eSTS Product Family
Reference Manual

Abstract

The LAVA eSTS Product Family permits the charging of select Samsung mobile devices while simultaneously interacting with USB 2.0 accessories.

The eSTS products share the core set of features present in all nSTS products, while also providing "extended" features such as battery modulation, screen brightness management, and improved network operation. All supported devices use the Micro USB-B interface.

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Introduction

The LAVA eSTS 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 eSTS products in detail.

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

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

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

eSTS Product Family Overview					
Product	USB 2.0 Ports [Type A]	Ethernet Adapter	Power over Ethernet	5 VDC Input [Micro-B]	9/36 VDC Input [Barrel]	Description
eSTS-PE	-	YES	YES	Auxiliary	-	Ethernet Adapter with PoE
eSTS-E	-	YES	-	YES	-	Ethernet Adapter
eSTS-P2UE	2	YES	YES	Auxiliary	-	2-port USB Hub & Ethernet Adapter with PoE
eSTS-2UE	2	YES	-	YES	-	2-port USB Hub & Ethernet Adapter
eSTS-3U	3	-	-	YES	-	3-port USB Hub
eSTS-1U	1	-	-	YES	-	1-port USB Hub
eSTS-vc3U	3	-	-	Auxiliary	Yes	3-port USB Hub
eSTS-vc2UE	2	YES	-	Auxiliary	Yes	2-port USB Hub & Ethernet Adapter
eSTS-vc1U	1	-	-	Auxiliary	Yes	1-port USB Hub
eSTS -vcE	-	YES	-	Auxiliary	Yes	Ethernet Adapter
eSTS-1U-OEM	1	-	-	YES	-	1-port OEM Adapter (board only)
eSTS-BM-OEM	-	-	-	YES	-	Charging-Board Adapter (board only)
Note: eSTS products **require** the installation and activation of the LAVA Tablet Manager application.						

System Requirements

The LAVA eSTS products operate with a specific group of Samsung mobile devices. Please contact LAVA Sales or Technical Support for the current list of tested mobile devices.

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

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

The eSTS product is connected to a mobile device using the custom Micro USB-B to Micro USB-B 39" (100 cm) cable, which is provided with the eSTS product. This cable must not be extended, as the additional power loss in the wires will result in unreliable mobile device charging and operation.

The eSTS products work with unrooted Samsung mobile devices.

The eSTS 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 eSTS PoE device.

The eSTS models without PoE require a USB Power Supply with a Micro USB-B receptacle. The Wall/USB charger provided with the mobile device is an ideal choice. Any USB Power Supply with sufficient power for the combined requirements of the 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 eSTS "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 must be 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.

The eSTS-1U-OEM and eSTS-BM-OEM products are connected to a mobile device using the custom Micro USB-B to Micro USB-B 8" (20 cm) cable provided with the board. This cable must not be extended, as the additional power loss in the wires will result in unreliable mobile device charging and operation.

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

The mobile device features used by the LAVA products are not universal across the Samsung product line. Samsung tailors the mobile device firmware to a world region or country. Mobile device versions created by Samsung for mobile carriers do not behave the same way as the standard products. You must verify the behavior of the mobile device model 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.*

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

Product Features

Overview

The eSTS and nSTS products share the following core features:

- ❑ USB Host operation with simultaneous device charging
- ❑ Up to three 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 eSTS products include the above core features as well as the following extended features:

- ❑ Support for installations running 24/7
- ❑ Battery modulation for mobile device longevity
- ❑ Enhanced Network Management for reliable network operation
- ❑ Screen brightness control for reduced heat generation

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

USB Host Operation with Simultaneous Mobile Device Charging

The primary feature of all LAVA eSTS and nSTS 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.

Unlike many other Android mobile devices on the market, Samsung mobile devices can operate as a USB host while being charged. LAVA calls this feature SimulCharge, for simultaneous charging while working with USB accessories. The System Requirements section states which mobile devices have been tested for the ability to employ SimulCharge.

Power to an eSTS product is applied after the mobile device has been attached and powered. The eSTS product applies power and data to the mobile device in a sequence that ensures proper battery charging and USB Host operation.

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 three 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 mobile device they are connected to.

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 mobile device.

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 eSTS 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.lavasimulcharge.com.

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 will launch automatically when the LAVA hardware is detected 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 on the mobile device home screen four times within a few seconds forces the application into the "configuration console", which allows the configuration settings to be reviewed or modified. The "Force To Background" option in the overflow menu places LTM back into Background Mode, which is 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 to 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 eSTS 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 where 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 behavior 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% in order to reset the battery calibration.

The LTM application works with the LAVA eSTS 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 behavior 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 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=1
board-type=1
btty-upper-threshold=75
btty-lower-threshold=45
btty-cycle-limit-on-start=2
btty-cycle-limit=50
```

The "product-family=1" is always used for eSTS products.

The "board-type" keyword selects between three 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 "btty-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 "btty-cycle-limit-on-start" command allows for an early battery calibration in situations where the device might have been turned off for some time. Using "btty-cycle-limit-on-start" is optional.

Wired Network Operation

Many eSTS products provide a 10/100 Fast Ethernet wired interface. This feature relies on standard support from the mobile device. A wired networking solution is more reliable than Wi-Fi and has greater security.

Mobile 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 mobile device setup menu.

The mobile device setup and Ethernet port status 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 mobile 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 mobile device attempts to fetch the network addressing information from a DHCP server. If the addressing information is not located within the timeout period, the mobile 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 eSTS Network Recovery automates the network restart, which is critical for embedding a mobile 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 it is re-enabled 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 eSTS product. The eSTS 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 eSTS products and the LTM application help a mobile device 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 mobile device turns off the Ethernet interface and makes no further attempts to reconnect. In a normal 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 back in to restart the connection. Until the process is restarted, the mobile 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 mobile 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 approximately 1 minute. If the connection is not restored, repeated attempts are made until a connection is successfully 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 screen is a major consumer of power and generator of heat within the mobile device. If the screen is too bright, the mobile device may not be able to charge the battery in SimulCharge mode.

Using the screen brightness management feature is recommended, however it is disabled as a default to simplify the initial setup of a 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. "Time 1" is assumed to be the start of the night-time operation. "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 brightness level of 85-90% causes minimal perceivable change compared to a level of 100%, yet significantly reduces heat generation within the mobile device.

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 nighttime is preferred.

Reducing heat generation over the life of the mobile device helps improve the longevity of the mobile device 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 Manager 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, the mobile device brightness is set to 15% at 1:00 AM, and 85% at 6 AM. From 1:00 Am-5:59 AM, the level 1 brightness is enforced. From 6:00 AM-00:59 AM, the level 2 brightness is enforced. If the screen brightness is changed manually, the configured values are restored within 1 minute.

Power Options

Most eSTS products can be powered using a standard USB Power supply, such as the one provided with the mobile device. 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 are present at the input to the eSTS. 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 eSTS PE and eSTS 2UE support Power over Ethernet (PoE) and can therefore 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 eSTS-PE or eSTS-P2UE-based system, even when wired Ethernet is not required by the customer application.

The eSTS "vc" products are designed to operate from a 9 to 36 VDC unregulated power supply. This power option is ideal for 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 eSTS when a wall outlet is not in a convenient location.

Please see the "Connection Descriptions" section of this document for additional details regarding 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 data. The eSTS PoE devices always support an Ethernet adapter for wired network communications.

The eSTS products with PoE resolve the problem of getting power to the 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.

The Ethernet RJ-45 provides the input power to the eSTS product. These eSTS 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 eSTS PoE Power Supply provides 10.4 watts of power for the mobile device, the eSTS, and attached USB accessories. The 10.4-watt limit allows the device to be treated as a PoE Class 0 device by a PoE switch.

The eSTS 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 eSTS **does not** prevent the attached devices from attempting to draw more than 10.4 watts. The accompanying mobile device and USB accessories must be designed to work within the design limits.

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

The eSTS PoE devices do not function if power is not available from the PoE-Ethernet interface or the Aux 5V Input. The eSTS products are not intended to draw power from the mobile device. The Aux 5V Input can only be used if power is not being provided over the Ethernet cable. The Aux 5V Input is only intended for initial testing of an eSTS module. The Aux 5V Input is described in a separate section of this document.

The PoE models include the eSTS-PE and eSTS-P2UE products.

System Watchdog Handling

The Android system was designed to conserve the 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 consumer market devices, and running one for an extended period of time 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 LAVA product has several safeguards to ensure that LTM will continue to function.

The LTM application sends information to the eSTS on a regular basis. If the LAVA product does not receive a message for 7 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 the LTM application up. The 7-minute Recovery Timeout can be disabled, but this is not recommended as it is an important feature used to ensure the 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) feature monitors the device battery level. In some rare cases, the device may refuse to start charging. This mechanism prevents the device from discharging in this situation. 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) feature 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

The LAVA Tablet Manager application 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.

The LTM application 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.*

Connection Descriptions

Connector Placement
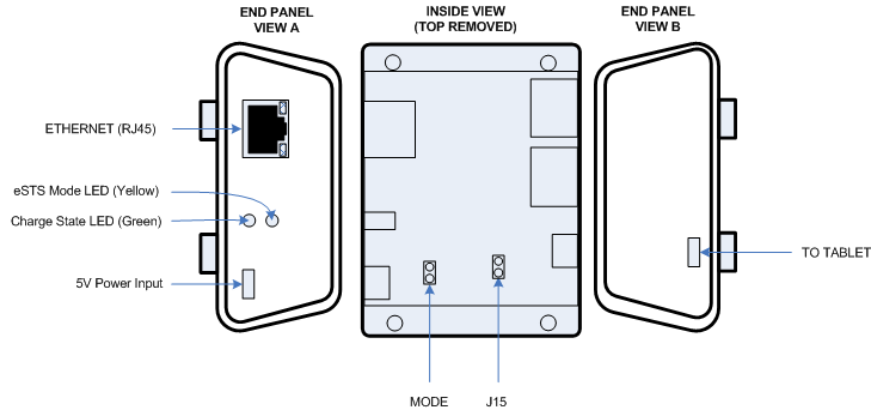
Figure 1: eSTS-E Connections
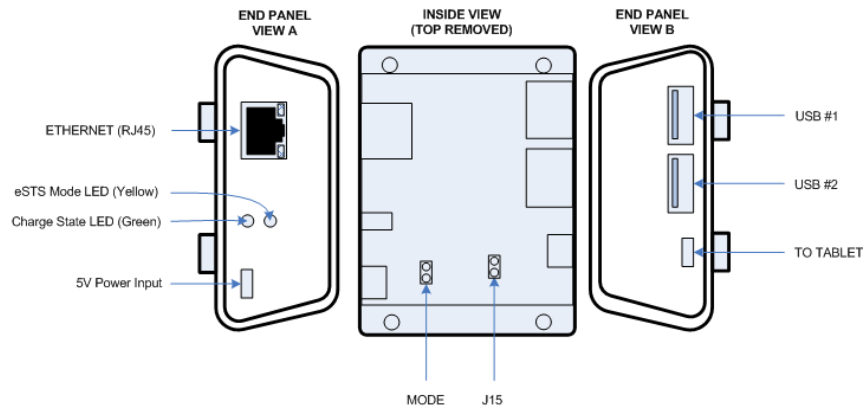
Figure 2: eSTS-2UE Connections
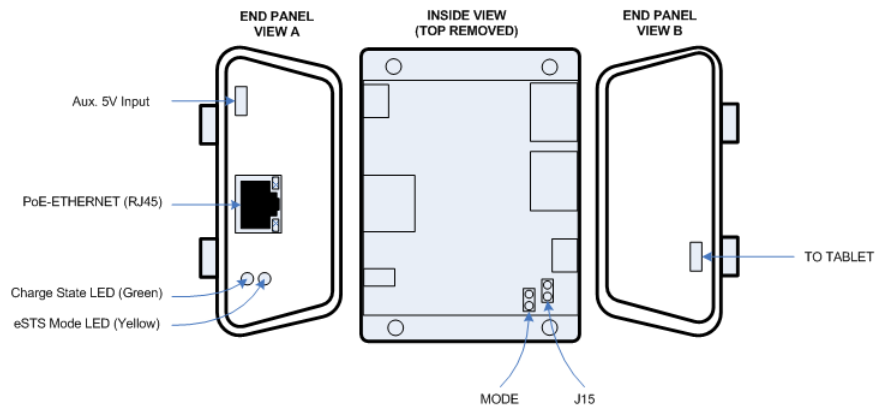
Figure 3: eSTS-PE Connections
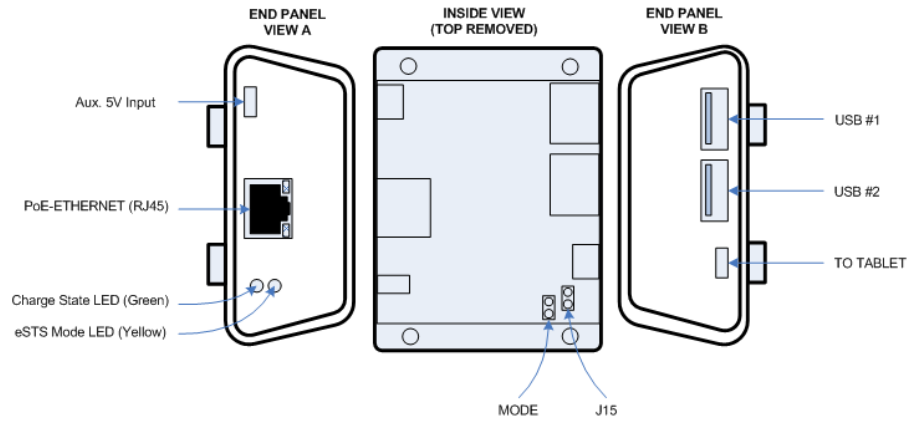
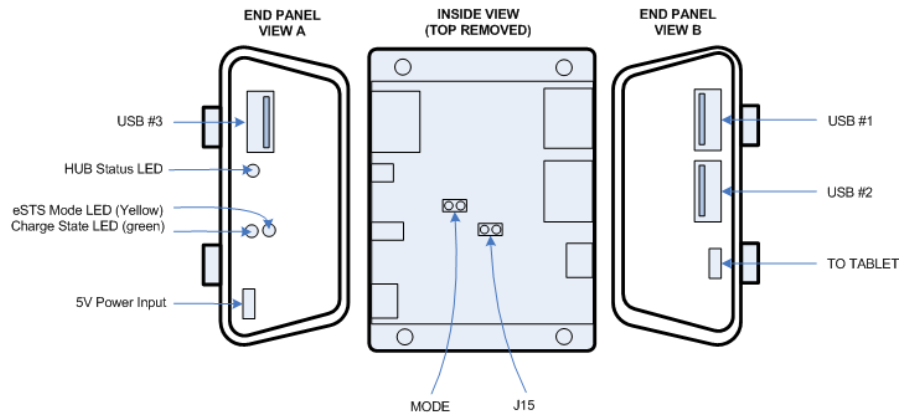**Figure 4:** eSTS-P2UE Connections

Figure 5: eSTS-3U Connections

Micro-B USB "To Tablet"

The "To Tablet" Receptacle is a standard Micro USB-B Receptacle.

The custom 39" (100 cm) cable provided with the eSTS product provides the connection between the eSTS and the mobile device. The custom cable has a Micro USB-B connector at each end. It does not matter which end of the cable is attached to the mobile device or the eSTS product.

The eSTS to mobile device cable must not be extended, as the additional power loss in the wires will result in unreliable mobile device charging and operation.

Note: The eSTS-1U and eSTS-BM boards are supplied with 8" (20 cm cables).

Note: All LAVA eSTS/nSTS cables of any length are interchangeable.

Micro-B USB "5V Power Input"

The "5V Power Input" is a Micro USB-B Receptacle on the eSTS products that do not have Power over Ethernet or a built-in voltage converter. This input provides power for the eSTS product, the mobile device, and attached USB accessories.

The eSTS product does not function if power has not been applied to the 5V Power Input. The eSTS products are not intended to draw power from the mobile device.

A standard USB 5V DC Power Supply is attached to the 5V Power Input. The supply need not be a Dedicated Charge Port (DCP) compliant device. A standard USB power supply is rated at 5 volts nominal, with a 5.25 volt maximum. The typical current rating is 2 amperes for a mobile 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 mobile 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. These supplies have some compensation for wire losses.

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

The 5V Power Input on the eSTS 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 eSTS 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 eSTS receptacle will be lower than the supply output due to cable power loss. There is power loss in the cable which connects the eSTS to the mobile device. If the voltage at the mobile device is too low, the mobile 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 mobile device via an eSTS 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 5V Power Input include the eSTS-1U-OEM, eSTS-BM-OEM, eSTS-1U, eSTS-3U, eSTS-E, and eSTS-2UE.

Micro-B USB "Aux 5V Input"

The "Aux 5V Input" is a Micro USB-B Receptacle on eSTS products with PoE capability or a built-in voltage converter.

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

This power input has the same specifications as the "5V Power Input".

The PoE models include the eSTS-PE and eSTS-P2UE products.

The units with voltage converters include the eSTS-vc1U, eSTS-vc3U, eSTS-vcE, and eSTS-vc2UE.

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 eSTS "vc" products require power to be supplied through a DC barrel jack with a 2-millimeter positive center pin. This receptacle is labeled "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 that is based on the USB peripherals you wish to use and the mobile device. In cases where no external USB peripherals 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. This has the benefit of your hardware system running cooler. As an example, if your system ideally requires 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 be factored into the power budget as well. A higher power supply voltage is always preferred to minimize the power loss in the wire.

When connecting the eSTS to the supply, ensure the wiring is such that the center pin is positive. If the polarity is reversed, the damage to the eSTS 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 eSTS 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 mobile device. Each receptacle provides power to each USB Accessory up to a maximum of 500 mA, as per the USB specification.

Status LEDs

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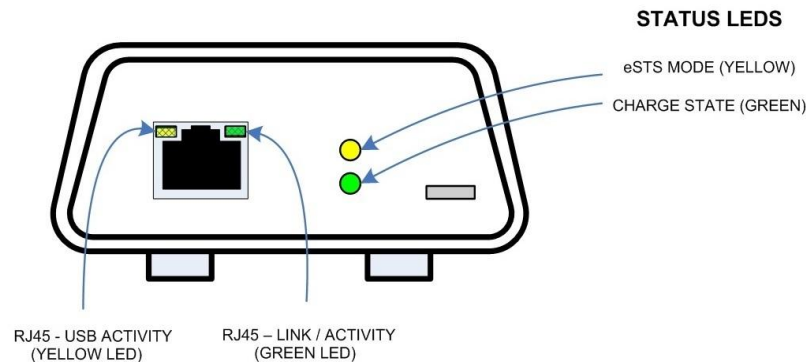

Figure 6: Typical eSTS Case

Units with Ethernet support also have two l 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 State" LED flashes on and off in a unique "flash-flash-pause" pattern during the first 2 to 3 seconds. The chart below explains the various states the "Charge State" LED reports. The "eSTS Mode" LED flashes on and off to report the system is running. A careful examination of the flash pattern can indicate finer details of the system operation such as the battery modulation state (charging or discharging).

STATUS LED STATES			
Name	**Colour**	**State**	**Description**
eSTS MODE	Yellow	On	The "eSTS Mode" LED reports that the USB Serial Port used by LTM has been detected by the mobile device. The "Extended STS" features are therefore enabled when this LED is "on".
		Off	The internal USB Serial Port used by LTM has not been detected by the mobile device. If this condition persists, verify the cable connecting the eSTS to the mobile device. The USB connection is reset every few minutes in an attempt to "wake" up the mobile device, which this indicator is "off".
CHARGE STATE	Green	Mostly "on", short flash "off"	Tablet is charging (part of the battery modulation process). The pattern repeats every 1.5 seconds.
		Mostly "off", short flash "on"	Tablet is discharging (part of the battery modulation process). The pattern repeats every 1.5 seconds.
		Slow "on" and "off" four times	A configuration command has been sent to the board. The pattern duration is 1.5 seconds.
		Rapid "on" and "off" eight times	Charging "on" or "off" command sent to the board. The pattern duration is 1.5 seconds.
		Continuous "on"	The "Extended STS" features are disabled. The internal MODE jumper is installed. The LTM application does not run in this state. The LTM application is not required on the mobile device.
		Off	No power is applied to the eSTS product. If using the hardware-reset-action which acts on the eSTS, the LED will be off for about 30 seconds and then recover.
		Even pattern of "on" and "off"	When the J15 jumper is installed, the unit remains in the Bootloader after power up. This pattern indicates the Bootloader is running. All extended operations are suspended while the Bootloader is active.

Each eSTS product has an internal USB serial port, which is used by the LTM application. The "eSTS Mode" LED reports if the serial port has been enumerated (detected) by the mobile device. If the "eSTS Mode" LED is not active, the LTM application cannot run. If the "eSTS Mode" LED is not active, the extended features such as Battery Modulation cannot run.

The watchdog process within the LAVA hardware monitors the eSTS Mode. If the "eSTS Mode" LED is not active within a reasonable time, the same "USB Reset" described in the System Watchdog Handling section is applied. The "eSTS Mode" LED indirectly reports that the extended features of the eSTS are operational.

"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 eSTS-E and eSTS-2UE.

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

The Ethernet port has two status indicators labeled "USB Activity" and "Link/Activity'.
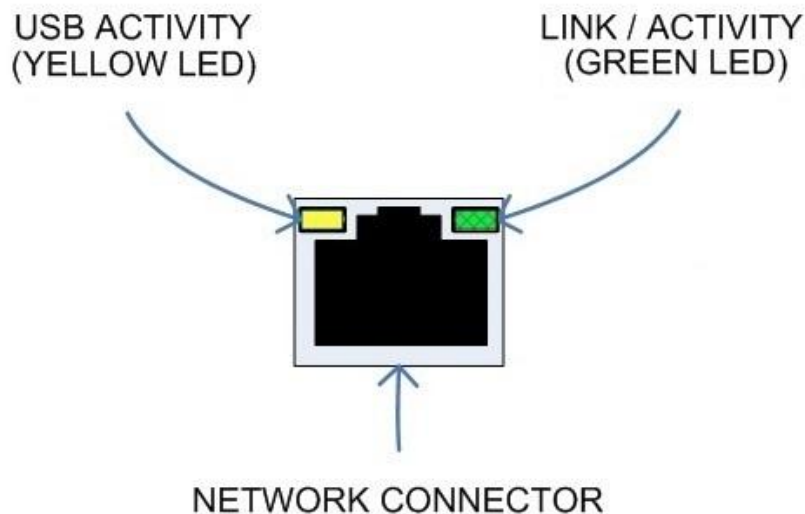
Figure 7: RJ45 Status Indicators

The USB Activity is a yellow indicator. The USB Activity is solid yellow when the eSTS is powered and connected to the mobile device. The USB Activity flashes when there is traffic between the mobile device and an eSTS 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 mobile device is not attached.

Both indicators remain off when power has not been applied.

The mobile 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 mobile 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 serving as the adapter enable.

When using DHCP, the mobile device attempts to fetch the addressing information from a DHCP server. If the addressing information is not located within the timeout period, the mobile 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 eSTS Network Recovery automates the network restart, which is critical for embedding a mobile device 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 eSTS product, mobile device charging, and attached USB accessories are provided by the PoE-Ethernet port.

A "PoE-Ethernet" port is present on the eSTS-PE and eSTS-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 eSTS-PE and eSTS-P2UE.

Warning: *When supplying power using the "Aux. 5 Volt" input on the eSTS-PE or eSTS-P2UE, you must not use PoE-supplied power.*

Internal Jumpers

Each eSTS 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 eSTS, including Battery Modulation. The "eSTS Mode" LED will always be off. All System Watchdog features are disabled. The LTM application will never run. There is no need to install the LTM application. The SimulCharge feature is always active. No jumper permits all extended features to function, and the LTM application must be installed on the mobile device. 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. **Do not** install a jumper on J15.

Mobile Device Charging with USB Host Operation (SimulCharge)

Overview

The Samsung mobile device was intended as a standalone device. When the mobile device battery requires charging, it is plugged into a Wall/USB Charger to restore the battery charge. The mobile device can continue being used while it is charging. Once the battery is charged, the mobile device may use the charger as a supplementary power source if the mobile device is left running. When not using LTM, it is preferable to charge a mobile device with the unit off and remove the supply once a full charge has been reached for the longest battery life.

When using a Samsung Wall/USB Charger, the mobile device charges at a high rate that is device specific. The charge rate is also limited to the power available from the attached charger. The Samsung Wall/USB Chargers come in several power ratings, each matched to the original mobile device requirements.

Charge-Only Mode

The Samsung Wall/USB Charger is equivalent to a USB Charger with a Dedicated Charge Port (DCP) as defined by the USB Battery Charging Specification R1.2.

The eSTS products use the term Charge-Only Mode to indicate the battery is being charged at the highest rate permitted by the mobile device and is equivalent to a USB Charger with a Dedicated Charge Port (DCP).

The eSTS products do not support Charge-Only Mode.

USB Host versus Accessory

A mobile device plugged into a desktop (or laptop) PC is treated as a USB Accessory (also referred to as a USB Target). The PC operates as a USB Host Controller when the mobile device is attached. The PC provides power to the mobile device, but the mobile device battery is being charged at a low rate. In some cases, the battery may not charge.

To plug a USB Accessory into a mobile device, the mobile device must operate as a USB Host Controller rather than a USB Accessory. The USB Standard has the On-The-Go (OTG) feature, in which the mobile device detects that a USB Accessory has been plugged in and automatically switches to operate as a USB Host Controller. Not all mobile devices support the USB OTG feature. When operating as an OTG USB Host, the mobile device is expected to supply power to the attached accessories, which means power is drained from the mobile device battery.

SimulCharge Mode

The eSTS products place a Samsung mobile device into the SimulCharge Mode. SimulCharge Mode informs the mobile device to operate as a USB Host controller, but not to provide power for USB accessories. With SimulCharge mode active, the mobile device is expecting power to be provided to it for battery charging and running the mobile device. This allows the mobile device to be run while simultaneously interacting with one or more USB accessories. The SimulCharge charging rates are specific to each mobile device.

Samsung mobile devices operating in SimulCharge mode may limit the amount of power drawn from the external power source. Limiting the power drawn from the external supply allows the supply to be shared between the mobile device and USB accessories. If there is not enough power coming in, the mobile device takes the extra from the battery. In this case, the battery will not be charging. The screen brightness may have to operate at less than 100% to allow the battery to charge. The application colour scheme can be designed to reduce the power required. Application processes requesting too much CPU time increase the power needed for the mobile device.

The mobile device must be turned on and connected to the eSTS product before power is applied to the eSTS product, to ensure proper startup. If the eSTS product is powered before attaching it to the mobile device, the device may not enter USB Host mode or may not enable battery charging.

The eSTS products use features specific to a set of Samsung mobile devices which are identified in the System Requirements section. Simultaneous battery charging and USB Host operation are not universal among Samsung mobile devices. Mobile device models have different features based on country/region.

The eSTS products must always be powered to keep the mobile device charged, and allow operation with USB accessories.

Additional Notes

A self-powered USB Hub can be used to offload the power required by the USB accessories from the power supply running the mobile device and eSTS product. A self-powered USB Hub should not draw power from the USB Host Controller but from a dedicated supply. A self-powered USB Hub becomes the power source for the attached USB accessories.

Using USB Serial Ports

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: eSTS-1U-OEM and eSTS-BM-OEM

The eSTS-1U-OEM and eSTS-BM-OEM are single-board OEM devices 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 eSTS-1U-OEM allows select Samsung mobile devices to work with USB accessories while power is being supplied to them. A single USB 2.0 Type-A receptacle is available.

The eSTS-BM-OEM is a unique member of the eSTS Family of devices. This board provides the battery modulation features of the eSTS Family of devices at a very low cost. This board does not support USB devices.
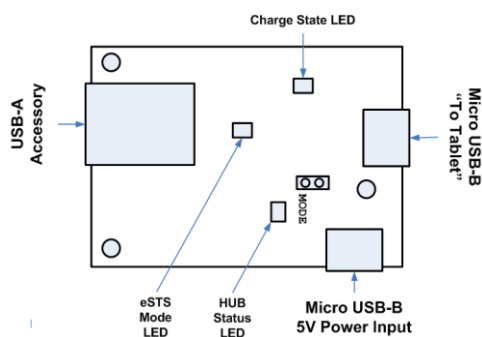
Figure 8: eSTS-1U-OEM
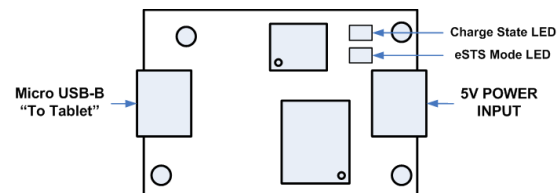
Figure 9: eSTS-BM-OEM

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

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

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

The board and mobile device are powered through a Micro USB-B power input using the same USB power supply provided with the mobile device. The standard Samsung USB Power Supply is rated at 5 volts and 2 amperes, which nominally provides 5.0 to 5.1 volts at the eSTS input. Extending the original power supply cable is not wise as the voltage reaching the eSTS may be too low due to cable losses.

The input voltage to the board should be at least 5 volts for proper mobile device operation. 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 in the system is not too low at any point. 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 over voltage or reversed connections. Application of the wrong voltage can result in **immediate** damage to the board and possibly other components in the system.

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

LAVA Tablet Manager Configuration File

Overview
The LAVA Tablet Manager (LTM) 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
ltm-setup-rev=x	This keyword is set by the configuration manager to indicate the last time the file was updated.
product-family=x	**The "product-family=1" must be set for SimulCharge products supporting battery modulation, such as an eSTS-** or STS-RBM.** The permitted range is 1 to 2. The value 2 is used for LAVASynC+ products. The default is 2.

board-type=x	**The "board-type" keyword must be set to the correct value; otherwise the battery protection feature is compromised.** This keyword is used with the Micro USB-C based devices.
	
	The supported values are:
	  0=Used by a prototype board with a unique command set (L180.0 board)
	  1=Protection type 1
	  2=Protection type 2
	  3=Protection type 3
	The default is 2.
	
	Examples:
	The Tab A 10.1" tablet uses board-type = 3.
	The Tab E 9.6", Tab A 9.7", and Tab A 8.0" tablets use board-type = 2.
	The Tab S2 9.7", S2 8.0" and Tab E 8.0" use board-type = 1.
	
	The "board-type" keyword is only used when "product-family=1" is set.

btty-protection-type=x	The "btty-protection-type" keyword **is not used by eSTS products** or STS-RBM products. With "product-type=1" set, the "protection-type" keyword is ignored and the "board-type" keyword is used to define the battery protection type. Use of the "board-type" keyword is a legacy issue.
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 (aka battery protection) 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 4 recovery attempts, the 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 eSTS 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=eSTS reset (the default)

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 disabled 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.
user-debug=x	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 mobile device. The permitted range is 0 to 3. The default is 1.

Level	Messages	Comments
0		No status messages
1	"LTM - controller attached"	The device has detected the eSTS board.
1	"LTM - controller running"	The LTM application has started to operate.
1	"LTM - controller detached"	The eSTS 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 mobile device battery is charging. The current battery level is "nn" percent.
2	"LTM - discharging nn%"	The mobile 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.

Note: Each level includes the messages of the lower levels.

ethernet-debug=x	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.

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.

Note: Each level includes the messages of the lower levels.

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 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. **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	Time stamp as the number of seconds since midnight January 1, 1970, UTC.
3	UT	Tablet 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 milli-volts.
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 mobile 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, btty-protection-type defines the protection type.
;
; When product-family=1 is used, board-type defines the protection type.
; When product-family=2 is used, btty-protection-type defines the protection type.
;
[LTM-START]
product-family=1
btty-protection-type=1
board-type=1
permit-ltm-icon=1
;
no-btty-modulation=0
btty-upper-threshold=75
btty-lower-threshold=45
btty-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
;
btty-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 products. 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 while the timeouts are disabled.

The DISABLE TIMEOUTS button disables the 7-minute recovery timeout. This button is presented after a device is detected while the timeouts are 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 button 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 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 LTM application is installed on the mobile device. No harm can be done by running the two applications. However, note that LTM can also modify the Timeouts settings.

Note: The LAVA-Device-Info utility and is a useful addition for LTM 3 users. However, it is redundant for users of LTM v4.** and v5.** as its features are now 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.** 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.
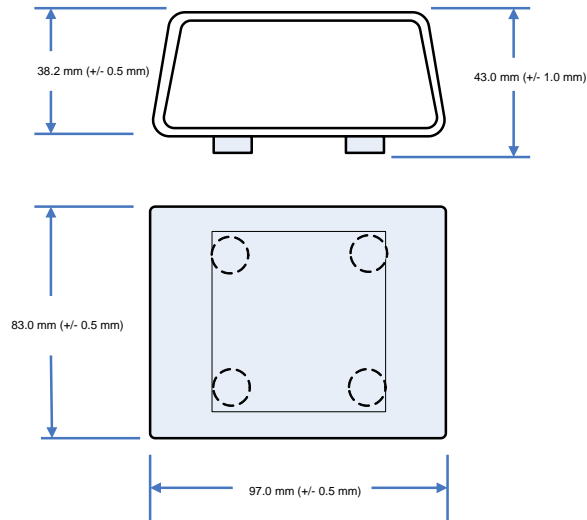
Dimensions

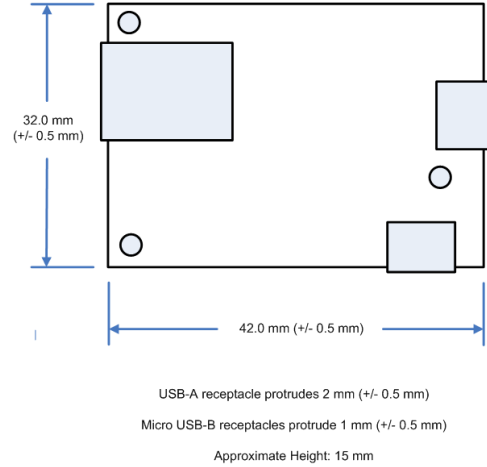**Figure 10:** Case dimensions for the eSTS-3U, eSTS-E, eSTS-PE, eSTS-2UE, and eSTS-P2UE

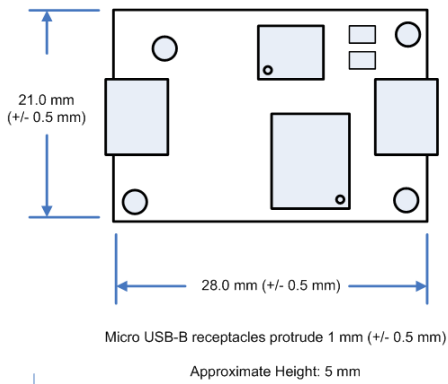**Figure 11:** Dimensions of the eSTS-1U-OEM board

Figure 12: Dimensions of the eSTS-BM-OEM board

Technical Support

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