



# LAVASynC+ Product Family Reference Manual

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## Abstract

The LAVASynC+ family of products permits the charging of select Samsung mobile devices while simultaneously interacting with USB-C, USB type accessories. The LAVASynC+ products share the core set of features present in all LAVASynC products, as well providing “extended” features such as battery modulation, screen brightness management, and improved network operation. All devices supported use the USB-C interface.

This document describes the features of the LAVASynC+ products in detail.

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## Introduction

The LAVASynC+ products allow select Samsung tablets and mobile phones to operate as a USB Host while simultaneously being charged. The LAVASynC+ products share the core set of features common to all LAVASynC products, as well providing “extended” features such as battery modulation, screen brightness management, and improved network operation. All devices supported use the USB-C interface.

While the LAVASynC products permit operation with potentially any USB-C based tablet or mobile phone, the LAVASynC+ products only work with select Samsung devices due to critical features unique to the Samsung devices. The "extended" features rely on a combination of LAVA hardware and software. This document discusses only the LAVASynC+ products.

The LAVA Tablet Manager (LTM) application **must** be installed to support a LAVASynC+ product.

LAVASynC+ Product Family Overview						
Product	USB 2.0 Ports [Type A]	Ethernet Adapter	Power over Ethernet	5 VDC Input [USB-C]	12/24 VDC Input [Barrel]	Description
LAVASynC+ PE	-	YES	YES	Optional	-	Ethernet Adapter with PoE
LAVASynC+ E	-	YES	-	YES	-	Ethernet Adapter
LAVASynC+ P2UE	2	YES	YES	Optional	-	2-port USB Hub & Ethernet Adapter with PoE
LAVASynC+ 2UE	2	YES	-	YES	-	2-port USB Hub & Ethernet Adapter
LAVASynC+ 3U	3	-	-	YES	-	3-port USB Hub
LAVASynC+ vc5UE	5	YES	-	-	Yes	5-port USB Hub & Ethernet Adapter
LAVASynC+ vc3U	3	-	-	-	Yes	3-port USB Hub
LAVASynC+ vc2UE	2	YES	-	-	Yes	2-port USB Hub & Ethernet Adapter
LAVASynC+ vc1U	1	-	-	-	Yes	1-port USB Hub
LAVASynC+ vcE	-	YES	-	-	Yes	Ethernet Adapter
LAVASynC+ 1U-OEM	1	-	-	YES	-	1-port OEM Adapter (board only)
LAVASynC+ BM-OEM	-	-	-	YES	-	Charging-Board Adapter (board only)
Note: LAVASynC+ products <b>require</b> the installation and activation of the LAVA Tablet Manager application.						

## System Requirements

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The LAVASync+ products operate with a group of Samsung tablets and mobile phones. These devices must implement specific aspects of the USB-C Power Delivery specification. Please contact LAVA Sales or Technical Support for the current list of tested devices.

The Samsung device **requires** the installation of the LAVA Tablet Manager (LTM) application, which is provided by LAVA. The "LAVASync+ Installation Manual" describes the setup procedure for the LAVASync+ product and LTM application. The LTM installation requires a brief WiFi connection for a one-time activation of the Samsung KNOX license. The KNOX license does not have an additional fee.

The Samsung device must include the Samsung Knox 2.6 or newer. The devices using Knox 2.\* must also include the Samsung Knox Standard SDK version 5.1 or newer. The SDK version information is available in the device's "About device" information.

**The Samsung devices using Knox 3.0 and newer must use the LTM v3.00 or newer. These units are typically running Android 8.0 or newer.**

**The Samsung devices running Android 7.0 and at least Knox 2.7 can use LTM v3.00 or newer.**

**The Samsung devices running Android 6.0 and at least Knox 2.6 must use LTM v2.03. The Android 6 devices with the older Knox are not compatible with LTM v3.\*.**

The LAVASync+ product is connected to a device using a standard USB-C to USB-C cable provided by the user. The USB-C cable **must support data and charging**. The cable may be up to 2 meters (6.6 feet) in length. The cable need not be electronically marked as the current levels are always less than 3 amperes.

The LAVASync+ products work with unrooted Samsung devices.

The LAVASync+ 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 a LAVASync+ PoE product. A PoE Power Injector is a standard add-on available from many Network Switch vendors.

The LAVASync+ 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 Samsung device and USB accessories, can be used. The USB Power supply should be able to provide 5 volts with at least 2 amperes.

The LAVASync+ "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 11 to 36 volts. These products are ideal for automotive based installations which are based on a 12-volt or 24-volt battery.

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 device features used by the LAVA products are not universal across the Samsung tablet and mobile phone line of devices. Samsung tailors the 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 behavior of the model of device and firmware build to be used before committing to any deployment.

## Product Features

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### Overview

The LAVASynC+ and LAVASynC products share the following core features:

- ❑ USB Host operation with simultaneous device charging
- ❑ Up to five USB-2.0 receptacles
- ❑ Wired networking (10/100 Ethernet) support
- ❑ Option for Power over Ethernet (PoE) support
- ❑ Option to be powered from a 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 LAVASynC+ products include the above core features as well as the following extended features:

- ❑ Support for installations running 24/7
- ❑ Battery modulation for the tablet or mobile phone longevity
- ❑ Enhanced Network Management for reliable network operation
- ❑ Screen brightness control for reduced heat generation
- ❑ Maintenance reset of a tablet or mobile phone
- ❑ Android USB permission handling using the Samsung KNOX SDK
- ❑ Android USB permission handling for up to two user peripherals

The LAVASynC+ extended features rely on the LAVA unit working in unison with the LTM application (LAVA Tablet Manager). Installation of the LTM application is mandatory before using a LAVASynC+ product.

### USB Host Operation with Simultaneous Charging

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

The Samsung devices documented in the Test Summary 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 LAVASync+ products include an internal USB 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 LAVASync+ 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 for the system must have sufficient capacity for the mobile device, LAVASync+ hardware, and attached USB accessories.

A LAVASync+ product must be powered for a USB-A receptacle to function. The LAVASync+ 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 (LTM) is an Android application provided by LAVA for use with the LAVASync+ products. This application must be installed on the tablet or mobile phone to manage each LAVASync+ product. The "LAVASync+ Installation Manual" describes the installation procedure. This application runs as a background service on the device. This application has no displayable component.

The LTM Service and related features are configured using a simple configuration file placed in the Internal Storage \ Download or \Contents folder of the tablet or mobile phone. The file name is LTM.INI. The LTM.INI file can be modified on any PC using a standard text editor. Updating the LTM.INI file on the device can be performed at any time. The LTM.INI file commands are described in a dedicated section later in this document.

The "LTM Setup" utility can be used to view and modify the LTM.INI file on the tablet.

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

*Note: The \Contents folder is created by the Samsung's KNOX Configure service and is not present as a default definition.*

*Note: Please see the System Requirements section for comments on which version of LTM is correct for the mobile device being used.*

*Note: Failure to correctly install and activate LTM results in USB devices being briefly disconnected every 7 minutes when the LAVASync+ Timeouts are active.*

*Note: It is possible to use the LAVASync+ without LTM if the Power Watchdog Timeouts and Keep Alive Timeouts are disabled. The easiest way to disable the timeouts is to use the LAVA Device Info application. The other method to use the LAVASync+ without LTM is via the internal MODE jumper, which is described later in this document. The extended features are lost if LTM is not used, however there are instances when this may be acceptable.*

## 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 low set point. This feature electronically mimics the process of charging a battery and then disconnecting the charger. This behavior follows the expected use-case for a tablet or mobile phone. After a set number of user-defined charge/discharge cycles, a "full" cycle is performed to reset the device battery calibration.

Battery Modulation ensures the device battery never remains at the 100% level for more than a few minutes over a month, which prevents overcharging. This behavior makes the LAVASynC+ 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.INI configuration file.

The sample LTM.INI sets following parameters and represents a typical battery modulation configuration:

```
bttty-upper-threshold=70
bttty-lower-threshold=45
bttty-cycle-upper-threshold=100
bttty-cycle-lower-threshold=45
bttty-cycle-limit-on-start=2
bttty-cycle-limit=50
```

The above sample sets the upper and lower battery charge thresholds at 70% and 45% respectively. Every 50 charge cycles the upper threshold is taken as 100%. Within a minute of reaching the 100% level, the device starts discharging down to the 45% level. In this example, 45% is used for both low thresholds.

The "bttty-cycle-limit-on-start=2" results in a full cycle being run two cycles after the LTM Service is started. The "bttty-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 "bttty-cycle-limit-on-start" is optional.

## Wired Network Operation

Many LAVASynC+ 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 WiFi 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 as well as serving as the adapter enables.

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 LAVASynC+ 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 WiFi for network access rather than the wired Ethernet support of the LAVASynC+ product. The LAVASynC+ product's Ethernet interface can be disabled when WiFi is enabled using the LTM.INI command "wifi-overrides-ethernet=1".

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



## Network Recovery Operation

The LAVASyncC+ 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 fails, or the 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 behavior 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 and if the connection is lost, and then 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, the 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.INI file.

## 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.

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 nighttime 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 nighttime 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 nighttime 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.

Using this feature is recommended but remains optional.

Using this feature requires the time to be correct on the device.

Using this feature requires that auto-brightness of a device is turned off.

This feature requires that LTM be permitted to change system settings. The only system setting manipulated is the screen brightness setting. When using LTM 3.0 or newer, 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 LTM.INI 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 LTM.INI values are restored within a minute.

## Permission Handling for USB Devices

Standard Android USB peripherals include keyboards, mice, memory sticks, and hard drives. These peripherals require no special permission from the user to add them to a system.

Any USB peripheral which is a non-standard peripheral results in an Android permission pop-up window when accessed by an application. The pop-up window asks the user if they grant permission for a given application to work with the specified USB peripheral. The permission must be granted every time the peripheral connects to the tablet or mobile phone. This permission window cannot be bypassed on a system which is not rooted unless it supports the Samsung KNOX SDK.

### Typical USB Permission Pop-Up Window



The LAVA Tablet Manager (LTM) suppresses the USB permission pop-up window for peripherals, using the Samsung KNOX SDK.

The USB devices built into a LAVA product are handled by LTM with no user setup required.

Up to two user peripherals can also be handled by LTM. Each user peripheral requires the setup of three parameters in the LTM configuration file.

To allow LTM to handle permission for a user's USB peripheral, the following information is required:

- The USB Vendor Identifier (as a decimal integer)
- The USB Product Identifier (as a decimal integer)
- The Android Package Name of the application to be used

The "LTM Setup" utility can be used to quickly set the parameters for USB Permission handling, or the LTM.ini file can be manually modified. The "LTM Setup" utility simplifies the lookup of the Android Package Name for the targeted application.

The USB vendor identifier and product identifier can be quickly determined for a peripheral using an application such as "USB Device Info," which is available on GooglePlay. The application package name can be provided by your application developer or by using "LTM Setup".

The LTM configuration file must be set up with the above information using the USB Permission Handling commands, which are "uph-package-N", "uph-vid-N", and "uph-pid-N," where "N" is either a "1" or a "2". The LTM v2.00 supports two sets of parameters for user permissions.

An example below shows the LTM configuration commands for an NFC reader with Vendor Identifier 1027, Product Identifier 24577, and an application with a package name of "com.lava.util.acr122u":

#### Using command set 1 ('N' = 1):

```
uph-package-1=com.lava.util.acr122u
uph-vid-1=1839
uph-pid-1=8704
```

#### Using command set 2 ('N' = 2):

```
uph-package-2=com.lava.util.acr122u
uph-vid-2=1839
uph-pid-2=8704
```

NOTE 1: Handling USB permissions for user peripherals is present in LAVA Tablet Manager v2.00 and later.

NOTE 2: There are special rules for using a USB Serial Port Adapter (aka UART). Please contact LAVA if you plan to use one or more USB Serial Port Adapters.

## Power Options

Most LAVASynC+ 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 Samsung 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 LAVASynC+. 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 LAVASynC+ PE and LAVASynC+ 2UE 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 a LAVASynC+ PE or LAVASynC+ P2UE based system, even when wired Ethernet is not required by the customer application.

The LAVASynC+ "vc" products are designed to operate from a 12 or 24 VDC unregulated power supply. This power option is ideal in vehicle-based applications or any stand-alone unit running from a storage battery. In a retail or business environment, this option permits the power brick to be placed a considerable distance from the LAVASynC+ 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.

## Power-over-Ethernet Support

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

The LAVASync+ 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 330 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 LAVASync+ product. These LAVASync+ 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 LAVASync+ PoE provides 10.4 watts of power for the device, the LAVASync+, 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 LAVASync+ 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 LAVASync+ **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 LAVASync+ products **do not** provide diode protection between the module and the peripheral ports.

The LAVASync+ PoE products do not function if power is not available from the PoE-ETHERNET interface or the “Aux. Power Adapter” input. The LAVASync+ 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 a LAVASync+ module. The “Aux. Power Adapter” input is described in a separate section of this document.

The PoE models include the LAVASync+ PE and LAVASync+ P2UE products.

## Maintenance Reset of System

Samsung tablets and mobile phones are consumer market devices. Running a device for an extended period is not the intended use-case. The nature of the application being run may require the device to be periodically reset to clean up the internal resources of the device.

The LAVASynC+ system has the option to reset the device and LAVASynC+ board every 'n' hours of operation. After 'n' hours of operation, the reset action can be postponed until a time window has been reached that will not interfere with the user experience.

The sample LTM.INI file located later in this document has the following settings included:

```
hardware-reset-frequency=240
hardware-reset-time-1=1:00
hardware-reset-time-2=2:00
hardware-reset-action=0
```

The sample LTM.INI settings result in the device and LAVASynC+ reset being scheduled every 240 hours, with the action delayed until a window of 1 AM to 2 AM. The hardware-reset-action is set to 0 in the default LTM.INI, which results in no action. If this feature is desirable, then review the potential actions as described in the "LAVASynC+ Product Family – Reference Manual." The sample configuration is arbitrary.

## 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. Samsung devices are a consumer market device, and running one for an extended period is not the intended use-case. The standard device behavior can result in the LAVA Tablet Manager (LTM) being shut down after a period of time. The LAVASynC+ has several safeguards to ensure LTM will continue to function.

Additional "watchdog" features include the Low-Level Detect (LLD), Low Voltage Detect (LVD), and Stuck Level Detect (SLD) mechanisms added in LTM v2.00. 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, 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 active as a default.

## Firmware Update Support

The application firmware of each LAVASynC+ board can be updated in the field. The update file is placed in the Download folder of the tablet or mobile phone. The LTM application detects the update image within a minute and begins the update process. The update takes 1 to 2 minutes. Normal system operation is restored after the update.

Once the update is finished, the update file is automatically removed from the Download folder.

The update process is immune to problems such as a power interruption.

The update file name is always “app\_ltm\_update.bin”.

When the update has completed, the Android Toast message “LTM – controller updated” is reported.

If the update fails, the Android Toast message “LTM – controller update failed” is reported. If the update fails, then removing power from the LAVASynC+ and restoring it allows the update to complete. If the update fails, the LAVASynC+ is stuck in the Boot Loader. When the Boot Loader is active, the Charge State (green) LED flashes on and off every ½ second. While in the Boot Loader, no battery modulation operations take place, and the device is left to charge up to 100%.

The “LTM\_UPD\_LOG.txt” file is generated and placed in the Download folder to indicate success or failure. The file contents are always appended.

The following indicates success:

```
1472658697:
4172658697: START OF UPDATE - 2016-08-31 11:51:37
1472658697: update version = 2.0
1472658697: product type = 2
1472658697: image type = 2
1472658711: UPDATE SUCCESSFUL
1472658711: END OF UPDATE
```

The following indicates failure:

```
1472658639:
1472658532: START OF UPDATE - 2016-08-31 11:48:52
1472658532: update version = 2.0
1472658532: product type = 2
1472658532: image type = 2
1472658537: open connection, status=false
1472658539: open connection, status=false
1472658539: UPDATE FAILED
1472658539: END OF UPDATE
```

The number at the start of each line is a UTC timestamp. The value is the number of seconds since January 1, 1970 (midnight UTC/GMT) not counting leap seconds.

If the product and image type are incorrect in the update file, the update is rejected, and normal operation continues. There is no restriction on the firmware version being newer than the active version. If the LTM Service does not consider an update file valid, the update is aborted before any changes are made to the LAVASynC+ product.

## Samsung Knox Configure

The LAVA Tablet Manager (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 and which is not present on the device as a default.

The LAVA Tablet Manager (LTM) searches for its LTM.ini configuration file in the \Download folder as well as the \Contents folder. Support of the \Contents folder was added in LTM v2.03.

The "Knox Configure" service can remotely handle the Device Administrator permissions required by LTM, eliminating the need for user interaction during this stage of the LTM setup.



## 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 LAVASynC+ and a tablet or mobile phone. This connection provides a power and data connection to the device.

When the LAVASynC+ is not powered, the device is not expected to provide power to the LAVASynC+. This behavior is deliberate to avoid the device accidentally being drained of power by the LAVASynC+ 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 data and charging.

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

### USB-C “Power Adapter” Input

The “Power Adapter” input is a USB-C receptacle on LAVASynC+ products without Power over Ethernet. This input provides power for the LAVASynC+ product, the device, and for attached USB accessories.

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

The LAVASynC+ product will not function if power has not been applied to the Power Adapter input. The LAVASynC+ products are not intended to draw power from the tablet or mobile phone.

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 LAVASynC+ products automatically use the 5-volt option.

The Power Adapter input on the LAVASynC+ 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 LAVASynC+ product **must be** as short as possible. The cable has power loss proportional to the cable length and wire thickness. The voltage present at the LAVASynC+ receptacle will be lower than the supply output due to cable power loss. There is power loss

in the cable which connects the LAVASyncC+ 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 a LAVASyncC+ 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 LAVASyncC 1U, LAVASyncC+ 1U-OEM, LAVASyncC+ BM-OEM, LAVASyncC+ 3U, LAVASyncC+ E, and LAVASyncC+ 2UE.

## Micro USB-B “Aux. Power Adapter” input

The “Aux. Power Adapter” input is a Micro USB-C receptacle on LAVASyncC+ PoE products.

This input **is only** used for system testing when PoE power **is not** present. The LAVASyncC+ 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 LAVASyncC+ product.

A standard USB 5V DC Power Supply is attached to the “Aux. Power Adapter” input. A standard USB power supply is rated at 5 volts nominal, with a 5.25 volts maximum. A typical USB Power supply is rated at 10 watts (2 amperes at 5 volts DC).

The LAVASyncC+ product does not function if power has not been applied either via PoE or the “Aux. Power Adapter” input. The LAVASyncC+ products are not intended to draw power from the tablet or mobile phone.

The Adaptive Fast Charger being shipped with many Samsung devices are fully compatible. These adapters are rated at 5 volts 2 amperes and 9 volts 1.6 amperes. The LAVASyncC+ products automatically use the 5-volt option. Some of these chargers cannot compensate for voltage drop in the wire, which makes it critical to keep the length as short as possible. The older non-adaptive chargers generally included compensation for voltage drop. If the device is not charging well, then the voltage reaching the LAVASyncC+ should be verified.

The PoE models include the LAVASyncC+ PE and LAVASyncC+ P2UE products.

**Warning:** *When supplying power through the “Aux. Power Adapter” input, you must not use PoE supplied power.*

## Barrel Jack “11-36 VDC In”

The LAVASynC+ "vc" products require power to be supplied through a DC barrel jack with a 2-millimeter positive center pin. This receptacle is labeled “11-36 VDC In.” The power cable and power supply are supplied by the user.

The typical application uses either a 12-volt 2-ampere power supply or a 24-volt 1-ampere power supply. The permitted input range is 11 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 LAVASynC+ when a suitable wire gauge is used.

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

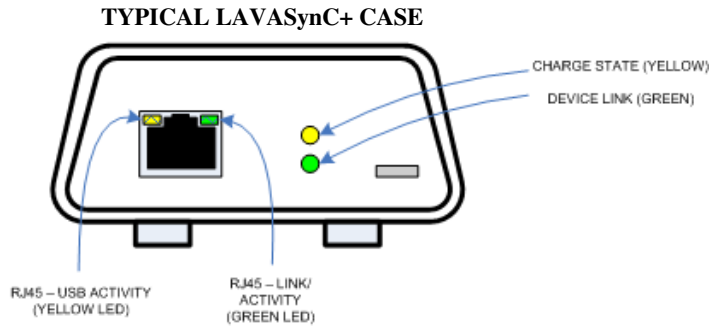
The attached power supply and wiring are responsible for providing short circuit protection.

## USB-A receptacles

Several LAVASynC+ 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 LAVASyncC+ has two primary Status LEDs. The mounting location varies between each LAVASyncC+ product. The LAVASyncC+ products in a casing always have the two primary Status LEDs mounted one above the other as shown in the following diagram.



Units with Ethernet support have two additional status LEDs mounted in the RJ45 receptacle, which are described in the ETHERNET RJ45 section.

The "Charge Status" and "Device Link" LEDs flashes are pulsed on for a ½ second then off for ¾ second when power is applied to the unit as a start-up test.

The chart below explains the various states for the "Charge Status" and "Device Link" LEDs, once the start-up test of the LEDs has completed:

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 or was installed and not activated, 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 behavior 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 LAVASyncC+ to function. The LTM application must be installed and activated on the mobile device. This is the manufacturing default for all LAVASyncC+ products.			

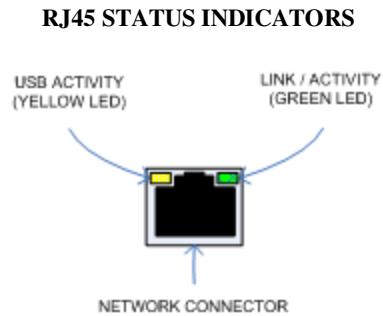
STATUS LED STATES (for "extended" Mode disabled)			
Name	Colour	State	Description
DEVICE LINK	Green	On solid	A mobile device has been attached and detected.
		OFF	No mobile device attached.
CHARGE STATUS	Yellow	1-second blink	Power has been applied to the LAVA product.
		Off	The LAVA product has no power.
Note: The 2-pin internal jumper is shorted to disable the "extended" features of the LAVASyncC+ 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 LAVASyncC+ 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 LAVASynC+ E and LAVASynC+ 2UE.

The ETHERNET Port only functions when the LAVASynC+ product is powered. The LAVASynC+ 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 labeled “USB Activity” and “Link/Activity”.



The USB Activity is a yellow indicator. The USB Activity is solid yellow when the LAVASynC+ is powered and connected to the device. The USB Activity flashes when there is traffic between the device and a LAVASynC+ 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 as well as serving 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 LAVASynC+ 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 LAVASynC+ product, device charging, and attached USB accessories are provided by the PoE-ETHERNET Port.

A “PoE-ETHERNET” port is present on the LAVASynC+ PE and LAVASynC+ 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 LAVASynC+ PE and LAVASynC+ P2UE.

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

## Internal Jumpers

Each LAVASynC+ 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 LAVASynC+, 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 activated 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.

## 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.

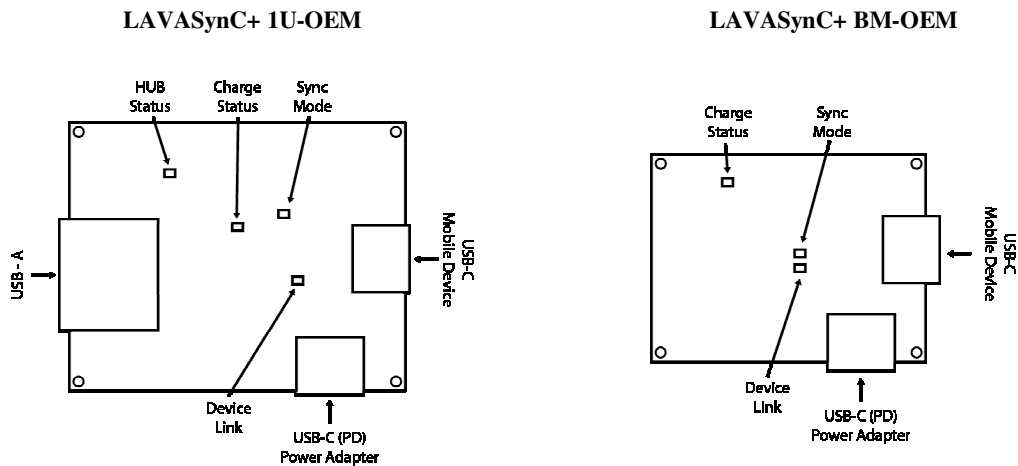
The LAVA Tablet Manager (LTM) v2.00 has added special support for single and multiple user-supplied serial ports. If your system is using a USB Serial Port, please contact LAVA for additional information.

## Modules: LAVASync+ 1U-OEM and LAVASync+ BM-OEM

The LAVASync+ 1U-OEM and LAVASync+ 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 LAVA LAVASync+ 1U-OEM allows select Samsung devices to work with USB accessories while power is being supplied to the device. A single USB 2.0 Type A receptacle is available. These products will not function on non-Samsung devices.

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



The LAVA Tablet Manager application **must** be installed on the mobile device (tablet or mobile phone). When combined with the LAVA Tablet Manage application, both products support the extended features of Battery Modulation and Screen Brightness control. The application firmware can also be updated through the LAVA Tablet Manager, just as any other member of the LAVASync+ Family.

The LAVASync+ 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 LAVASync+ 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 LAVA Tablet Manager 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 Samsung USB Power Adapter is rated at 5 volts and 2 amperes, which nominally provides 5.0 to 5.1 volts at the LAVASync+ input. Extending the original power adapter cable is not wise as the voltage reaching the LAVASync+ may be too low due to cable losses.



When the mobile device is charging, up to 1.2 amperes of current is offered to the device. The power consumption of the LAVA board is negligible. The power supply for a LAVASync+ 1U-OEM should have a capacity of at least 1.7 amperes to allow for power required by an attached USB accessory. The power supply for a LAVASync+ BM-OEM should have a capacity of at least 1.2.

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 at no point in the system is too low. 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 INI File

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### Overview

The LAVA Tablet Manager (LTM) Service is configured by the file LTM.ini located in the Internal Storage folder of the device. This folder contains sub-folders such as Download, Playlists, Music, Movies, and so on.

The LTM.INI file is a simple human-readable UTF-8 (ASCII) file. The file can be modified using a text editor on a PC, as most devices do not have a suitable editor installed. The “LTM Setup” utility can be used to view and modify the most common attributes of the LTM.INI file while running on a tablet.

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

The INI file can be copied to the device at any time. When the INI file has changed, all but four commands take effect immediately within the LTM Service. The following commands are in a unique category and are only acted on when the service starts:

- power-watchdog-timeout
- power-watchdog-action
- keep-alive-timeout

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 Service has default values for all commands. If a given command is missing from the INI or the INI was deleted, the LTM Service will still run.

The LTM.ini file must be present for LTM v3.00 (and newer) to run. Removing the LTM.ini file serves as a quick method of disabling the LTM service when dealing with Android issues.

The LTM.ini was optional for LTM v2.00 to v2.03. If the configuration was not present, then internal default values would be used.

## Commands and Parameters

INI Command	Description
configuration=x	This command defines an optional message string to identify the INI version. The string is reported via a Toast message when the LTM Service is started. No whitespace allowed. If the string is not defined, no Toast is displayed. The default is an empty string, therefore no message. Example: The Toast message “LTM – xyz” is reported for “configuration=xyz”.
product-family=x	The <b>product-family</b> is set to 2 for a LAVASync+ products and 1 for a SimulCharge products supporting battery modulation, such as an eSTS-** or STS-RBM. This keyword is not present in the sample LTM.INI files provided by LAVA in the “LTM Software Release” package, as the default value is 2. This keyword was introduced in LTM v2.08 for the LTM Setup utility. The LTM Setup utility was released in August 2018. The permitted range is 1 to 2. The default is 2.  <b>Note:</b> The INI file used with SimulCharge products use the keyword “board-type”, which forces the “product-family” to be internally treated as 1 for SimulCharge. The LAVASync+ products do not use the “board-type” keyword.
btty-upper-threshold=x	The standard upper limit for battery charging as a percentage. The permitted range is 20 to 100. The default is 95.
btty-lower-threshold=x	The standard lower limit for battery charging as a percentage. The permitted range is 1 to 100. The default is 70.
btty-cycle-upper-threshold=x	The "full" charge cycle upper limit for battery charging as a percentage. When the battery level reaches this point during a "full" charge cycle, then charging is automatically turned off. It is important to allow the device to charge up to 100% to reset the calibration periodically. A "full" charge cycle is performed every 'n' standard cycles, where “ btty-cycle-limit” defines ‘n’. This parameter should always be 100. The permitted range is 20 to 100. The default is 100.
btty-cycle-lower-threshold=x	The "full" charge cycle lower limit for battery charging as a percentage. When the battery level reaches this point during a full charge cycle, then charging is automatically turned off. It is important to allow the device to charge up to 100% to reset the calibration periodically. A "full" charge cycle is performed every 'n' standard cycles, where “ btty-cycle-limit” defines ‘n’. The parameter is typically set to the same value as “btty-lower-threshold”. The permitted range is 1 to 90. The default is 70.
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 0.
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 25.
encourage-night-charging=x	The "encourage-night-charging" feature results in the device being forced into the charge state 'x' minutes before the start of brightness-level2-time. The "night time" window starts at "brightness-level1-time" and ends at the "brightness-level2-time". During this window, the device screen can be set to operate at low brightness to reduce heat generation. This feature encourages the battery to be charged toward to upper threshold to take advantage of the reduced heat. The permitted range is 0 to 720. The default is 30.
check-btty-current=x	This command is used to enable the checking of the battery charge current while waiting for a charge threshold to be reached. If the battery current is not flowing in the expected direction, a reminder command (charge or discharge) is sent to the LAVASynC+ board. The permitted range is 0 to 1. The default is 1, which enables the feature.

no-btty-modulation=x	<p>This command can be used to disable the battery modulation. The LTM service 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.</p>
permit-ethernet=x	<p>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.</p>
dhcp-recovery=x	<p>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.</p> <p>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.</p> <p>A dhcp-recovery value of 2 results in subsequent recovery attempts taking place every 2 minutes. The dhcp-recovery value of 2 was added in LTM v1.11.</p>
wifi-overrides-ethernet=x	<p>This command allows the wired Ethernet interface to be disabled when WiFi is enabled. The permitted range is 0 to 1. A “1” results in the Ethernet interface being disabled if WiFi is enabled. A “0” results in the Ethernet interface being active if WiFi is enabled, and the Android system determines how messages are routed. The permitted range is 0 to 1. The default is 0.</p>
keep-alive-rate=x	<p>The number of minutes between a charge (on or off) command being sent to the LAVASync+ board as a reminder of the current charging state. The permitted range is 0 to 60. A 0 disables keep-alive messages; charge commands are only sent when an upper or lower threshold is reached. The default is 3.</p>
keep-alive-timeout=x	<p>This command defines the timeout for the reception of any command from the LTM Service. If no command is received within the timeout, the communication port used for the device to LAVASync+ messaging is reset. This command is used as a first level recovery mechanism in the event the LTM Service has been shut down by the Android system. This can occur on occasion as the Android system does not want a user launched application to run forever. A value of 0 disables the timeout. Values 1 to 4 are treated as 0. The permitted range is 0 to 60 minutes. The manufacturing default is 5 minutes. This setting should never be changed. This value is stored in non-volatile memory of the board, so if the command is removed from the INI file, the last value presented is remembered by the board. This value is only set when the LTM Service starts.</p>
power-watchdog-timeout=x	<p>This command sets a timeout for the reception of a charge command. The LTM Service is expected to send a charge (on or off) command on a regular basis as a keep alive. If no command is received within the timeout, the LTM Service is assumed to have been halted by the Android system. This can occur on occasion as the Android system does not want a user launched application to run forever. If the timeout does occur, the "power-watchdog-action" defines the action to take place. The units are in minutes. A value of 0 disables the timeout. Values 1 to 4 are treated as 0. The permitted range is 0 to 60 minutes. The default is 7 minutes. This setting should never be changed. This value is stored in non-volatile memory of the board, so if the command is removed from the INI file, the last value presented is remembered by the board. This value is only set when the LTM Service starts.</p>
power-watchdog-action=x	<p>This command defines the action to take when the power-watchdog-timeout expires. A “1” results in the device being restarted. A “0” results in the device power being turned back on. The permitted values are 0 and 1. The manufacturing default is 1. This setting should never be changed. This value is stored in non-volatile memory of the board, so if the command is removed from the INI file, the last value presented is remembered by the board. This value is only set when the LTM Service starts.</p>

brightness-level1-time=x	<p>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.</p>
brightness-level2-time=x	<p>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.</p>
brightness-level1=x	<p>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.</p>
brightness-level2=x	<p>Screen brightness used by "brightness-level2-time". The permitted range is 0 to 100. The default is 85.</p>
hardware-reset-frequency=x	<p>This command defined the number of hours the LTM Service runs before a hardware reset is performed as defined by the "hardware-reset-action". A tablet or mobile phone was not originally intended to run for an extended period. Depending on the device used and the customer application a partial or full reset of the system on a regular interval can prevent unexpected resets during prime operating hours. The time is specified in hours since the LTM Service has been started. The permitted range of values is 0 to 5000 hours (208 days). Once the number of hours has been reached, a time of day window can also be specified. If the hours do not fall in the time of day window, the reset is delayed until the next time of day window. The permitted range is 0 to 5000. The default is 0, which disables the feature.</p>
hardware-reset-time-1=x	<p>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.</p>
hardware-reset-time-2=x	<p>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.</p>
hardware-reset-action=x	<p>This command determines the action to take once the "hardware-reset-frequency" limit is reached. The actions included resetting the LAVASynC+ hardware and resetting the device. A LAVASynC+ 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=LAVASynC+ reset (the default) 2=Device reset (tablet or mobile phone) 3=LAVASynC+ and device reset</p>

	<p>The <b>USB Permission Handling</b> feature allows the Android USB permissions for an application to be assigned automatically for user peripherals. This eliminates the need for the user to respond to the standard Android pop-up normally presented when a USB peripheral attaches. The mechanism supports two USB devices. The USB vendor identifier and product identifier must be specified, along with the "package name" of the Android application. The feature was added in LTM v2.00.</p> <p>There are special rules for using USB Serial Port. If you are using one or more serial ports, please contact LAVA for additional information.</p>
uph-package-1=x	USB Permission Handling - Package name #1. The minimum length is 5 characters.
uph-vid-1=x	USB Permission Handling - USB vendor identifier #1. Range is 1 to 65535.
uph-pid-1=x	USB Permission Handling - USB product identifier #1. Range is 1 to 65535.
uph-package-2=x	USB Permission Handling - Package name #2. The minimum length is 5 characters.
uph-vid-2=x	USB Permission Handling - USB vendor identifier #2. Range is 1 to 65535.
uph-pid-2=x	USB Permission Handling - USB product identifier #2. Range is 1 to 65535.
uph-debug=x	<p>The "uph-debug=x" command enables a set of debug toast (android debug) messages for the USB Permission Handling feature. The permitted ranges of values are 0 to 3, with a default of 1.</p> <p>A debug level of 0 results on only exceptions being reported.</p> <p>The default value of 1 reports failures to assign USB permission.</p> <p>When debugging permissions for the first time, use level 3.</p> <p>This feature was added in LTM v2.07.</p>
uph-log-limit=x	<p>The "uph-log-limit=x" enables a debug log for the USB Permission Handling feature.</p> <p>The log file is stored in the Download folder of the mobile device.</p> <p>The log file name is "LTM_AP_LOG.txt".</p> <p>The file format is UTF-8 (simple ASCII).</p> <p>The file can be read on a PC using any text editor.</p> <p>A non-zero value enables the log.</p> <p>The log file size is limited to the "uph-log-limit" value time 1000000 characters.</p> <p>The permitted range of values are 0 to 5, with a default of 0.</p>
lld-permitted=x	<p>The "lld-permitted" command enables the Low-Level Detect (LLD) feature for the device battery level. In some rare cases, the device may refuse to start charging. This mechanism prevents the device from discharging. 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, to enable the detection feature.</p> <p>This mechanism is part of the System Watchdog Handling.</p> <p>The permitted values are 0 (off) and 1 (on), the default is 1.</p> <p>This feature was added in LTM v2.00.</p>
lld-threshold=x	<p>The activation "threshold" for the Low-Level Detect feature. If the lld-threshold is not defined, then the "bttty-lower-threshold" default is used. The "lld-threshold" is limited to the modulation lower thresholds, defined by "bttty-lower-threshold" and "bttty-cycle-lower-threshold".</p> <p>The range is 1 to 99. The default is defined by that of "bttty-lower-threshold".</p> <p>This feature was added in LTM v2.00.</p>
lld-offset=x	<p>The "offset" for the Low-Level Detect (LLD) feature.</p> <p>The range is 0 to 99. The default is 10.</p> <p>This feature was added in LTM v2.00.</p>
lvd-permitted=x	<p>The "lvd-permitted" command enables the Low Voltage Detect (LVD) feature for the device battery voltage. In some rare cases, the device may refuse to start charging. This mechanism prevents the device from discharging. If the signal drops below the danger threshold ("lvd-threshold" - "lvd-offset") for three samples, then a recovery operation is started. The signal must have been above or at the activation threshold ("lvd-threshold") on a previous sample, to enable the detection feature. This mechanism is part of the System Watchdog Handling.</p> <p>The permitted values are 0 (off) and 1 (on), the default is 1.</p> <p>This feature was added in LTM v2.00.</p>

lvd-threshold=x	The activation “threshold” for the Low Voltage Detect feature The range is from 3000 to 4000. The default is 3700. This feature was added in LTM v2.00.
lvd-offset=x	The “offset” for the Low Voltage Detect (LVD) feature. The range is 0 to 1000. The default is 100. This feature was added in LTM v2.00.
sld-permitted=x	The command enables the Stuck Level Detect (SLD) feature. In some rare cases, the device charge level gets stuck. After many hours the device recovers. This mechanism ensures the recovery time is controlled. A value of 10 to 300 enables the feature. If the battery level does not change for ‘x’ minutes then a recovery operation is started. This mechanism is part of the System Watchdog Handling. The permitted range is 0 to 300 minutes. Values 1..9 are treated as 0. The default is 60. This feature was added in LTM v2.00.
permit-wake-lock=x	This command results in the LTM service being a little more persistent, when the device screen saver is being used, or if the device screen is manually turned off. The typical use-case for a device using a LAVASync+ product is to have the device screen always active. A 1 enables the feature. A 0 disables the features. If the command is not specified, the feature is disabled as the default. This feature was added in LTM v2.03.  Note: When the use-case for the device includes allowing the screen to turn off, it is best to set “sld-permitted=0” or at least “sld-permitted=300”. With the screen turned off, the device is in a hibernation state in which the battery discharges very slowly.
permit-ltm-icon=x	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.
log-file-rate=x	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.
log-file-limit=x	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.
ltm-inhibit=x	Setting “ltm-inhibit” to 1 prevents LTM from running. This parameter only takes effect on mobile device startup or startup of the LAVA device. This parameter is reserved for special situations and should generally not be used. This command was added in LTM v3.**. The permitted range is 0 to 1. The default is 0.

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 Service and device. The permitted range is 0 to 3. The default is 1.</p> <table border="1" data-bbox="521 289 1383 753"> <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 LAVASynC+ board.</td> </tr> <tr> <td>1</td> <td>“LTM - controller running”</td> <td>The LTM7 Service has started to operate.</td> </tr> <tr> <td>1</td> <td>“LTM - controller detached”</td> <td>The LAVASynC+ has disconnected from the device.</td> </tr> <tr> <td>1</td> <td>“LTM - brightness update”</td> <td>The LTM Service has updated the device screen brightness.</td> </tr> <tr> <td>1</td> <td>“LTM – inhibit in effect”</td> <td>The LTM Service was not allowed to run as “ltm-inhibit=1” is set in the LTM.ini file. This is only valid in LTM v3.*.</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 Service 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 LAVASynC+ board.	1	“LTM - controller running”	The LTM7 Service has started to operate.	1	“LTM - controller detached”	The LAVASynC+ has disconnected from the device.	1	“LTM - brightness update”	The LTM Service has updated the device screen brightness.	1	“LTM – inhibit in effect”	The LTM Service was not allowed to run as “ltm-inhibit=1” is set in the LTM.ini file. This is only valid in LTM v3.*.	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 Service 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="521 940 1383 1255"> <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 Service 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 Service 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 Service 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 Service if the Ethernet interface is connected to the network.												
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## Diagnostic Log File

The LTM Service 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 Download folder. The log file name is LTM\_\*\*\*\_LOG.txt. The \*\*\* portion of the file is the device serial number.

If the device is an LTE device, then the IMEI number is used for \*\*\*, for versions of LTM up to v2.02. As of LTM v2.03, the application no longer reads the IMEI information from the device.

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 Service always appends new information.

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

Each line of data contains 15 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 Service 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> <tr> <td>L16</td> <td>Charging enabled due to "encouragement", see the "encourage-night-charging" command.</td> </tr> </tbody> </table>	Value	Description	L1	Periodic log entry as selected by "log-file-rate"	L2	Charging state change	L4	LTM Service has started (or possible re-started)	L8	Hardware reset requested. The action was determined by the "hardware-reset-action" command.	L16	Charging enabled due to "encouragement", see the "encourage-night-charging" command.
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L16	Charging enabled due to "encouragement", see the "encourage-night-charging" 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 Service 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 Service is not controlling the device screen brightness.												
13	MR	This field is reserved for future use.												
14	IC	This field is reserved for future use.												
15	AM	This field is reserved for future use.												

## Sample INI File

```
;-----  
; LTM7 (LAVA Tablet Manager VII) - Initialization File  
;-----  
[LTM-START]  
configuration=20181009-1200  
product-family=2  
;-----  
bttty-upper-threshold=70  
bttty-lower-threshold=45  
bttty-cycle-upper-threshold=100  
bttty-cycle-lower-threshold=45  
;  
bttty-cycle-limit-on-start=2  
bttty-cycle-limit=50  
;  
no-bttty-modulation=0  
;-----  
permit-ethernet=1  
dhcp-recovery=2  
wifi-overrides-ethernet=1  
;-----  
brightness-level1-time=1:00  
brightness-level2-time=6:00  
brightness-level1=15  
brightness-level2=85  
;-----  
hardware-reset-frequency=240  
hardware-reset-time-1=1:00  
hardware-reset-time-2=2:00  
hardware-reset-action=0  
;-----  
;uph-package-1=  
;uph-vid-1=  
;uph-pid-1=  
;-----  
;uph-package-2=  
;uph-vid-2=  
;uph-pid-2=  
;-----  
log-file-rate=0  
log-file-limit=0  
;-----  
user-debug=1  
ethernet-debug=1  
;-----  
;uph-log-limit=0  
;uph-debug=0  
;-----  
[LTM-END]
```

## The “LTM Setup” Utility

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The “LTM Setup” utility is used to review, modify, or created an LTM.ini configuration file. The utility can be used while LTM is running, as changes are automatically picked up.

This APK is part of the standard software release package for the LAVASync+ Product Family.

The utility allows the most common attributes in the LTM.ini file to be directly managed. Attributes that are not managed by LTM are written back to a modified INI file without any changes. The attributes not directly handled by “LTM Setup” can be modified on a PC with any standard text editor.

The “APPLY” in the top right corner is selected to write changes to the mobile device. Only comments at the top of the LTM.ini file are preserved. Attributes not directly managed by the utility are moved to the bottom of the file.

The “LTM Setup” utility compatible with all LAVASync+, eSTS, and STS-RBM products.

## The “LAVA Device Info” Utility

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This utility is used to verify the firmware version and settings of a LAVASync+, 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 sets the *Power Watchdog Timeout* to 7 minutes and the *Keep Alive Timeout* to 5 minutes. This button is presented after a device is detected and the timeouts are currently disabled.

The DISABLE TIMEOUTS button sets the *Power Watchdog Timeout* to 0 minutes and the *Keep Alive Timeout* to 0 minutes. 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 (LTM) 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.

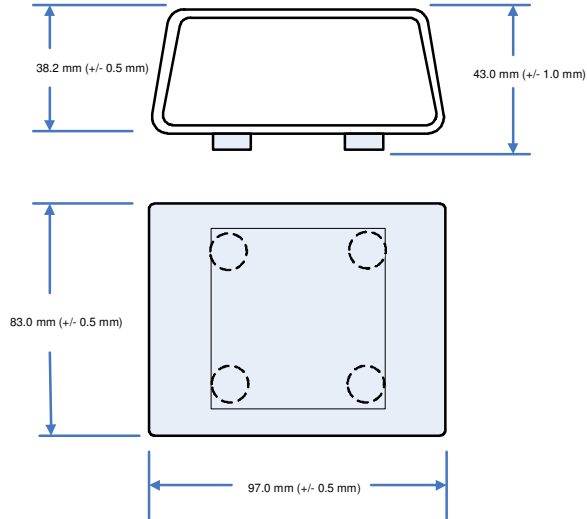
The LAVASync+ and eSTS products have an internal 2-pin jumper labeled MODE. When this jumper is installed, the extended features of the product are disabled, and the product cannot be detected by this utility. The jumper is installed when the mobile device is not going to use LTM. With the jumper installed, 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.

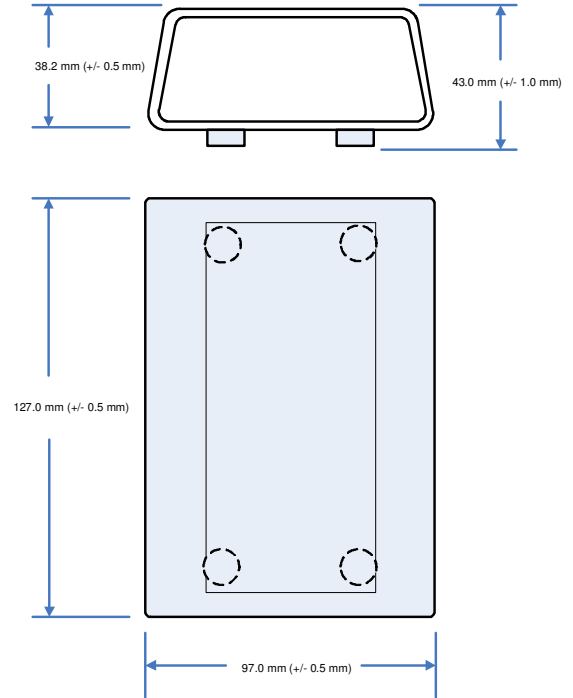
The utility must be used with caution when the LAVA Tablet Manager (LTM) is installed on the mobile device. No harm can be done by running to two applications, however, note that that LTM can also modify the Timeouts settings.

## Dimensions

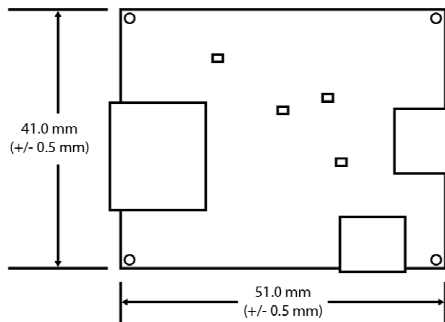
Case dimensions for the LAVASynC+ 3U, E, PE, 2UE, P2UE, vc3U, vc2UE, vc1U, and vcE.



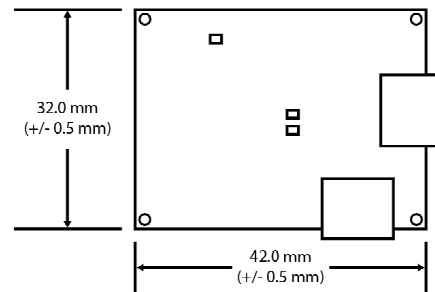
Case dimensions for the LAVASynC+ vc5UE



Dimensions of the LAVASynC+ 1U-OEM board



Dimensions of the LAVASynC+ 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).

<p>Telephone: +1 416 674-5942</p> <p>Fax: +1 416 674-8262</p> <p>Toll-Free (US and Canada): 800 241-5282</p> <p>Internet: <a href="http://www.lavalink.com/helpdesk">www.lavalink.com/helpdesk</a></p>
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## History

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Document Revision	Date	Change
A02	Jul. 6 2018	Initial release.
A03	Oct. 10 2018	The system requirements now discuss Android 8 and LTM v3.00. The list of tested tablets has been removed from the system requirements section. Correction to description of btty-cycle-limit-on-start and btty-cycle-limit. Added product-family=x. Added ltm-inhibit=x Expanded the Screen Brightness information to discuss additional permissions, as required by LTM v3.0 and newer. Updated the LTM.ini Overview.
A04	Jan, 11 2019	Expanded the Status LED description. Expanded notes for the LAVA Tablet Manager (LTM) application describing how to run without installing LTM. Corrected the lld-permitted command description, the value 1 is “on”. Corrected the lvd-permitted command description, the value 1 is “on”. Added information for the “LAVA Device Info” utility. Eliminated the term “root” when referring to the storage location of the INI file.