB 2.0 Hub is detected by the mobile device.

The “Sync Mode” LED indicates when the extended features of the board are permitted with the mobile device. The LTM application must also be installed to permit the extended features to operate.

The board and device are powered through a USB-C receptacle using the same USB Power Adapter provided with the device. The standard mobile device USB Power Adapter is rated at 5 volts and 2 amperes, which nominally provides 5.0 to 5.1 volts at the eSynC input. Extending the

original power adapter cable is not wise as the voltage reaching the eSynC may be too low due to cable losses.

When the mobile device is charging, up to 1.3 amperes of current is offered to the device. The power consumption of the LAVA board is negligible. The power supply for an eSynC-1U-OEM should have a capacity of at least 1.8 amperes to allow for power required by an attached USB accessory. The power supply for an eSynC-BM-OEM should have a capacity of at least 1.3 amperes.

The input voltage to the board should be at least 5 volts for proper device operation. Any 5-volt regulated DC power supply can be used with these boards, including USB Power banks. The preferred voltage at the board input is 5.1 to 5.25 volts. The board input voltage **must not** exceed 5.25 volts.

Due to power loss across the connecting cables, the designer must ensure that the voltage is not too low at any point in the system. Power loss is an issue that applies to all USB cables in the system.

The power supply used to run the system is responsible for handling over current conditions.

The power connectors have no protection against overvoltage or reversed connections. Application of the wrong voltage can result in **immediate** damage to the board and possibly other components in the system.

Ethernet-related features described in this document do not apply to these boards.

Application of the wrong input voltage violates LAVA's Manufacturer Warranty.

## LAVA Tablet Manager (LTM) Configuration File

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### Overview

The LAVA Tablet Manager is configured by the file LTM\_CFG.txt located in the “Internal Storage\Android\data\com.lava.tabletmanager7\files\” folder of the mobile device.

The LTM setup is typically managed using the configuration manager built into LTM. When the Configuration Console is active, the “GO TO CONFIGURATION” button enters the configuration manager, which allows all common features to be managed.

The LTM\_CFG.txt file is a simple human-readable UTF-8 ASCII file. The file can also be modified using a text editor on a PC, as most devices do not have a suitable editor installed. Changes to the file are copied to the “InternalStorage\Android\data\com.lava.tabletmanager7\files\” folder and are automatically used by LTM.

A configuration file update can be placed in the \Download or \Contents folder and is then automatically read by the LTM application. The \Contents folder is created by the Samsung’s KNOX Configure service and is not present as a default definition.

The LTM\_CFG.txt file can be copied to the device at any time.

All lines starting with a ';' character are ignored. Lines starting with a '#' character can be used as comments.

The configuration file tokens are not case sensitive.

The configuration file contains a set of tokens and values with the format of "token=x", where 'x' is a decimal integer.

The LTM configuration must be present for LTM to run.

**Note:** *This document only refers to LTM v4.\*\* and v5.\*\*.*

## Commands and Parameters

INI Command	Description
lrm-setup-rev=x	This keyword is set by the configuration manager to indicate the last time the file was updated.
product-family=x	<b>The “product-family=2” must be set for eSynC products supporting battery modulation.</b>  The permitted range is 1 to 2. The value 1 is used for SimulCharge products (such as eSTS). The default is 2.
btty-protection-type=x	The “btty-protection-type” keyword selects the battery protection mechanism to be used. The options are 1 or 2 based on the mobile device being used.  The selection used must match the mobile device capabilities. Mobile devices may only implement a sub-set of the USB-C PD specification, which requires LAVA test each model to verify the level of compatibility.  eSynC Mk1 products only the “btty-protection-type=1”. eSynC Mk2 products support both “btty-protection-type=1” and “btty-protection-type=2”.  Using “btty-protection-type=2” with an eSynC Mk1 results in the device charging to 100%.
board-type=x	The “board-type” keyword <b>is not used with eSynC</b> products. With “product-type=1” set, the “board-type” keyword is ignored and the “btty-protection-type” keyword is used to define the battery protection type.
btty-upper-threshold=x	The standard upper limit for battery charging as a percentage. The permitted range is 20 to 100. The default is 75.
btty-lower-threshold=x	The standard lower limit for battery charging as a percentage. The permitted range is 1 to 100. The default is 45.
btty-cycle-limit-on-start=x	The number of charge cycles after startup before a "full" charge cycle is forced. For a "full" charge cycle the btty-cycle-lower-threshold and btty-cycle-upper-threshold are used. The permitted range is 0 to 100. A value of 1 is treated as 2. The default is 2.
btty-cycle-limit=x	The number of charge cycles before a "full" charge cycle is used. For a "full" charge cycle the btty-cycle-lower-threshold and btty-cycle-upper-threshold are used. The permitted range is 1 to 9999. Values less than 4 are treated as 4. The default is 50.
no-btty-modulation=x	This command can be used to disable the battery modulation. The LTM application continues to run and provide other extended features such as network recover and screen brightness management. A “1” results in: no battery modulation and all battery thresholds are internally set to 100. A “0” permits battery modulation. Disabling battery modulation is not recommended. The ability is present for internal testing. The permitted range is 0 to 1. The default is 0. Sorry for the use of reverse logic.
permit-ethernet=x	This command is used to enable the Ethernet related features of LTM. The permitted range is 0 to 1. A 1 permits the Ethernet features. A 0 disables the Ethernet features. The default is 1.
dhcp-recovery=x	A dhcp-recovery value of 1 or 2 enables the Network/DHCP Recovery mechanism. When the network connection is lacking for approximately 1 minute, a network reset is attempted. A value of 0 disables the mechanism. The permitted range is 0 to 2. The default is 1.  A dhcp-recovery value of 1 results in subsequent recovery attempts taking place after 2, 3, 5, and then 8 minutes. After the first four recovery attempts, then subsequent attempts are every 8 minutes.  A dhcp-recovery value of 2 results in subsequent recovery attempts taking place every 2 minutes.

wifi-overrides-ethernet=x	This command allows the wired Ethernet interface to be disabled when Wi-Fi is enabled. The permitted range is 0 to 1. A "1" results in the Ethernet interface being disabled if Wi-Fi is enabled. A "0" results in the Ethernet interface being active if Wi-Fi is enabled, and the Android system determines how messages are routed. The permitted range is 0 to 1. The default is 0.
update-timeouts-automatically=x	The command determines if LTM updates the state of the timeouts in the LAVA product. A value of 0 results in no updates. A value of 1 results in LTM updating the timeouts. The default is 1.
recovery-timeouts-enabled=x	The command determines if the recovery timeouts in the LAVA product are enabled. The value is written to be LAVA product only if update-timeouts-automatically is 1. A value of 0 disables the timeouts. A value of 1 enables the timeouts.
brightness-level1-time=x	Time of night when the "level 1" brightness is set. The military (aka 24 hour) time format is used. The default is -1, which disables the brightness timers. Examples: 0:00 for midnight, 7:30 for 7:30AM, 23:15 for 11:15PM Note: The format expects an ':' to separate the hour and minutes. Note: If one integer is present, it is treated as hours, with minutes defaulting to 0. Note: If minutes exceed 59, then time is invalid. Note: If hours exceed 23, the time is invalid. Note: A negative time (ex. -1) disables all brightness thresholds Note: If the brightness times are valid and equal, then brightness-level2 is always applied.
brightness-level2-time=x	Time of day when the "level 2" brightness is set. Same format and rules as used by brightness-level1-time The default is -1, which disables the brightness timers.
brightness-level1=x	Screen brightness used by "brightness-level1-time". The permitted range is 0 to 100. The default is 15. Invalid values are replaced with the default.
brightness-level2=x	Screen brightness used by "brightness-level2-time". The permitted range is 0 to 100. The default is 85.
hardware-reset-frequency=x	This command defined the number of hours the LTM application runs before a hardware reset is performed as defined by the "hardware-reset-action". The permitted range is 0 to 5000. The default is 0, which disables the feature.
hardware-reset-time-1=x	The "hardware-reset-time-1" and "hardware-reset-time-2" define the start and end of the window in which a hardware reset is permitted as controlled by the "hardware-reset-frequency". See the "hardware-reset-frequency" description for further information. The time used the same format as used by brightness-level1-time. A negative value disables the parameter and the time window. The "hardware-reset-time-1" and "hardware-reset-time-2" must be different valid times to enable the window. The default is -1, which disables the feature.
hardware-reset-time-2=x	The "hardware-reset-time-1" and "hardware-reset-time-2" define the start and end of the window in which a hardware reset is permitted as controlled by the "hardware-reset-frequency". See the "hardware-reset-frequency" description for further information. The time used the same format as used by brightness-level1-time. A negative value disables the parameter and the time window. The "hardware-reset-time-1" and "hardware-reset-time-2" must be different valid times to enable the window. The default is -1, which disables the feature.
hardware-reset-action=x	This command determines the action to take once the "hardware-reset-frequency" limit is reached. An eSynC hardware reset has the same effect as removing power from the board and then restoring power. The possible values for the command and associated action are: 0=nothing 1=eSynC reset (the default)

permit-ltm-icon=x	<p>This command determines if the LTM Notification Icon is visible or transparent.  A 1 enables the LTM icon. This is the default.  A 0 disables the icon, which is made transparent.  It is not possible to eliminate the icon. The notification text is always present.  This feature was added in LTM v2.03.</p>																														
log-file-rate=x	<p>The number of minutes between updates of the diagnostic log file.  The log file records the battery level and several other relevant statistics.  A value of 0 results in updates only for changes in charge direction.  The permitted range is 0 to 1440.  The default is 0.</p>																														
log-file-limit=x	<p>The maximum size of the diagnostic log file.  The value is in units of 1000000.  The permitted range is 0 to 100.  A 0 disables logging.  The default is 0.</p>																														
user-debug=x	<p>This command enables a set of Toast based status messages suitable for the user.  The messages report the general state of the LTM application and device.  The permitted range is 0 to 3. The default is 1.</p> <table border="1"> <thead> <tr> <th>Level</th> <th>Messages</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>No status messages</td> </tr> <tr> <td>1</td> <td>“LTM - controller attached”</td> <td>The device has detected the eSynC board.</td> </tr> <tr> <td>1</td> <td>“LTM - controller running”</td> <td>The LTM application has started to operate.</td> </tr> <tr> <td>1</td> <td>“LTM - controller detached”</td> <td>The eSynC has disconnected from the device.</td> </tr> <tr> <td>1</td> <td>“LTM - brightness update”</td> <td>The LTM application has updated the device screen brightness.</td> </tr> <tr> <td>1</td> <td>“LTM – inhibit in effect”</td> <td>The LTM application was not allowed to run as “ltm-inhibit=1” is set in the configuration file.</td> </tr> <tr> <td>2</td> <td>“LTM - charging nn%”</td> <td>The device battery is charging. The current battery level is “nn” percent.</td> </tr> <tr> <td>2</td> <td>“LTM - discharging nn%”</td> <td>The device battery is discharging. The current battery level is “nn” percent.</td> </tr> <tr> <td>3</td> <td>“LTM - PASS #nn”</td> <td>The pass number “nn” increments each time the LTM application runs.</td> </tr> </tbody> </table> <p>Note: Each level includes the messages of the lower levels.</p>	Level	Messages	Comments	0		No status messages	1	“LTM - controller attached”	The device has detected the eSynC board.	1	“LTM - controller running”	The LTM application has started to operate.	1	“LTM - controller detached”	The eSynC has disconnected from the device.	1	“LTM - brightness update”	The LTM application has updated the device screen brightness.	1	“LTM – inhibit in effect”	The LTM application was not allowed to run as “ltm-inhibit=1” is set in the configuration file.	2	“LTM - charging nn%”	The device battery is charging. The current battery level is “nn” percent.	2	“LTM - discharging nn%”	The device battery is discharging. The current battery level is “nn” percent.	3	“LTM - PASS #nn”	The pass number “nn” increments each time the LTM application runs.
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ethernet-debug=x	<p>This command enables a set of Toast based messages suitable for the user. The messages report the status of the Ethernet interface. The permitted range is 0 to 3. The default is 1.</p> <table border="1" data-bbox="527 289 1398 630"> <thead> <tr> <th>Level</th> <th>Messages</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>No status messages</td> </tr> <tr> <td>1</td> <td>“LTM – ethernet connected”</td> <td>Reported when the Ethernet state changes from not connected to connected.</td> </tr> <tr> <td>1</td> <td>“LTM – ethernet not connected”</td> <td>Reported when the Ethernet state changes from connected to not connected.</td> </tr> <tr> <td>2</td> <td>“LTM – ethernet not connected”</td> <td>Reported each pass of the LTM application if the Ethernet interface is not connected to the network. The message repeats every 30 seconds.</td> </tr> <tr> <td>3</td> <td>“LTM – ethernet remains connected”</td> <td>Reported each pass of the LTM application if the Ethernet interface is connected to the network.</td> </tr> </tbody> </table> <p>Note: Each level includes the messages of the lower levels.</p>	Level	Messages	Comments	0		No status messages	1	“LTM – ethernet connected”	Reported when the Ethernet state changes from not connected to connected.	1	“LTM – ethernet not connected”	Reported when the Ethernet state changes from connected to not connected.	2	“LTM – ethernet not connected”	Reported each pass of the LTM application if the Ethernet interface is not connected to the network. The message repeats every 30 seconds.	3	“LTM – ethernet remains connected”	Reported each pass of the LTM application if the Ethernet interface is connected to the network.
Level	Messages	Comments																	
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## Diagnostic Log File

The LTM application has the option to write the battery status to a diagnostic log file.

The file format is UTF-8 (simple ASCII). The file can be read on a PC using any text editor.

The log file is located in the “Internal Storage\Android\data\com.lava.tabletmanager7\files\” folder. The log file name is LTM\_\*\*\*\_LOG.txt. The \*\*\* portion of the file is the device serial number.

The “log-file-rate” defines the number of minutes between updates of the diagnostic log file. The permitted range is 0 to 1440, with a default of 0. A value of 0 results in updates only for changes in charge direction.

The “log-file-limit” defines the maximum size of the diagnostic log file in units of 1000000 characters. The permitted range is 0 to 100, with a default of 0. A 0 disables the log file.

The log file can be erased at any time. The LTM application always appends new information.

When the log file is created, the current configuration settings from the configuration file are written to a header in the file. Subsequent changes to the configuration file are not written until a new log file has to be created.

Each line of data contains 16 fields. A comma separates each field of data. The first line after the header contains a short “title” for each field, which is useful for some graphing applications.

Diagnostic Log File – Field Descriptions												
Field	Title	Description										
1	ID	The ID field contains an ‘L’ followed by an integer indicating the log source.										
		<table border="1"> <thead> <tr> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>Periodic log entry as selected by "log-file-rate"</td> </tr> <tr> <td>L2</td> <td>Charging state change</td> </tr> <tr> <td>L4</td> <td>LTM application has started (or possible re-started)</td> </tr> <tr> <td>L8</td> <td>Hardware reset requested. The action was determined by the "hardware-reset-action" command.</td> </tr> </tbody> </table>	Value	Description	L1	Periodic log entry as selected by "log-file-rate"	L2	Charging state change	L4	LTM application has started (or possible re-started)	L8	Hardware reset requested. The action was determined by the "hardware-reset-action" command.
		Value	Description									
		L1	Periodic log entry as selected by "log-file-rate"									
		L2	Charging state change									
L4	LTM application has started (or possible re-started)											
L8	Hardware reset requested. The action was determined by the "hardware-reset-action" command.											
2	DT	Timestamp as the number of seconds since midnight January 1, 1970, UTC.										
3	UT	Device up time in seconds.										
4	AC	The Activity Count is a counter that advances each time the LTM application runs. The value is reported as “PASS #” when the “user-debug” level is set.										
5	BCI	The Battery Charge Index is an internal counter used to keep track of the charging state of the battery.										
6	BL	The Battery Level is the battery charge level as a percentage.										
7	HLTH	The Android Health parameter is reported here.										
8	BI	The Battery Current is reported in units of mill-amperes.										
9	BV	The Battery Voltage is reported in units of millivolts.										
10	BT	The Battery Temperature is reported in degrees Celsius * 10.										
11	NR	The Network Reset Count is the number of times a reset of the Ethernet interface was requested since the last log entry.										
12	BN	The Brightness Number ranges from 0 to 2. A value of 2 indicates the “daytime” brightness is active. A value of 1 indicates the “nighttime” brightness is active. A 0 indicates the LTM application is not controlling the device screen brightness.										

13	SUT	Service Up Time (internal use)
14	LMD	Low Measurement Detect (internal use)
15	UD	Report all UARTs dropped (internal use)
16	FT	(product family * 10) + protection-type

## Sample LTM\_CFG.txt Configuration File

```
; Generated by LAVA Tablet Manager (LTM) v4.00
;
; When product-family=1 is used, board-type defines the protection type.
; When product-family=2 is used, tty-protection-type defines the protection type.
;
; When product-family=1 is used, board-type defines the protection type.
; When product-family=2 is used, tty-protection-type defines the protection type.
;
[LTM-START]
product-family=2
tty-protection-type=1
board-type=1
permit-ltm-icon=1
;
no-tty-modulation=0
tty-upper-threshold=75
tty-lower-threshold=45
tty-cycle-limit=50
;
permit-ethernet=1
dhcp-recovery=1
wifi-overrides-ethernet=1
;
brightness-level1-time=1:00
brightness-level2-time=6:00
brightness-level1=15
brightness-level2=85
;
hardware-reset-frequency=0
hardware-reset-time-1=-1
hardware-reset-time-2=-1
hardware-reset-action=0
;
update-timeouts-automatically=1
recovery-timeouts-enabled=1
;
log-file-rate=0
log-file-limit=0
;
user-debug=1
ethernet-debug=1
;
tty-cycle-limit-on-start=2
;
ltm-setup-rev=2020/11/02,13:58:51
;
[LTM-END]
```

## The “LAVA Device Info” Utility

---

This utility is used to verify the firmware version and settings of an eSynC, LAVA eSTS, or STS-RBM product. Installation of this utility is optional.

Pressing SCAN FOR DEVICE is used to check for a LAVA device and then report the device information.

The ENABLE TIMEOUTS button enables the 7-minute recovery timeout. This button is presented after a device is detected and the timeouts are currently disabled.

The DISABLE TIMEOUTS button disables the 7-minute recovery timeout. This button is presented after a device is detected and the timeouts are currently enabled. Disabling the timeouts permits the LAVA product to function without LAVA Tablet Manager being installed. LTM is generally configured to restore these timeouts for reliable operation with LTM.

The RESTORE DEFAULTS resets the board to the manufacturing defaults. The *Power Watchdog* and *Keep Alive Timeouts* are disabled as a manufacturing default. This button is presented after a device is detected and the firmware version includes the required support. The RESTORE DEFAULTS is not available in all product versions.

The eSynC and eSTS products have an internal 2-pin jumper labelled MODE. When this jumper is installed, the extended features of the product are disabled, and the product cannot be detected by this utility. The jumper is installed when the mobile device is not going to use LTM. With the jumper installed, there are no timeouts to deal with. The factory default does not install this jumper. Therefore, the extended features are active as the factory default.

With the timeouts enabled, the LAVA board is expecting messages from LTM. If no messages are received within the timeout period, all attached USB devices are briefly disconnected and reconnected every 7 minutes in an attempt to force LTM to run. As of late 2018, all LAVA devices are shipped with the timeouts disabled as a manufacturing default. Disabling the Timeouts with this utility is useful when LTM is not being used and it is not convenient to install the 2-pin MODE jumper.

There are two generations of eSynC product. The original generation of products is reported as “LAVASynC+”, and is also referred to as the “LAVASynC+ Mk1”. The second generation of products is reported as “LAVASynC+ Mk2”.

The utility must be used with caution when LTM is installed on the mobile device. No harm can be done by running to two applications, however, note that LTM can also modify the Timeouts settings.

*Note: The LAVA-Device-Info utility is a useful addition for LTM 3 users. However, it is redundant for users of LTM v4.\*\* and v5.\*\*. Its features are built into the app.*

## **The “LTM Setup” Utility**

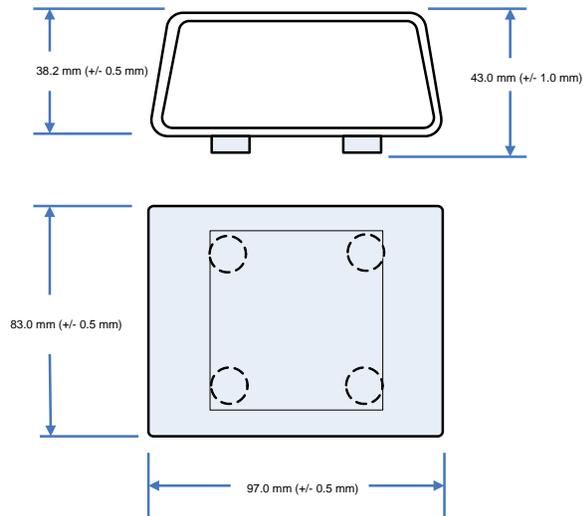
---

The “LTM Setup” utility was a standalone Android application used to manage the configuration file for earlier versions of LTM. The LTM v1.\*\*, v2.\*\*, and v3.\*\* had no display component built in.

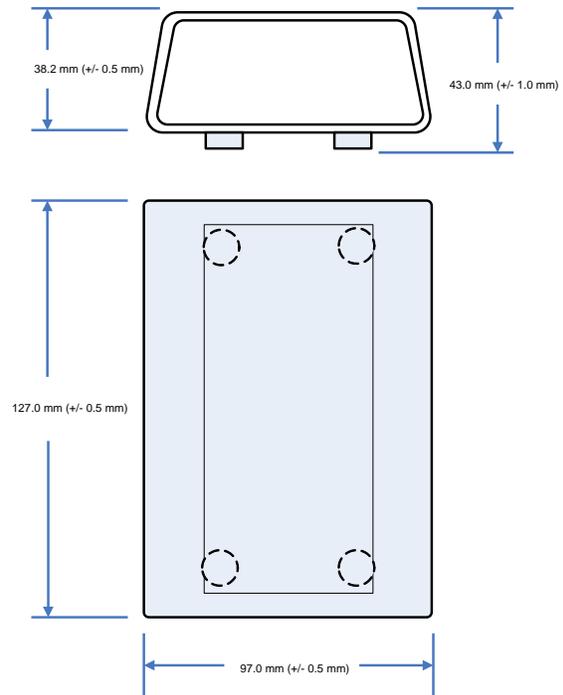
The LTM v4.\*\* and v5.\*\* now have built-in support for configuration management, which eliminates the need for an external utility. Also, LTM v4.\*\* and v5.\*\* use a different location and name for the configuration file. The file location was changed for compatibility with the newer versions of Android. The configuration file name was changed to use a “txt” suffix to allow standard Android applications to view the file.

The “LTM Setup” utility should be removed from the mobile device.

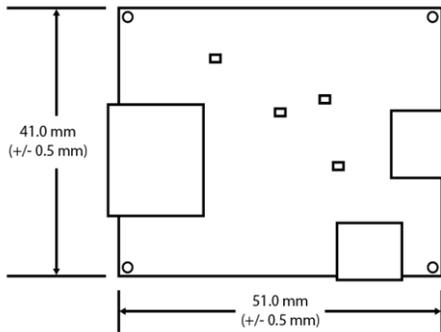
## Dimensions



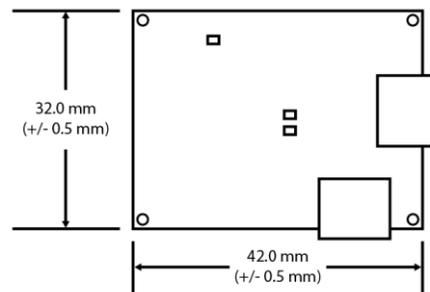
**Figure 5:** Case dimensions for the eSynC-3U, E, PE, 2UE, P2UE, vc3U, vc2UE, vc1U, and vcE



**Figure 6:** Case dimensions for the eSynC-vc5UE



**Figure 7:** Dimensions of the eSynC-1U-OEM board



**Figure 8:** Dimensions of the eSynC-BM-OEM board

## Technical Support

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LAVA Technical support is open from 9:00 am to 5:00 pm Monday through Friday (EST).

Telephone: +1 416 674-5942

Toll-Free (US and Canada): 1 800 241-5282

Internet: [www.lavalink.com/helpdesk](http://www.lavalink.com/helpdesk)