



STS-RBM Reference Manual

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Abstract

The LAVA STS-RBM Products permit the charging of select Samsung tablets while simultaneously interacting with USB accessories. The STS-RBM enhanced features include battery modulation, reliable DHCP operation, and screen brightness management.

This document describes the features of an STS-RBM device.

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Introduction

The LAVA STS-RBM Products permit the charging of select Samsung tablets while simultaneously interacting with USB accessories. The LAVA STS-RBM Products are part of the LAVA STS Family of devices. The STS-RBM enhanced features include battery modulation, improved network operation, and screen brightness management.

The STS-RBM term refers to a group of LAVA products. The STS-RBM Products are available in several configurations. This document describes all potential features of the STS-RBM Products.

An STS-RBM system is a combination of hardware and software. The STS-RBM board attaches to the Samsung Tablet with the LAVA provided cable. The tablet runs the LAVA Tablet Manager (LTM) application to support the STS-RBM board.

The LAVA Mini Kiosk combines a Samsung Galaxy Tab E 9.6” enclosure, an STS-RBM module with PoE, and an optional high-quality barcode scanner. The tablet must be procured and configured by the integrator of the STS-RBM system.

The “STS-RBM Installation Manual” describes the STS-RBM setup and software installation procedure for the tablet.

System Requirements

The STS-RBM products are designed to use features unique to a group of Samsung tablets.

The Samsung Tablet requires the installation of the LAVA Tablet Manager (LTM) application, which is provided to the STS-RBM integrator. The setup procedure for this application is described in the “STS-RBM Installation Manual”. The setup process requires a brief WiFi connection for a one-time activation of the Samsung KNOX license. The KNOX license does not require an additional fee.

The tablet must include the Samsung Knox Standard SDK version 5.1 or newer. The SDK version information is available in the tablet’s “About device” information.

The ST-RBM works with unrooted Samsung tablets.

The STS-RBM and LTM Application have been tested with the following Samsung tablets:

Test Summary - Samsung Tablet and STS-RBM					
Model Number	Device Name	Screen Size	Android Version	Build Number	Note(s)
SM-T580	Galaxy Tab A 10.1”	10.1	6.0.1	MMB29K.T580UEU1APG1	1,6
SM-T560	Galaxy Tab E 9.6”	9.6	5.1.1	LMY47X.T560NUUEU1AOK1 MMB29M.T560NUUES1BPL1 MMB29M.T560NUUEU1BQF1	1,2
SM-T377W	Galaxy Tab E 8.0”	8.0	6.0.1	MMB29K.T377WVLU0APC3 MMB29K.T377WVLU2API2	1,4
SM-T377V	Galaxy Tab E 8.0”	8.0	6.0.1	MMB29K.T377VVRU1BPD6	1,5
SM-T810	Galaxy Tab S2 9.7”	9.7	5.1.1	LMY47X.T810XXU2BOJ1 MMB29K.T810XXU2CPK1	1
SM-P550	Galaxy Tab A 9.7”	9.7	6.0.1	MMB29M.P550XXU1BPF3 MMB29M.P550XXS1BPK1	1,3
SM-T350	Galaxy Tab A 8.0”	8.0	6.0.1	MMB29M.T350XXU1BPE3	1
SM-T530NU	Galaxy Tab 4 10.1”	10.1	5.0.2	LRX22G.T530NUUEU1BOI2	1

The devices in the test summary have been verified with the STS-RBM and LTM Service as of September 2017. LAVA only has access to models from the Canadian market and some U.S. models for internal testing. A tablet integrator must perform a verification of the tablet model and build targeted for their application. LAVA will assist in the testing of other tablets provided a sample tablet is made available. The sample tablet must be delivered with the intended build already installed.

*The tablet features used by the STS-RBM and STS-** Products are not universal across the Samsung Tablet line. Samsung tailors the tablet 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 tablet and firmware build to be used before committing to any deployment.*

The 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 PoE capable STS-RBM device. A PoE Power Injector is a standard add-on available from many Network Switch vendors.

STS-RBM models without PoE require a USB Power Supply with a Micro USB-B receptacle. The Wall/USB Charger provided with the tablet is an ideal choice for use with the STS-RBM.

Note	Description
1	The tablets issue a beep when the battery modulation changes from the discharging to charging state on most tablets. The newer tablets allow the “Charging sound” to be disabled within the Sound menu. Older tablets can lower the system volume if sound is not required.
2	Tested with a North American build for STS-RBM and STS-** devices. Problems have been using reported with U.K. Android 4.x.x builds with STS-** devices. The U.K. Android builds have not been tested with STS-RBM.
3	Requires tablet connection cable be no longer than 19” (50 cm).
4	The SM-T377W was tested with build MMB29K.T377WVLU0APC3. The unit tested was a Canadian model, not specific to a carrier.
5	The SM-T377V was tested with build MMB29K.T377VVRU1BPD6. Earlier builds do not work with the STS-RBM or any STS-** device. The unit tested was a U.S.Verison model.
6	The Tab A 10.1” tablet briefly disconnects attached USB accessories each time the battery modulation changes from charging to discharging. This side effect has the benefit of periodically refreshing the internal resources used by the device. Using a wider set of modulation thresholds will minimize the effect of this behavior on the user.

STS-RBM Features

Overview

The STS-RBM Products support a variety of features that include:

- ❑ Battery modulation for tablet longevity
- ❑ USB Host operation with simultaneous tablet charging
- ❑ Enhanced Network Management for reliable network operation
- ❑ Screen brightness control for reduced heat generation
- ❑ Interaction with USB accessories
- ❑ Up to two standard USB-2.0 receptacles
- ❑ Wired networking (10/100 Ethernet) support
- ❑ Option for barcode scanner with customization interface
- ❑ Power over Ethernet (PoE) support
- ❑ Option to operate using standard power brick
- ❑ Support for installations running 24/7
- ❑ Maintenance resets of tablet and module hardware
- ❑ Configurable Charge Mode button
- ❑ USB permission handling using the Samsung KNOX Standard SDK
- ❑ USB permission handling for up to two user peripherals

The STS-RBM features rely on the hardware working with the LAVA Tablet Manager (LTM) application. Installation of the LAVA Tablet Manger is mandatory before using an STS-RBM product.

USB Host operation with simultaneous tablet charging

The primary feature of all LAVA STS-RBM, eSTS and STS** Products is to allow the charging of select Samsung tablets while interacting with USB accessories.

Unlike many other Android tablets on the market, the Samsung tablets have the ability to operate as a USB HOST and be charged. Lava calls this feature SimulCharge, for simultaneous charging while working with USB accessories. The System Requirements section states which tablets have been tested.

Power to an STS-RBM Product is applied after the tablet is attached and powered. The STS-RBM applies power and data to the tablet in a sequence that ensures proper battery charging and USB Host operation.

The STS-RBM has an internal USB Hub used to connect a 10/100 Fast Ethernet Adapter to the tablet, up to two user accessible USB2.0 ports, and a proprietary communication port. The communication port is used by a LAVA application to manage the STS-RBM hardware.

The LAVA eSTS, eSTS-E, eSTS-PE, eSTS-2UE, and eSTS-P2UE products support SimulCharge as well as the features present in the STS-RBM. The LAVA STS, STS-E, STS-PE, STS-2UE, and STS-P2UE products also support SimulCharge.

LAVA Tablet Manager (LTM) Application

The LAVA Tablet Manager (LTM) is an Android application provided by LAVA for use with the STS-RBM. This application must be installed on the tablet to manage the STS-RBM. The installation procedure is described in the “STS-RBM Installation Manual”. This application runs as a background service in the tablet. This application has no GUI component.

The LTM Service and related features are configured using a simple configuration file placed in the tablet root folder. The file name is LTM.INI. The LTM.INI file can be modified on any PC using a standard text editor. The LTM.INI file can be updated on the tablet at any time. The commands in the LTM.INI file are described in a dedicated section later in this document.

Note: The LAVA Tablet Manager is not a standalone product, and requires the STS-RBM to function.

Battery Modulation

The Battery Modulation feature helps reduce stress on the tablet 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. After a set number of user-defined charge/discharge cycles, a “full” cycle is performed to reset the tablet battery calibration.

Battery Modulation ensures the tablet never remains at the 100% level for more than a few minutes over a month. This behavior makes the STS-RBM suitable for enclosures that run 24 hours a day, 7 days a week.

All parameters associated with the modulation are customized using a human-readable configuration file placed in the Device Storage “root” folder of the tablet. The “root” refers to the folder that contains sub-folders such as Download, Playlists, Music, Movies, and so on.

The STS-RBM supports several battery modulation schemes. Setting the correct “board-type” is critical for battery modulation to work. The STS-RBM Setup will identify which option to use for a given tablet. The sample LTM.INI sets following parameters and represents a typical battery modulation configuration:

```
board-type=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
encourage-night-charging=60
```

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 tablet 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 has been started. This allows for an early battery calibration for situations where the tablet might have been turned off for some time. Using “bttty-cycle-limit-on-start” is optional.

The “encourage-night-charging” is another optional feature used to help reduce heat generation. Please see the INI File description for more information.

Wired network operation

The STS-RBM provides a 10/100 Fast Ethernet wired interface. This feature relies on standard support from the tablet. A wired networking solution is more reliable than WiFi and has greater security.

Tablets 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 tablet setup menu.

The tablet 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 tablet 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 enable.

When using DHCP, the tablet attempts to fetch the network addressing information from a DHCP server. If the addressing information is not located within the timeout period, the tablet 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 STS-RBM Network Recovery automates the network restart, which is critical for embedding a tablet 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.

In some cases, an installation may choose to use WiFi for network access rather than the wired Ethernet support of the STS-RBM product. The STS-RBM 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 STS-RBM and the LTM application help a tablet recover from network connection failures when using a wired network. The typical failure is the inability to establish a network address from a DHCP server.

When a DHCP lookup fails, or the lease renewal fails, the tablet turns off the Ethernet interface and makes no further attempts. 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 in again to restart the connection. Until the process is restarted, the tablet 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 tablet.

The LTM application monitors the wired network connection and if the connection is lost, 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 screen is a major power consumer and heat generator within the tablet. If the screen is too bright, the tablet may not be able to charge the battery in SimulCharge Mode.

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 tablet 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 helps improve the longevity of the tablet battery and other internal components.

Using this feature is recommended but remains optional.

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

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

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 AM the tablet 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 brightness 2 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. This permission window cannot be bypassed on a system which is not rooted, unless it supports the Samsung KNOX Standard SDK.

Typical USB Permission Pop-Up Window



The LAVA Tablet Manager (LTM) eliminates this USB permission window for peripherals using the Samsung KNOX Standard 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 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.

The LTM configuration file must be setup 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 (PoE or USB Power Supply)

The STS-RBM can be powered using a standard USB Power supply, such as that provided with the tablet.

The typical power supply provided with a Samsung tablet is rated at 5 volts nominal output voltage with a 2-ampere capacity. The Samsung Power Supplies have “droop” compensation to ensure that 5 volts or more reaches the end of the charging cable.

Any 5 volt regulated power supply is permitted, provided at least 5 volts is present at the input to the STS-RBM. The preferred voltage is 5.1 to 5.25 volts. The input voltage must never exceed 5.25 volts. Exceeding the maximum input voltage does violate LAVA’s manufacturer warranty.

The STS-RBM has the option for Power over Ethernet (PoE) which is a standard for passing electrical power through an Ethernet cable along with the network data. The STS-RBM products with PoE can resolve the problem of getting power to the tablet and peripherals when an AC outlet is not in a convenient location. Deploying network cabling with PoE support can be significantly cheaper than installing dedicated power lines through a facility.

The PoE specification allows the powered device to be up to 330 feet (100 meters) from the Network Switch or PoE Injector.

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

Barcode Scanner Support

The STS-RBM system has the option for a high-resolution Barcode Scanner. The Scanner can be operated in Keyboard Mode or the enhanced LAVA Mode. Configuring the Scanner for either mode of operation is described in the “STS-RBM Installation Manual”.

Operating the Scanner in Keyboard Mode has the device behave like a standard USB Keyboard. Mimicking a keyboard is a technique used by many devices, as Android has built in support. This method of intercepting the barcode information requires an application keep the device in focus to avoid missing data.

Operating the Scanner in LAVA Mode, the service watches for a barcode scan to take place, and reports the barcode using a simple Android Intent message. The LTM Service interacts with the Barcode Scanner to isolate the “user application” from hardware specific issues. A user developed application can watch for the Intent, to take any required action. The Intent mechanism is understood by any Android programmer. This mode of operation is used by the LAVA ScannerReceiver application.

The ScannerReceiver is a sample “user application” provided by LAVA, which watches for a barcode scan to take place and launch a Web Browser. The barcode information has extra data wrapped around it to form a URL used for a Web-based product lookup. The extra data is defined in the LTM.INI file. A simple web based product scanner can be developed with no custom Android application development.

The source code for the ScannerReceiver application is available to STS-RBM integrator. This application demonstrates how to intercept and use the barcode message.

The Barcode Scanner option is available for the enclosed versions of the STS-RBM, which will have the Scanner mounted in the factory.

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

```
lsr-url-prefix=http://www.ebay.ca/sch/i.html?_from=R40&_sacat=0&_nkw=  
lsr-url-postfix=
```

These settings result in the scanned barcode being turned into the following URL:

```
"http://www.ebay.ca/sch/i.html?_from=R40&_sacat=0&_nkw=*****"
```

In the above example "*****" would be the barcode value.

Additional information on the Barcode Scanner support is presented later in this document.

Configurable Charge Mode button

The Charge Mode button is used to change the charging Mode. SimulCharge Mode and Charge-Only Mode are described in the Tablet Charging section. The behavior of the button can be selected from the LTM.INI file using the command "mode-button=1" and "mode-button=2".

The Charge Mode Button is described in more detail in the "STS-RBM Board" section of the document.

Maintenance Reset of System

The Samsung Tablets are a consumer level device. Running a tablet for an extended period is not the intended use-case. The nature of the application being run may require the tablet be periodically reset to clean up the internal resources of the tablet.

The STS-RBM system has the option to reset the tablet and STS-RBM 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=3
```

The sample LTM.INI settings result in the tablet and STS-RBM being reset 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 “STS-RBM 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 telephone or tablet. The Android System limits how long a user-installed application can run. The Samsung Tablets are a consumer level device, and running one for an extended period is not the intended use-case. The standard tablet behavior can result in the LAVA Tablet Manager (LTM) being shut down after a period of time. Additional factors include effects of other applications installed by the integrator.

The STS-RBM has several safeguards to ensure it will continue to function. The LTM sends information to the STS-RBM on a regular basis. If the messages stop, the STS-RBM will attempt to wake up the LTM Service. The first recovery mechanism involves an automatic reset of the port used for the tablet to STS-RBM messaging. The second level of recovery involves the STS-RBM automatically shutting down all power and signals to the tablet for 30 seconds and then restoring the signals. This second level of recovery is equivalent to powering down the STS-RBM board and then restoring power.

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

```
keep-alive-rate=3
keep-alive-timeout=5
power-watchdog-timeout=7
power-watchdog-action=1
```

There should be no need to change these parameters. These parameters can be removed from the LTM.INI file as they represent the system defaults. The ability to change these parameters has been included to handle custom applications.

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 a number of rare conditions seen in a few tablet models.

The Low Level Detect (LLD) monitors the tablet battery level. In some rare cases, the tablet may refuse to start charging. This mechanism prevents the tablet from discharging. The configuration commands use a "lld-" prefix. If the signal drops below the danger threshold ("lld-threshold" - "lld-offset") for three samples, then a recovery operation is started. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. 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 tablet battery voltage. In some rare cases, the tablet may refuse to start charging when using battery modulation. This mechanism prevents the tablet from discharging. The configuration commands use a "lvd-" prefix. If the signal drops below the danger threshold ("lvd-threshold" - "lvd-offset") for three samples, then a recovery operation is started. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. The signal must have been above or at the activation threshold ("lvd-threshold") on a previous sample, to enable the detection feature. This feature is active as a default.

The Stuck Level Detect (SLD) feature monitors the tablet battery level. In some rare cases, the tablet charge level gets stuck. After many hours the tablet recovers. This mechanism ensures the recovery time is controlled. The configuration commands use a "sld-" prefix. If the battery level does not change for 'x' minutes, then a recovery operation is started. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. This feature is active as a default.

Firmware Field Update

The STS-RBM board firmware can be updated in the field. The update file is placed in the tablet Download folder. The LTM Application detects the update image with 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. Once power is restored the update continues automatically.

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 STS-RBM and restoring it allows the update to complete. If the update fails, the STS-RBM is stuck in the Boot Loader. When the Boot Loader is active, the SimulCharge (Yellow) LED flashes on and off every ½ second. While in the Boot Loader, no battery modulation operations take place, and the tablet 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 = 1.0
1472658697: product type = 1
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 = 1.0
1472658532: product type = 1
1472658532: image type = 2
1472658537: open connection, status=false
1472658539: open connection, status=false
1472658539: UPDATE FAILED
1472658539: END OF UPDATE
```

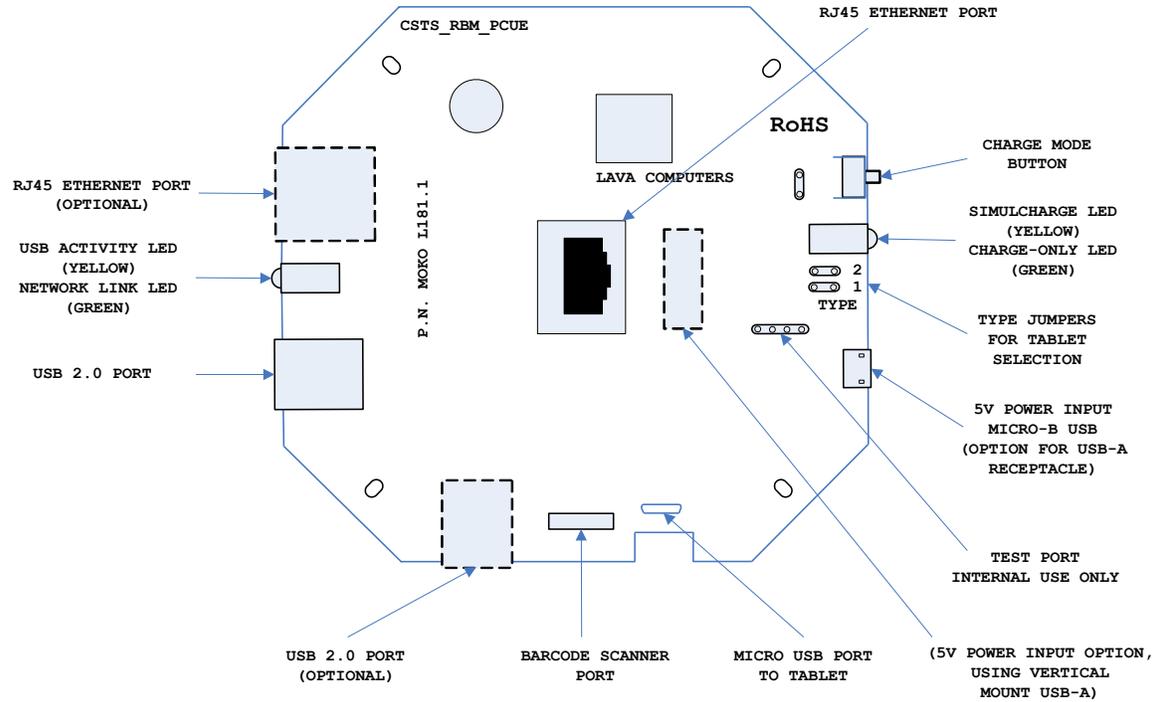
The number at the start of each line is a UTC timestamp. The value is the number of seconds since January 1, 1970 (midnight UTC/GMT) not counting leap seconds.

The product type and image type will always be “1” and “2” respectively. 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 STS-RBM.

STS-RBM Board

Board Connector Placement

STS-RBM (L181.1) Board



TYPE Jumper for Tablet Selection

The TYPE Headers determine the type of Samsung tablet supported. It is critical to set these headers with the correct jumpers else the tablet may not charge very well or may not charge at all. Each header has two pins and uses a standard 0.1-inch jumper.

TYPE Header Jumper Options		
Header 1	Header 2	Description
Open	Open	Operation with Tab E, Tab S2, Tab A
Installed	Open	Operation with Tab 4
Open	Installed	Reserved for future use
Installed	Installed	Force Boot Loader to run.

When power applied to the STS-RBM, the green Charge-Only LED will flash on and off for 2 to 3 seconds and then the yellow SimulCharge LED goes active. If the Type 1 jumper is open, the green led flashes with a pulse-pulse-pause pattern for the 2 to 3 seconds. If the Type 1 jumper is closed, the green led flashes with a continuous on-off pattern for the 2 to 3 seconds.

Charge Mode Button

The Charge Mode button is used to change between SimulCharge Mode and Charge-Only Mode.

SimulCharge Mode informs the tablet to operate as a USB Host controller, but not to provide power for USB accessories. With SimulCharge mode active, the tablet is expecting power to be supplied to it for battery charging and running the tablet. The system power supply provides power for USB accessories and the tablet.

Charge-Only Mode results in the tablet battery being charged at the highest rate permitted by the tablet. Charge-Only Mode is equivalent to a USB Charger with a Direct Charge Port (DCP). No USB devices are accessible during Charge-Only Mode.

The STS-RBM defaults to SimulCharge mode on power up.

The active state (Charge-Only or SimulCharge) is reported on status LEDs beside the Charge Mode button.

The Charge Mode button has two possible behaviors, which can be selected through the LTM.INI configuration file used by the LTM Service.

Charge Mode Button Behavior Options	
Level	Description
1	Holding the button places the unit in Charge-Only mode. Release the button; the unit is in SimulCharge mode. As the button is momentary, the unit is in SimulCharge by default.
2	The STS-RBM defaults to SimulCharge mode when power is applied. Pressing the Charge Mode button for 5 seconds or more places the tablet into Charge-Only Mode. The tablet remains in Charge-Only mode for about 7 minutes before automatically changing back to SimulCharge mode, even if the Charge Mode button remains held. The 7-minute Charge-Only window can be canceled early by double clicking the Charge Mode button. To click the button press for 1 second, release for 1 second and then repeat once more. This setting is the manufacturing default for the STS-RBM board.

Charge Mode Status LEDs

The active state (Charge-Only or SimulCharge) is reported on status lights on one end of the STS-RBM case, beside the Mode Select button.

The yellow indicator is for SimulCharge Mode. The STS-RBM board defaults to SimulCharge Mode.

The green indicator is for Charge-Only Mode. When Charge-Only Mode is active, the green LED remains solid; hence there is no flash pattern.

When an STS-RBM is powered on, the green indicator (Charge-Only) will flash for 2 to 3 seconds. The pattern of flashing is dependent on the TYPE jumper selection.

These LEDs are used to report a number of special conditions in addition to the Charge Mode.

When SimulCharge is active, the Charge Mode LEDs indicate several conditions using different flash patterns. The patterns are used to determine if the STS-RBM system is working.

Charge Mode LED States		
SimulCharge (Yellow) LED	Charge-Only (Green) LED	Description
Mostly “on”, short pulse “off”	Off	SimulCharge Mode: Tablet is charging (part of the battery modulation process). The pattern repeats every 1.5 seconds.
Mostly “off”, short pulse “on”	Off	SimulCharge Mode: Tablet is discharging (part of the battery modulation process). The pattern repeats every 1.5 seconds.
Slow “on” and “off” four times	Off	SimulCharge Mode: Configuration command sent to the board. The pattern duration is 1.5 seconds.
Rapid “on” and “off” eight times	Off	SimulCharge Mode: Charging “on” or “off” command sent to the board. The pattern duration is 1.5 seconds.
Any of the above are possible.	Pulse “on” for 1 second.	SimulCharge Mode: Tablet charging forced on (see hardware-reset-action command in INI file).
Any of the above are possible.	Pulse “on” for 1/8 second	SimulCharge Mode: The tablet keep-alive-timeout has occurred. The communication port used to talk to the STS-RBM has been reset.
Off	On (solid)	Charge-Only Mode: No USB accessories permitted. No battery modulation is taking place. The tablet is charging at a high rate.
Continuous “on” and “off”	Off	A continuous “on” and “off” of the SimulCharge LED every ½ second indicates the STS-RBM Boot Loader is running. If a firmware update is not in-progress, something has gone wrong, or both TYPE jumpers are installed.
Off	Off	No power is applied to the STS-RBM. If using the hardware-reset-action which acts on the STS-RBM, these LEDs will be off for about 30 seconds and then recover.

Tablet Port (Micro USB)

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

The custom cable provided with the STS-RBM product provides the connection between the STS-RBM and the tablet. The cable provided is either 8” (20 cm) or 39” (100 cm) in length. 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 tablet or the STS-RBM product.

The STS-RBM to Tablet cable must not be extended

5V Power Input (Micro USB)

The “5V Power Input” is a Micro USB-B Receptacle on STS-RBM products without Power over Ethernet.

The “5V Power Input” provides power for the STS-RBM product, the tablet, and for attached USB accessories. The STS-RBM Product will not function if power has not been applied.

A standard USB 5Volt DC Power Supply is attached to the “5V Power Input”. The supply need not be a Direct Charge Port (DCP) compliant device. 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). Exceeding the maximum input voltage does violate LAVA’s manufacturer warranty.

The USB Power Supply provided with most Samsung tablets are rated at 5.3 volts and 2 amperes. For the cable provided by Samsung, the voltage delivered to the end of the cable will typically be from 5.0 to 5.1 volts for the range of expected currents. These supplies have some compensation for wire losses.

The “5V Power Input” on the STS-RBM products can be used with external USB Battery Packs (aka Power Bank). This ability can be advantageous for some tablet-based enclosures. The USB Battery Pack must be physically removed for recharging.

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

The cable length between the Power Supply and the STS-RBM 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 STS-RBM receptacle will be lower than the supply output due to cable power loss. There is power loss in the cable that connects the STS-RBM to the tablet. If the voltage at the tablet is too low, the tablet 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 USB accessories to the tablet via an STS-RBM device, 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 “5V Power Input” is not present on all STS-RBM configurations. If not present, then the system is expected to be powered using PoE.

An STS-RBM with PoE support can be powered through the “5V Power Input”.

Warning: *When supplying power through the 5 Volt input, you must not use a Network Switch Port that is providing PoE power.*

The “5V Power Input” can optionally be built with a USB Type-A receptacle in place of the standard Micro USB receptacle. This option allows a USB 3.0 Type-A to Type-A cable to be used to connect the STS-RBM to a 5-volt USB Power Supply. The USB 3.0 cables use higher gauge wires than USB 2.0 cables, which have lower power loss than the power supply cable supplied with a tablet. This option allows the STS-RBM to be placed up to 3 meters (10 feet) from the power supply. The 3-meter (10 feet) figure is typical. The actual distance depends on the quality of the USB cable used and the USB power supply. This is a non-standard non-stocked item.

Ethernet Port (RJ45)

The RJ45 Ethernet Port is an IEEE 802.3 10BASE-T / 100BASE-TX compatible Fast Ethernet interface.

The RJ45 receptacle has two mounting options. Only one RJ45 receptacle is populated.

The wired Ethernet option allows the enclosure developer to design for non-WiFi environments.

The USB Ethernet Controller implemented in the STS-RBM Product has standard support built into the Samsung Tablets noted in the compatibility list. Applications developed for the tablet using any network operations are automatically routed by the tablet operating system to the active network interface.

The Ethernet Port only functions when the STS-RBM device is powered.

The tablet 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 tablet 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 tablet attempts to fetch the addressing information from a DHCP server. If the addressing information is not located within the timeout period, the tablet 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.

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

Power-over-Ethernet (PoE)

The STS-RBM power is provided through the Ethernet RJ-45 port. These modules require a suitable Ethernet Network Switch with PoE support.

The STS-RBM PoE Power Supply provides 10.4 watts of power for the tablet, the STS-RBM, and attached USB accessories. The value of 10.4 watts allows the device to be treated as a Class 0 device by a PoE switch.

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

The system designer must budget for the charging requirements of the tablet and the power required by USB accessories. The STS-RBM products do not provide any diode protection between the module and the peripheral ports.

The PoE option is not present on all STS-RBM configurations.

Warning: *When using a Network Switch Port that is providing power, the 5 Volt input must not be used.*

Ethernet Link and USB Activity LEDs

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 STS-RBM is powered and connected to the tablet. The USB Activity pulses when there is traffic between the tablet and the STS-RBM.

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

Both indicators remain off when the STS-RBM power has not been applied.

USB-2.0 Support

The STS-RBM has up to two USB 2.0 ports with a standard A-type receptacle. Each receptacle allows a USB Accessory to be accessed by the tablet. Each receptacle provides power to each USB Accessory.

The USB ports are connected to the tablet via a USB Hub that is part of the STS-RBM. These ports both limit the current available to the attached accessories to 500 mA each. The power available to the attached devices depends on the system power supply capacity, the needs of the STS-RBM hardware and the needs of the tablet.

The USB-A receptacles only function when the STS-RBM device is powered.

A USB Hub can be attached to the STS-RBM USB receptacles to extend the number of accessories supported by the system. Additional USB accessories and the related cabling require a power budget be developed for the system. Power loss in the cables results in lower voltages at each device.

Using self-powered USB Hubs may be required in some systems, to offload the main supply responsible for the tablet.

Barcode Scanner Port

This connector is used with a specific Barcode Scanner, which has been integrated, with the STS-RBM by LAVA. Please contact LAVA for additional details.

Additional information on the Barcode Scanner is presented later in this document.

Tablet Charging (SimulCharge versus Charge-Only)

Overview

The Samsung tablet was intended as a stand-alone device. When the internal battery of the tablet requires charging, it is plugged into a Wall/USB Charger to restore the battery charge. The tablet can continue to be used while being charged. Once the battery is charged, the tablet may use the charger as a supplementary power source if the tablet is left running. It is preferred to charge a tablet 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 tablet charges at a high rate that is tablet 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 tablet requirements.

Charge-Only Mode

The Samsung Wall/USB Charger is equivalent to a USB Charger with a Direct Charge Port (DCP) as defined by the USB Battery Charging Specification R1.2. The STS** Products use the term Charge-Only Mode to indicate the tablet battery is being charged at the highest rate permitted by the tablet and is equivalent to a USB Charger with a Direct Charge Port (DCP).

USB Host versus Accessory

A tablet 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 tablet is attached. The PC provides power to the tablet, but the tablet battery is being charged at a low rate. In some cases, the battery may not charge.

To plug a USB Accessory into a tablet, the tablet 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 tablet detects that a USB Accessory has been plugged in and automatically switches to operate as a USB Host Controller. Not all tablets support the USB OTG feature. When operating as an OTG USB Host, the tablet is expected to supply power to the attached accessories, which means power is drained from the tablet battery.

SimulCharge Mode

The STS** products place a Samsung tablet into the SimulCharge Mode. SimulCharge Mode informs the tablet to operate as a USB Host controller, but not to provide power for USB accessories. With SimulCharge mode active, the tablet is expecting power to be provided to it for battery charging and running the tablet. This allows the tablet to be run simultaneously while interacting with one or more USB accessories. Using SimulCharge Mode makes it practical to embed a tablet in an enclosure. The charging rates during SimulCharge are specific to each tablet.

Samsung tablets operating in SimulCharge mode will limit the amount of power drawn from the external power source. If there is not enough power coming in, the tablet takes the extra from the battery. Hence 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 color scheme can be designed to reduce the power required. Application processes requesting too much CPU time increases the power needed by the tablet. Limiting the power used from the external supply, allows the Power Supply to be shared between the tablet and USB accessories.

Power should be applied to the STS** product after it has been attached to the tablet, to ensure proper tablet startup. If the STS** product is powered up before attaching it to the tablet, the tablet may not enter USB Host mode or may not enable battery charging.

The STS** products use charging features specific to a set of Samsung tablets identified in the System Requirements section. Simultaneous battery charging and USB Host operation are not universal among

Samsung tablets. Tablet models have different features based on country/region. Custom versions created for mobile providers may have the same basic model number, but very different features.

The STS** products are always expected to be powered to keep the tablet 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 tablet and STS** device. 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.

Charge-Only Mode is important for Samsung Tab 4 (8" and 10.1") operation. If the Tab 4 is turned off, the tablet cannot be turned on or charged when SimulCharge is active. Placing the STS** in Charge-Only Mode allows the tablet to be charged, and the option to turn it on immediately. The Tab 4 battery is allowed to run down, the same problem results as the tablet having been manually turned off. This issue is unique to the Tab 4 tablet.

Charge-Only Mode is a useful temporary state for any Samsung tablet that has a severely depleted battery. These tablets may require the tablet battery be charged for several minutes in Charge-Only mode; else the tablet may simply shut down on startup, even with a power supply attached.

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 a number of 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.

LAVA Tablet Manager INI File

Overview

The LAVA Tablet Manager (LTM) Service is configured by the file LTM.ini located in the root folder.

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 tablets do not have a suitable editor installed.

A configuration file update can be placed in the download folder, and is then automatically moved to the root by the LTM Service. The configuration file can always be directly updated in the root folder.

The INI file can be copied to the tablet 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:

- mode-button
- 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 command "board-type" defines the only critical parameter in the configuration file. This parameter must be matched to the tablet being used to define the battery modulation scheme.

The STS-RBM board is also referred to as the L181.1 board.

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 white space 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”.
board-type=x	Select the STS-RBM board type and modulation command set. The supported values are: 0=L180.0 Prototype board using a unique command set 1=L181.1 Modulation scheme 1 2=L181.1 Modulation scheme 2 3=L181.1 Modulation scheme 3 The default is 2. 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”, Tab E 8.0” and Tab 4 10.1” use board-type 1.
mode-button=x	This command sets the behavior of the "charge mode button". A value of 2 sets the "level 2" behavior, which is described elsewhere in the document. A value of 1 sets the "level 1" behavior, which is described elsewhere in the document. The manufacturing default for the board is 2 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.
bty-upper-threshold=x	The standard upper limit for battery charging as a percentage. The permitted range is 20 to 100. The default is 95.
bty-lower-threshold=x	The standard lower limit for battery charging as a percentage. The permitted range is 1 to 100. The default is 70.
bty-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 tablet to periodically charge up to 100% to reset the calibration. A "full" charge cycle is performed every 'n' standard cycles, where “ bty-cycle-limit” defines ‘n’. This parameter should always be 100. The permitted range is 20 to 100. The default is 100.
bty-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 tablet to periodically charge up to 100% to reset the calibration. A "full" charge cycle is performed every 'n' standard cycles, where “ bty-cycle-limit” defines ‘n’. The parameter is typically set to the same value as “bty-lower-threshold”. The permitted range is 1 to 90. The default is 70.
bty-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 bty-cycle-lower-threshold and bty-cycle-upper-threshold are used. The permitted range is 0 to 100. The default is 0.
bty-cycle-limit=x	The number of charge cycles before a "full" charge cycle is used. For a "full" charge cycle the bty-cycle-lower-threshold and bty-cycle-upper-threshold are used. The permitted range is 1 to 9999. The default is 25.

encourage-night-charging=x	<p>The "encourage-night-charging" feature results in the tablet being forced into the charge state 'x' minutes before the start of brightness-level2-time.</p> <p>The "night time" window starts at "brightness-level1-time" and ends at the "brightness-level2-time". During this window, the tablet screen can be set to operate at a 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 window.</p> <p>The permitted range is 0 to 720.</p> <p>The default is 30.</p>
check-btty-current=x	<p>This command is used to enable the checking 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 STS-RBM board.</p> <p>The permitted range is 0 to 1.</p> <p>The default is 1, which enables the feature.</p>
ignore-btty-current=x	<p>This command behaves the same as "check-btty-current".</p> <p>This command has been kept for backward compatibility with another product.</p> <p>This command sets the same internal variable as "check-btty-current".</p>
no-btty-modulation=x	<p>This command can be used to disable the battery modulation.</p> <p>A "1" results in no battery modulation and all battery thresholds are internally set to 100.</p> <p>A "0" permits battery modulation.</p> <p>Disabling battery modulation is not recommended. The ability is present for internal testing.</p> <p>The permitted range is 0 to 1.</p> <p>The default is 0.</p>
permit-ethernet=x	<p>This command is used to enable the Ethernet interface.</p> <p>The permitted range is 0 to 1. A 1 permits Ethernet. A 0 disables Ethernet.</p> <p>The default is 1, which enables Ethernet.</p> <p>Added for LTM v1.11</p>
dhcp-recovery=x	<p>A dhcp-recovery value of 1 or 2 enables the Network/DHCP Recovery mechanism.</p> <p>When the network connection is lacking for approximately 1 minute, a network reset is attempted.</p> <p>A value of 0 disables the mechanism.</p> <p>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 4 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.</p> <p>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.</p> <p>The permitted range is 0 to 1.</p> <p>A "1" results in the Ethernet interface being disabled if WiFi is enabled.</p> <p>A "0" results in the Ethernet interface being active if WiFi is enabled, and the Android system determines how messages are routed.</p> <p>The permitted range is 0 to 1.</p> <p>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 STS-RBM board as a reminder of the current charging state.</p> <p>The permitted range is 0 to 60.</p> <p>A 0 disables keep-alive messages; charge commands are only sent when an upper or lower threshold is reached.</p> <p>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 tablet to STS-RBM 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 any user launched application to run forever.</p> <p>A value of 0 disables the timeout. Values 1 to 4 are treated as 0</p> <p>The permitted range is 0 to 60 minutes.</p> <p>The manufacturing default is 5 minutes.</p> <p>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.</p> <p>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.</p> <p>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 any 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.</p> <p>A value of 0 disables the timeout. Values 1 to 4 are treated as 0</p> <p>The permitted range is 0 to 60 minutes.</p> <p>The default is 7 minutes.</p> <p>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.</p> <p>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.</p> <p>A "1" results in the tablet being restarted in SimulCharge mode.</p> <p>A "0" results in the tablet power being turned back on.</p> <p>The permitted values are 0 and 1.</p> <p>The manufacturing default is 1</p> <p>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.</p> <p>This value is only set when the LTM Service starts.</p>
brightness-level1-time=x	<p>Time of day when the "level 1" brightness is set.</p> <p>The military (aka 24 hour) time format is used.</p> <p>The default is -1, which disables the brightness timers.</p> <p>Examples: 0:00 for midnight, 7:30 for 7:30AM, 23:15 for 11:15PM</p> <p>Note: The format expects an ':' to separate the hour and minutes.</p> <p>Note: If one integer is present, it is treated as hours, with minutes defaulting to 0.</p> <p>Note: If minutes exceed 59, then time is invalid.</p> <p>Note: If hours exceed 23, the time is invalid.</p> <p>Note: A negative time (ex. -1) disables all brightness thresholds</p> <p>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.</p> <p>Same format and rules as used by brightness-level1-time</p> <p>The default is -1, which disables the brightness timers.</p>
brightness-level1=x	<p>Screen brightness used by "brightness-level1-time".</p> <p>The permitted range is 0 to 100.</p> <p>The default is 15.</p> <p>Invalid values are replaced with the default.</p>
brightness-level2=x	<p>Screen brightness used by "brightness-level2-time".</p> <p>The permitted range is 0 to 100.</p> <p>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".</p> <p>A tablet was not originally intended to run for an extended period. Depending on the tablet 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 simply delayed until the next time of day window.</p> <p>The permitted range is 0 to 5000.</p> <p>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.</p> <p>The time used the same format as used by brightness-level1-time.</p> <p>A negative value disables the parameter and the time window.</p> <p>The "hardware-reset-time-1" and "hardware-reset-time-2" must be different valid times to enable the window.</p> <p>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.</p> <p>The time used the same format as used by brightness-level1-time.</p> <p>A negative value disables the parameter and the time window.</p> <p>The "hardware-reset-time-1" and "hardware-reset-time-2" must be different valid times to enable the window.</p> <p>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 STS-RBM hardware and resetting the Tablet. An STS-RBM hardware reset has the same effect as removing power from the board and then restoring power.</p> <p>The possible values for the command and associated action are:</p> <ul style="list-style-type: none"> 0=nothing 1=STS-RBM reset (the default) 2=Tablet reset 3=STS-RBM and Tablet reset
	<p>The USB Permission Handling 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.
lld-permitted=x	<p>The "lld-permitted" command enables the Low Level Detect (LLD) feature for the tablet battery level. In some rare cases, the tablet may refuse to start charging. This mechanism prevents the tablet from discharging. If the signal drops below the danger threshold ("lld-threshold" - "lld-offset") for three samples, then a recovery operation is started. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. 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 (on) and 1 (off), 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 "bty-lower-threshold" default is used. The "lld-threshold" is limited to the modulation lower thresholds, defined by "bty-lower-threshold" and "bty-cycle-lower-threshold".</p> <p>The range is 1 to 99. The default is defined by that of "bty-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 tablet battery voltage. In some rare cases, the tablet may refuse to start charging. This mechanism prevents the tablet from discharging. If the signal drops below the danger threshold ("lvd-threshold" - "lvd-offset") for three samples, then a recovery operation is started. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. 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 (on) and 1 (off), 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 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 tablet charge level gets stuck. After many hours the tablet 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. All signals to the tablet are removed for 3 or 4 seconds, and the tablet is then placed back into Simulcharge. 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.																																	
lsr-url-prefix=x	The command defines a prefix string used with the barcode reader value to form a URL. Also, see lsr-url-postfix. The resulting string is broadcast via the intent "com.lava.tabletmanager.SCAN_AVAILABLE" as extra data with a name of "SCAN".																																	
lsr-url-postfix=x	The command defines a postfix string used with the barcode reader value to form a URL. Also, see lsr-url-prefix. The resulting string is broadcast via the intent "com.lava.tabletmanager.SCAN_AVAILABLE" as extra data with a name of "SCAN".																																	
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 important 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 Service and tablet. The permitted range is 0 to 3. The default is 1. <table border="1"> <thead> <tr> <th>Level</th> <th>Messages</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>No status messages</td> </tr> <tr> <td>1</td> <td>“LTM - controller attached”</td> <td>The tablet has detected the STS-RBM 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 STS-RBM has disconnected from the tablet.</td> </tr> <tr> <td>1</td> <td>“LTM - scanner attached”</td> <td>The tablet has detected the barcode scanner.</td> </tr> <tr> <td>1</td> <td>“LTM - scanner detached”</td> <td>The barcode scanner has been disconnected from the tablet.</td> </tr> <tr> <td>1</td> <td>“LTM - brightness update”</td> <td>The LTM Service has updated the tablet screen brightness.</td> </tr> <tr> <td>2</td> <td>“LTM - charging nn%”</td> <td>The tablet battery is charging. The current battery level is “nn” percent.</td> </tr> <tr> <td>2</td> <td>“LTM - discharging nn%”</td> <td>The tablet 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 tablet has detected the STS-RBM board.	1	“LTM - controller running”	The LTM7 Service has started to operate.	1	“LTM - controller detached”	The STS-RBM has disconnected from the tablet.	1	“LTM - scanner attached”	The tablet has detected the barcode scanner.	1	“LTM - scanner detached”	The barcode scanner has been disconnected from the tablet.	1	“LTM - brightness update”	The LTM Service has updated the tablet screen brightness.	2	“LTM - charging nn%”	The tablet battery is charging. The current battery level is “nn” percent.	2	“LTM - discharging nn%”	The tablet 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="527 289 1372 592"> <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 feature is useful when evaluating a new system to determine how the tablet behaves to a given set of charging thresholds.

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 Tablet serial number. If the Tablet is an LTE device, then the IMEI number is used for ***.

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.	
		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.		
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 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 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 0 indicates the LTM Service is not controlling the tablet 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
; -----
; Options for board-type:
; Type 1 - Tab S2 9.7", Tab E 8.0", Tab 4 10.1"
; Type 2 - Tab E 9.6", Tab A 9.7", Tab A 8.0"
; Type 3 - Tab A 10.1"
; -----
[LTM-START]
configuration=20170927-1200
; -----
board-type=1
;mode-button=2
; -----
bttv-upper-threshold=70
bttv-lower-threshold=45
bttv-cycle-upper-threshold=100
bttv-cycle-lower-threshold=45
bttv-cycle-limit-on-start=2
bttv-cycle-limit=50
; -----
encourage-night-charging=0
; -----
permit-ethernet=1
dhcp-recovery=2
wifi-overrides-ethernet=1
; -----
;keep-alive-rate=3
;keep-alive-timeout=5
;power-watchdog-timeout=7
;power-watchdog-action=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
; -----
;Only for an STS-RBM with Barcode Scanner:;
;lsr-url-prefix=http://www.ebay.ca/sch/i.html?_from=R40&_sacat=0&_nkw=
;lsr-url-postfix=
; -----
;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=0
ethernet-debug=0
; -----
[LTM-END]

```

Barcode Scanner – LAVA Mode

Overview

The STS-RBM system has the option for a high-resolution Barcode Scanner. The Scanner can be operated in Keyboard Mode or the enhanced LAVA Mode. Configuring the Scanner for either mode of operation is described in the “STS-RBM Installation Manual”.

Using LAVA Mode

Operating the Scanner in LAVA Mode, the LTM Service watches for a barcode scan to take place, and reports the barcode using a simple Android Intent message. The LTM Service interacts with the Barcode Scanner to isolate the “user application” from hardware specific issues. A user developed application can watch for the Intent, to take any required action.

The ScannerReceiver is a sample “user application” provided by LAVA that watches for a barcode scan to take place and launch a Web Browser. The barcode information has extra data wrapped around it to form a URL used for a Web-based product lookup. The extra data is defined in the LTM.INI file. The ScannerReceiver has no GUI component, and runs each time a barcode scan is reported. A simple web based product scanner can be developed with no custom Android application development.

The ScannerReceiver is provided by LAVA as an executable APK and in source code. This application demonstrates how to intercept and use the barcode message. The code is contained in an Android Studio (v1.1.0) project. The code can be integrated into a user-developed application.

The ScannerReceiver demonstration performs a barcode lookup from “www.ebay.com”. Changing the values of the “lsr-url-prefix” and “lsr-url-postfix” strings in the LTM.INI, allows the ScannerReceiver application to access any web site you chose.

The ScannerReceiver source code shows how to set up an Android broadcast receiver to accept the Intent message generated by the LTM Service, how to extract the barcode data, and finally, build how to build the URL used to launch a browser.

The ScannerReceiver has no GUI component. The Scanner Receiver is launched automatically when the LTM Service generates the Android Intent message after a barcode scan.

The ScannerReceiver does not require Samsung KNOX, so can be easily installed by the integrator. The Android USB Permission for accessing the Barcode scanner are handled by the LTM Service.

The sample “user application” is provided as-is for a LAVA Mini Kiosk customer. The “user application” is loaded the same as any other APK onto the Tablet. During development, the “user application” can be loaded directly by Android Studio for debugging. If the demonstration application is to be customized, the package name should be changed from the “com.lava....” to a customer specific package name.

The intent message is:

```
"com.lava.tabletmanager.SCAN_AVAILABLE".
```

Broadcast Receiver Example

An example of the broadcast receiver used by an early version of the Scanner Receiver application is:

```
public class CodeReceiverSample extends BroadcastReceiver
{
    public static final String ScanAvailable =
        "com.lava.tabletmanager.SCAN_AVAILABLE";
    final String EANUPCStandard = "]E0";

    @Override
    public void onReceive(Context context, Intent intent)
    {
        String action = intent.getAction();

        if (ScanAvailable.equals(action))
        {
            String AIMI = intent.getStringExtra("AIMI");
            String RawScan = intent.getStringExtra("SCAN");
            // Send it to determine what type of code based on AIMI code.
            Determine_Symbology(AIMI, RawScan, context);
        }
    }

    private void Determine_Symbology(String AIMI, String RawScan, Context context)
    {
        if (EANUPCStandard.equals(AIMI.trim())) // it is a valid UPC or EAN code
        {
            // Take the AIMI off the raw scan data.
            String barcode = (RawScan).substring(4);
            // Send it to the UPC_A/EAN process.
            UPC_A(barcode, context);
        }
    }

    private void UPC_A(String barcode, Context context)
    {
        String LookupURL = context.getString(R.string.lookup_url);

        // Append the valid barcode to the Browser URL, then launch the Browser.
        LookupURL = LookupURL + barcode + context.getString(R.string.lookup_url_trailer);
        Uri uriUrl = Uri.parse(LookupURL);
        Intent launchBrowser = new Intent(Intent.ACTION_VIEW, uriUrl);
        launchBrowser.setFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
        launchBrowser.putExtra(Browser.EXTRA_APPLICATION_ID, context.getPackageName());
        //Toast.makeText(context,uriUrl.toString(), Toast.LENGTH_LONG).show();
        context.startActivity(launchBrowser);
    }
}
```

The ScannerReceiver Application supplied with the STS-RBM operates the same as the above example. However, the URL Prefix and Postfix strings are read from the LTM.ini configuration file. The source coded provided in the release package uses the LTM.ini configuration file. The source code includes a simple parser used to read the configuration file.

The Broadcast receiver is registered in the manifest as seen in the following example:

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.lava.scannerreceiver"
  android:versionCode="200"
  android:versionName="2.00" >

  <uses-sdk
    android:minSdkVersion="19"
    android:targetSdkVersion="19" />
  <uses-permission android:name="android.permission.READ_EXTERNAL_STORAGE"/>
  <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE"/>

  <application
    android:allowBackup="true"
    android:icon="@drawable/ic_launcher"
    android:label="@string/app_name"
    android:theme="@style/AppTheme" >
    <activity
      android:name="com.lava.scannerreceiver.MainActivity"
      android:label="@string/app_name"
      android:theme="@style/Theme.Transparent"
      android:noHistory="true"
      android:excludeFromRecents="true"

      android:exported="false">
    </activity>

    <receiver android:name=".BarcodeReceiver"
      android:exported="true"
      android:enabled="true" >
      <intent-filter>
        <action android:name="com.lava.tabletmanager.SCAN_AVAILABLE" />
      </intent-filter>
    </receiver>

  </application>
</manifest>
```

Technical Support

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

<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: www.lavalink.com/helpdesk</p>
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History

Document Revision	Date	Change
A00	Sep.13, 2016	Initial release.
A01	Sep.21, 2016	Revised the STS-RBM Setup section. Corrections to the Power Up Behavior. Corrections to the Barcode Scanner and Barcode Scanner Handling section.
A02	Sep.26, 2016	Revised the “user-debug” option in the LTM.INI file description. Revised the “log-file-rate” option in the LTM.INI file description. Added the “ethernet-debug” option to the LTM.INI file description. Updated the “System Requirements” section. Minor updates throughout the document.
A03	Sep.28, 2016	Updated the “System Requirements” section.
A04	Oct.02, 2016	Moved the software and board setup to the “STS-RBM Installation Manual”. Updated the Barcode Scanner information to include Keyboard and LAVA Mode. Minor updates throughout the document.
A05	May 17,2017	Document renamed to “Reference Manual” from “User Manual”. Updated the Network Recovery description and the “dhcp-recovery” command description to include additional option added in LTMv1.11. Corrected description for INI command “ethernet-debug”. The INI command “permit-ethernet” has been added for LTM v1.11. Revised the sample INI file. Changed the dhcp-recovery value to 2. General updates to the STS-RBM features section.
A06	Sep.07,2017	Updated the document for LTM v2.00. Revised document introduction. Revised STS-RBM Features Overview. Added the “Permission Handling for USB Devices” section. Added the “Using USB Serial Ports” section. Expanded the System Watchdog Handling to include the Low Level Detect (LLD), Low Voltage Detect (LVD), and Stuck Level Detect (SLD).