



Zoom™ OMAP35x Torpedo Development Kit User Manual

Logic PD // Products
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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
A	JCA	Initial release	JCA	11/17/09
B	NJK, JCA	<ul style="list-style-type: none"> -Removed references to Linux demo SD card; -Section 5: Clarified jumper JP1 description; updated Table 4.1; -Section 9.1.1: Corrected USB_VBUS signal name; added references to AN 416; -Added Section 9.1.2 on how to recover a completely drained battery; -Section 9.2: Updated explanation of 5V Power; -Appendix A: Added link for AN 416 	NJK	05/14/10
C	JCA	<ul style="list-style-type: none"> -Throughout: Moved sections for better document flow; -Section 2: Added section on formatting SD card; -Section 3: Added section on updating LoLo; -Section 4: Added section of using NAND recovery files; -Removed "Updating Pre-Built SD Card Image" Section; -Section 9.1.2: Updated instructions for recovering from completely drained battery; added SD card method; -Appendix A: Added more software documents 	NJK, JCA	12/21/10
D	SO	<ul style="list-style-type: none"> -Added Section 1.1; -Figure 6.1: Updated Torpedo SOM Clip Hold-Down Drawing to reflect new thermal pad; -Appendix A: Updated documentation link for kit Hardware Design Files to reflect new online format; added link to <i>Documentation Overview Flowchart</i>. 	SO	11/17/11

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1 Introduction

This user manual continues where the QuickStart Guide ended by providing additional hardware details about the Zoom OMAP35x Torpedo Development Kit. The purpose of this document is to present information that may be useful after you've unpacked your kit, run through the demo, and are ready to begin development work. This document also points you to other resources depending upon your specific development needs.

1.1 Scope of Document

This user manual does not provide detailed instructions for the software included with the kit. Please refer to the specific user guides for each respective software product for additional information. A list of additional documentation is available in Appendix A.

1.2 Requirements

- It is assumed that the QuickStart Guide has been read in its entirety. See Appendix A for a link to this document.
- The following items will be needed for the procedures described in this document:
 - Zoom OMAP35x Torpedo Development Kit [registered on Logic PD's website](#)¹
 - Host PC (this document was written assuming a Windows XP host PC)
 - SD card reader
 - SD card
 - Active Internet connection
 - Serial cable (included in development kit)
 - Terminal emulation program (e.g., Tera Term as described in Section 3.1)

¹ http://support.logicpd.com/auth/register_product.php

2 Formatting a Bootable SD Card

The OMAP35x processor supports booting from SD and several procedures in this document walk you through a process using a bootable SD card. This section describes how to format an SD card so the OMAP35x Torpedo Development Kit will recognize it as a bootable device.

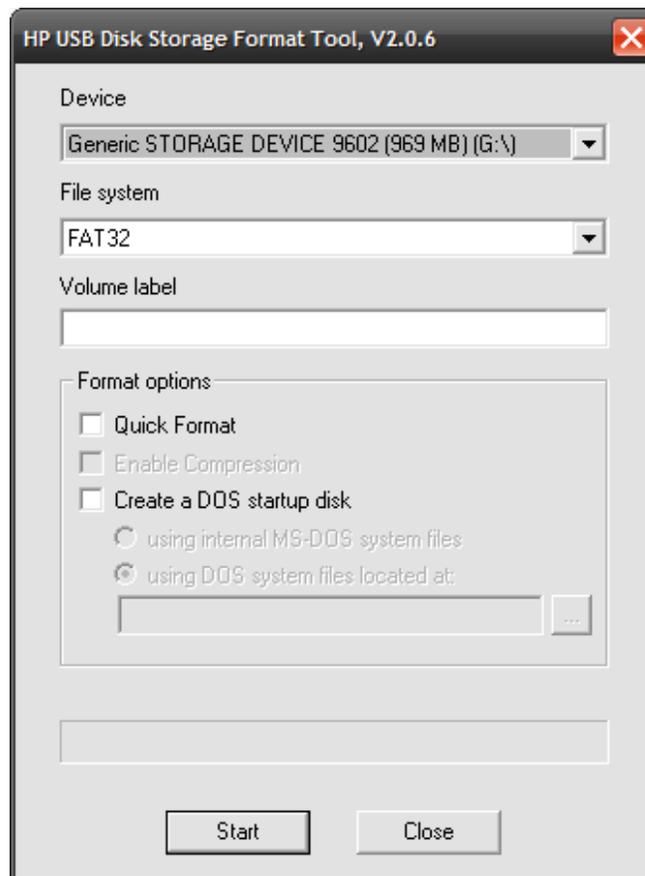
A requirement of the OMAP35x processor is that the SD card must be formatted without an extended partition to boot properly. The built-in Windows formatting tool is not always able to do this. It has been found that the HP USB Formatting Tool version 2.0.6 appears to be the best tool for formatting an SD card so it can be used to boot an OMAP35x device. **NOTE:** If you are using Linux or have access to a Linux box, you can find instructions on the Texas Instruments (TI) [SD/MMC format for OMAP3 boot](http://processors.wiki.ti.com/index.php/MMC_Boot_Format)² wiki page.

The most recent version of the tool available on HP's site doesn't seem to work as well as version 2.0.6. As such, the tool needs to be downloaded from any number of third-party websites. To find these websites, perform a Google search for: **HP formatting tool 2.0.6**. **NOTE:** As with downloading anything from the Internet, use caution in what sites you visit and what you download. Logic PD has no association with any of these websites and makes no guarantees to their validity or the usability of downloads from their sites.

1. After the HP USB formatting tool has been installed on your host PC, insert an SD card into your USB card reader and open the formatting tool. **IMPORTANT:** Remember that formatting an SD card will erase its entire contents; back-up the SD card's contents before continuing or select a card that doesn't contain vital information.

² http://processors.wiki.ti.com/index.php/MMC_Boot_Format

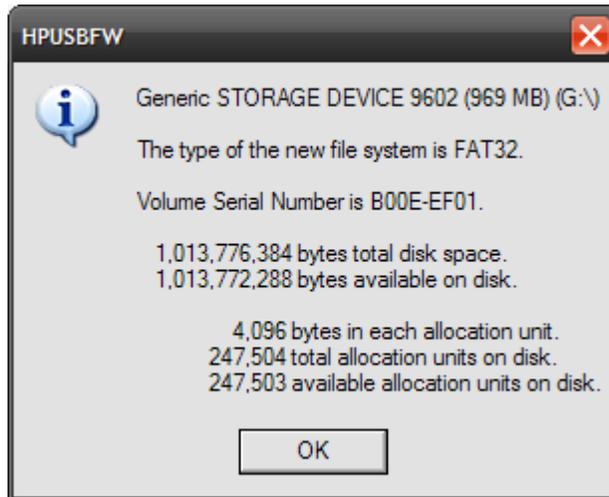
2. Select the SD card device and **FAT32** from the *File System* drop-down menu. Click **Start**.



3. You will receive a warning that the contents of the card will be erased. Assuming you have backed-up the contents of the SD card, click **Yes**.



4. When formatting completes, you will receive a confirmation screen with the new file system type and the space allocation on the card similar to the window shown below.



You are now ready to add LogicLoader files (see Section 3) or the NAND flash recovery files (see Section 4) to the SD card and boot from SD.

3 Update LogicLoader

This section will walk you through the process of updating the LogicLoader bootloader software on your OMAP35x Torpedo SOM.

3.1 Terminal Emulation Installation

The Zoom OMAP35x Torpedo Development Kit is designed to communicate with terminal emulation programs using the included null-modem serial cable. The terminal emulation program must support binary transfers in order to download software to the kit. Although Logic PD does not support any particular terminal emulation program, we suggest using Tera Term for Windows 2000 or XP (Tera Term is not available for Linux users). Tera Term can be downloaded for free from Logic PD's website. To install Tera Term:

1. Download the [ZIP file](#)³ from Logic PD's website and extract the contents.
2. After extracting the contents, locate the *teraterm-x.xx.exe* file and double-click it.
3. Follow the on-screen instructions to install Tera Term.

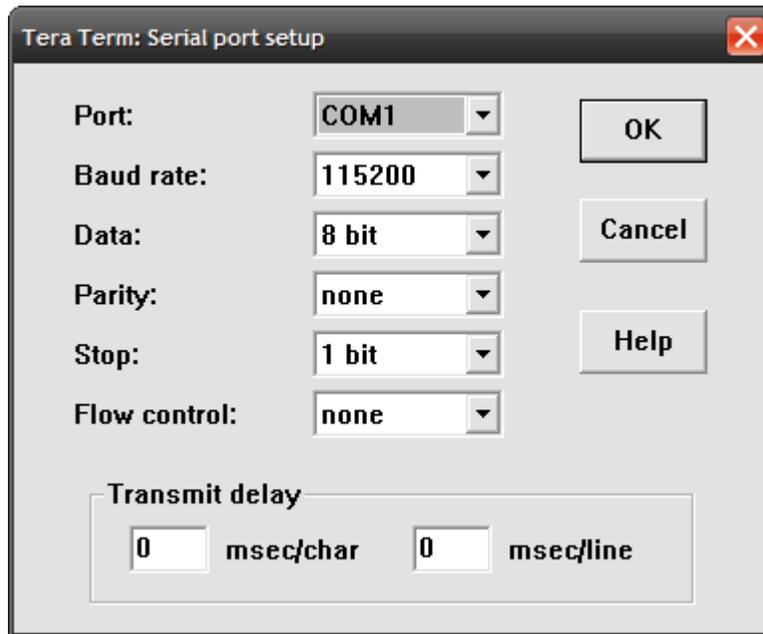
3.2 Setup Tera Term

All Tera Term settings are controlled by an *.ini* file that you can modify as needed to make your time in Tera Term as efficient as possible (for example you can preset the port settings).

1. Start the Tera Term program
2. From the menu, select **Setup > Serial port**

³ <http://support.logicpd.com/downloads/240/>

3. Select the appropriate COM port for your workstation and then change the port settings to:
 - a. Baud rate: **115200**
 - b. Data: **8 bit**
 - c. Parity: **None**
 - d. Stop: **1 bit**
 - e. Flow control: **None**



4. Click **OK**

3.3 Connect Development Kit to PC

In order to begin development work, the development kit needs to be connected to a PC. The following steps will walk you through this process.

1. Connect the null-modem serial cable (supplied in the kit) to the serial port connector on the baseboard and to an empty COM port on your PC. See Figure 3.1.
2. Connect the regulated 5V power supply to the appropriate power adapter for the location in which you are using the development kit.
3. Plug the power adapter into an electrical outlet and the 5V line output connector into the power-in connector on the baseboard. See Figure 3.1.



Figure 3.1: Connect Serial Cable

3.4 Boot into LogicLoader

1. Power on your kit and hold down the **v** key on the keyboard. Doing this will provide specific boot information in the LogicLoader output. For instance, in the image below you see that the image type is `Elf` and it booted from the `NAND` device. This is a helpful trick to use to determine if your development kit is booting from the onboard NAND flash or the SD card.

```

COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help
NoLo Version : 2.4.10-OMAP3503 0001
NoLo Build   : LPD386 Wed Jan 20 11:55:47 CST 2010
NoLo Compiler: gcc version 4.2.1
Image type  : Elf
Boot Device  : NAND

*****

                               LogicLoader

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LoLo Version:      2.4.10-OMAP3503 0001
SOM Model Number:  SOMXOMAP3530-20-1670AGCR
SOM Part Number:   1012494
SOM Serial Number: 0909M00011

*****

losh>

```

2. Take note of what LogicLoader Version number appears in this welcome prompt. This will help you know if you need to upgrade to a new version.

3. Power off your kit.

3.5 Download New Version of LogicLoader

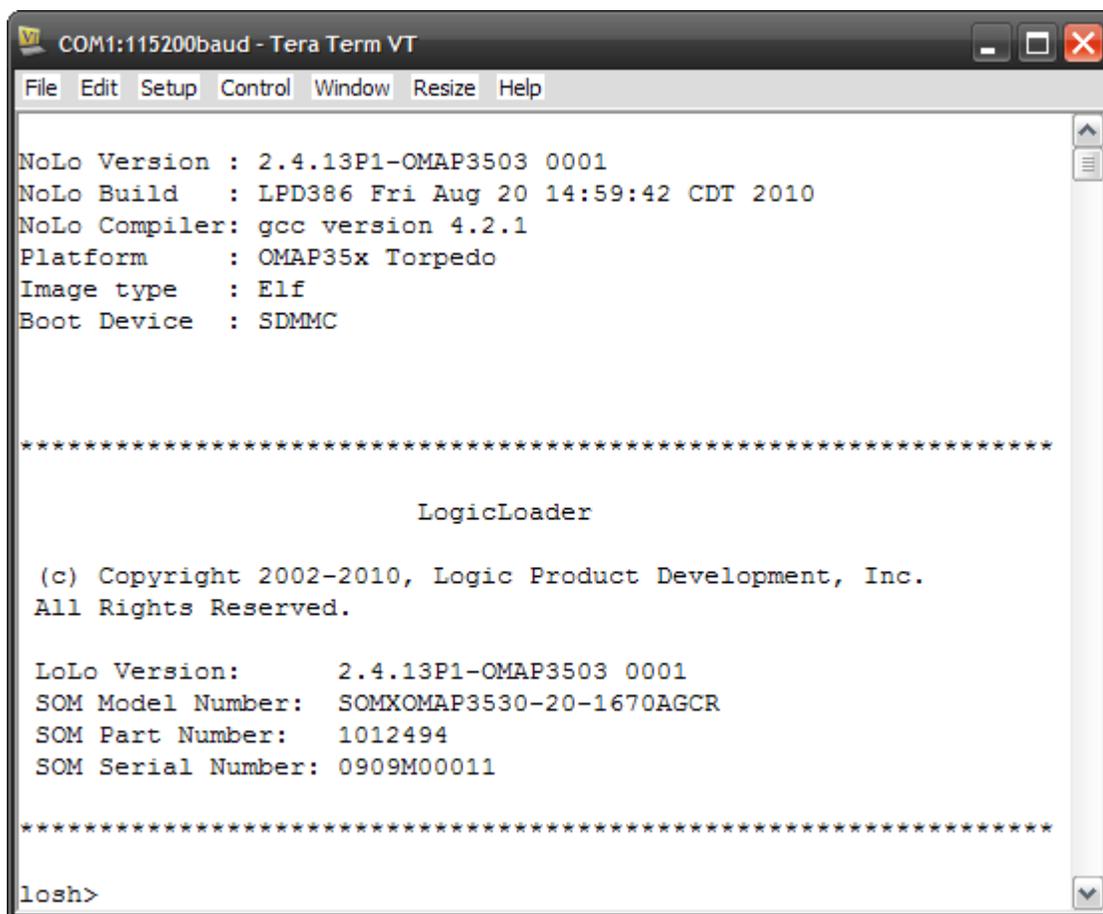
1. Log into Logic PD's [download site](#)⁴ using your username and password.
2. Click on the **All Downloads** link for the *OMAP35x Torpedo Development Kit*.
3. Scroll down until you find the section header *LogicLoader Bootloader/Monitor*.
4. Click on the + icon next to **LogicLoader for the OMAP35x Torpedo SOM** link; this expands the list of all available LogicLoader versions. If the current version is newer than what is on your OMAP35x Torpedo SOM, you should update.
5. Click on the version number marked (*current*) and save the file to your host PC.
6. After the ZIP file finishes downloading, extract all files of the folder to a location on your host PC that you can access later on.

Now that you have downloaded the latest version of LogicLoader to your computer, you can update LogicLoader on your development kit using a bootable SD card.

3.6 Update LogicLoader Using a Bootable SD card

1. Prepare a bootable SD card as described in Section 2.
2. Locate the LogicLoader files that you downloaded to your host PC (see Section 3.5).
3. Copy the *MLO* file from that folder to the SD card. **IMPORTANT NOTE: This file must be the first added to the SD card for the kit to boot properly.**
4. Next, copy the *lboot.elf* file to the SD card.
5. Remove the SD card from your USB card reader and insert it into the primary (bootable) SD card slot on your OMAP35x Torpedo Development Kit.
6. Slide the power switch to the ON position and you should see a screen similar to what is shown below. **HINT:** You can hold down the **v** key on the keyboard during boot-up to verify the Boot Device is *SDMMC* indicating the kit booted from the SD card.

⁴ <http://support.logicpd.com/auth/>



```
COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help

NoLo Version : 2.4.13P1-OMAP3503 0001
NoLo Build   : LPD386 Fri Aug 20 14:59:42 CDT 2010
NoLo Compiler: gcc version 4.2.1
Platform    : OMAP35x Torpedo
Image type   : Elf
Boot Device  : SDMMC

*****

                        LogicLoader

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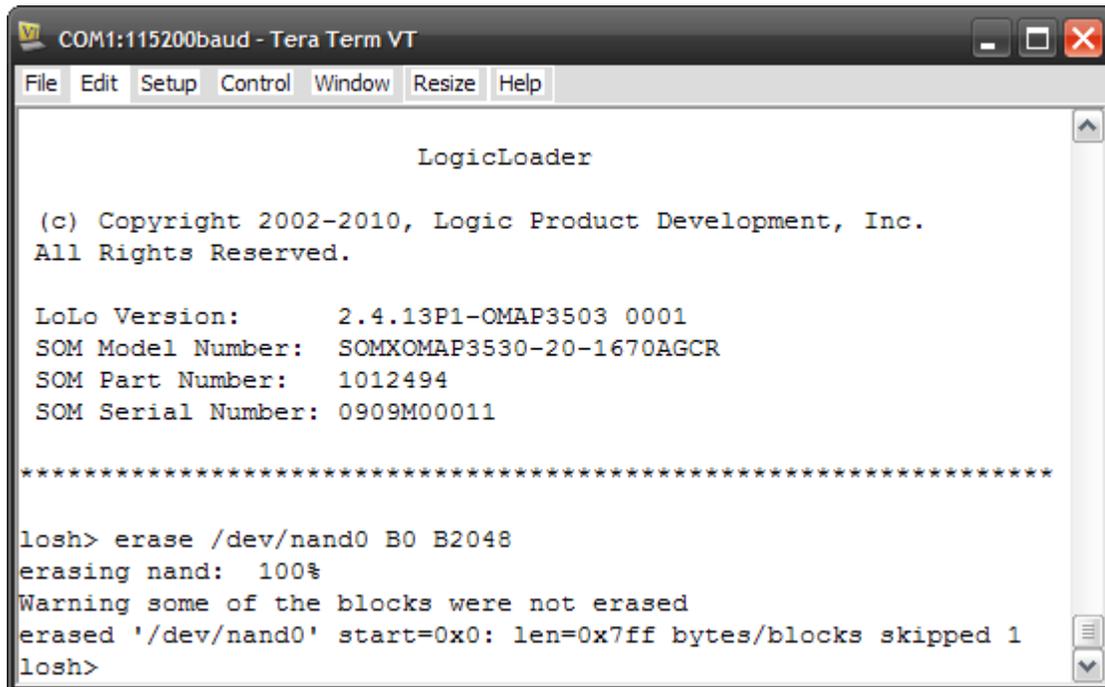
LoLo Version:      2.4.13P1-OMAP3503 0001
SOM Model Number:  SOMXOMAP3530-20-1670AGCR
SOM Part Number:   1012494
SOM Serial Number: 0909M00011

*****

losh>
```

Notice that the LogicLoader Version number now shows the version you downloaded from the Logic PD website. This is because you have booted from the SD card containing that version.

- Because LogicLoader resides in NAND, it is necessary to erase the old LogicLoader on the OMAP35x Torpedo SOM before updating. Type `erase /dev/nand0 B0 B2048` and press the Enter key.



```

COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help

LogicLoader

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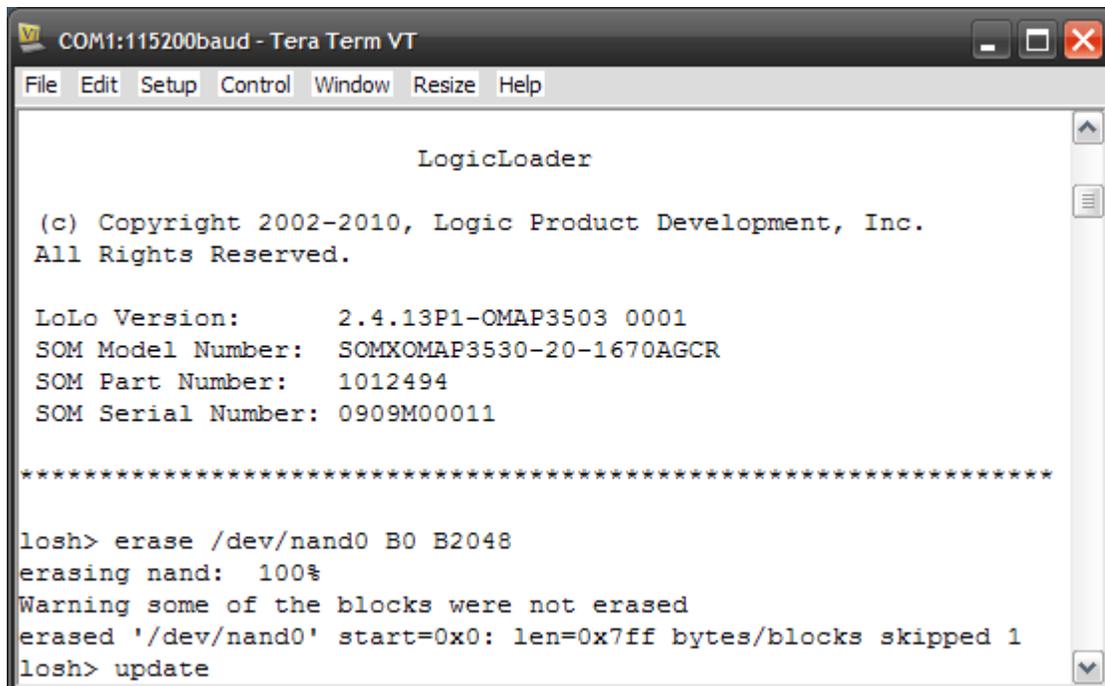
LoLo Version:      2.4.13P1-OMAP3503 0001
SOM Model Number:  SOMXOMAP3530-20-1670AGCR
SOM Part Number:   1012494
SOM Serial Number: 0909M00011

*****

losh> erase /dev/nand0 B0 B2048
erasing nand: 100%
Warning some of the blocks were not erased
erased '/dev/nand0' start=0x0: len=0x7ff bytes/blocks skipped 1
losh>

```

- Type `update` and press the Enter key.



```

COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help

LogicLoader

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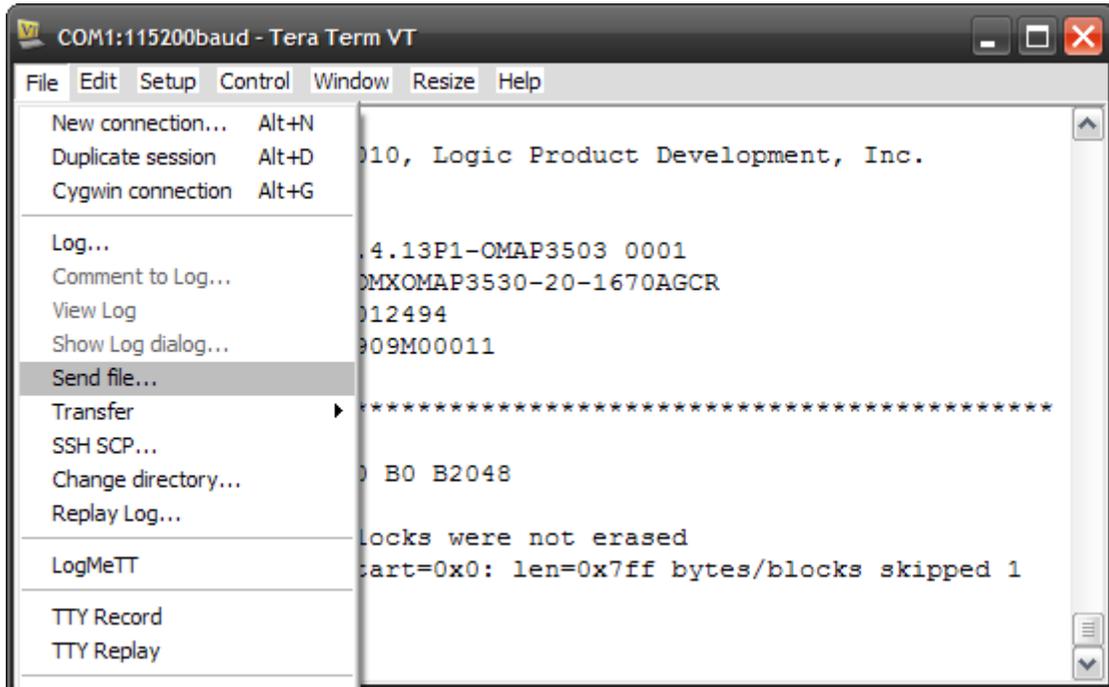
LoLo Version:      2.4.13P1-OMAP3503 0001
SOM Model Number:  SOMXOMAP3530-20-1670AGCR
SOM Part Number:   1012494
SOM Serial Number: 0909M00011

*****

losh> erase /dev/nand0 B0 B2048
erasing nand: 100%
Warning some of the blocks were not erased
erased '/dev/nand0' start=0x0: len=0x7ff bytes/blocks skipped 1
losh> update

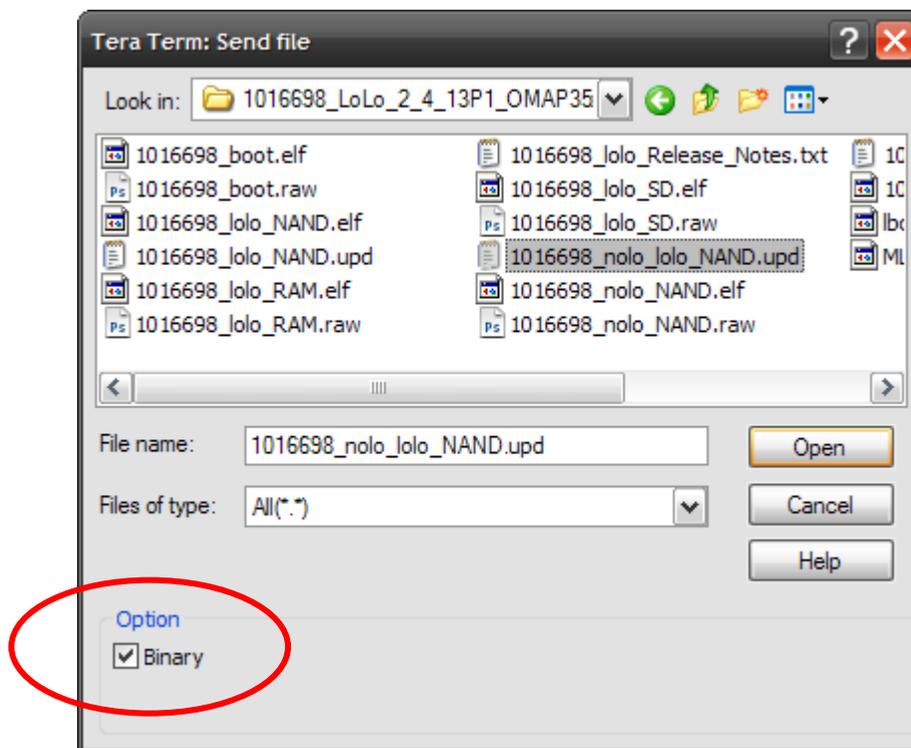
```

- LogicLoader is waiting for you to send the new version over the serial port. From the menu, select **File > Send file...** to send the new LogicLoader version to your OMAP35x Torpedo SOM.

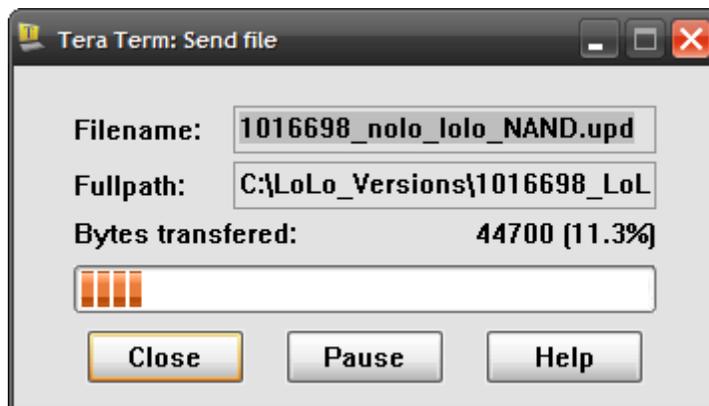


- Navigate to the location where you extracted the LogicLoader files and select the file that includes *nolo_lolo_NAND.upd*. This file contains both NoLo and LogicLoader components necessary for updating LogicLoader. If you do not see a file that includes *nolo_lolo_NAND.upd*, please refer to the *Release_Notes.txt* file included in the LogicLoader version download for special instructions.

11. Verify that the Binary checkbox is checked. Click **Open**.



12. Tera Term will begin sending the file to the OMAP35x Torpedo SOM.



13. Verify that the download was successful by waiting for an update done message to appear.

```

COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help
SOM Model Number:  SOMXOMAP3530-20-1670AGCR
SOM Part Number:   1012494
SOM Serial Number: 0909M00011

*****

losh> erase /dev/nand0 B0 B2048
erasing nand: 100%
Warning some of the blocks were not erased
erased '/dev/nand0' start=0x0: len=0x7ff bytes/blocks skipped 1
losh> update
send update file:
.....
.....
YAFFS core: yaffs: Mounting temp
YAFFS core: save exit: isCheckpointed 1
update done.
losh>

```

14. Remove the SD card from your development kit and press the RESET button on the baseboard.

```

COM1:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help
YAFFS core: save exit: isCheckpointed 1
update done.
losh>

*****

                          LogicLoader

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All Rights Reserved.

LoLo Version:           2.4.13P1-OMAP3503 0001
SOM Model Number:      SOMXOMAP3530-20-1670AGCR
SOM Part Number:       1012494
SOM Serial Number:     0909M00011

*****

losh>

```

15. If the new version number is displayed, you now have the updated version of LogicLoader installed on your OMAP35x Torpedo SOM.

4 Recover Corrupt Boot NAND Flash

This section describes how to recover corrupt boot NAND flash on the OMAP35x Torpedo Development Kit by using a bootable SD card.

4.1 Recovery via SD Card Procedure

1. Prepare a bootable SD card as described in Section 2.
2. Log into Logic PD's [download site](#) using your username and password.
3. Click on the **All Downloads** link for the *OMAP35x Torpedo Development Kit*.
4. Scroll down until you find the section header *LogicLoader Bootloader/Monitor*.
5. Click on the **NAND Flash Recovery for OMAP35x Torpedo SOM** link and save the ZIP file to your host PC.
6. Extract all the files contained in the ZIP file; then copy the *MLO* file from that folder to the SD card. **IMPORTANT: This file must be the first added to the SD card for the kit to boot properly.**
7. Next, copy the remaining files to the SD card.
8. Eject the SD card from the host PC.
9. Power off the development kit and insert the SD card into the primary SD card slot on the development kit.
10. Power on the development kit.
11. The development kit shows an image on the 4.3" LCD display while the NAND flash is being reprogrammed.
12. When the process completes, the LCD display shows an updated image that indicates the process is complete.
13. Remove the SD card from the development kit and press the RESET button on the baseboard.
14. Your development kit should now boot from onboard NAND into the latest LogicLoader.
15. If the process fails, copy the entire Tera Term serial output and include it in the web form when you [contact Logic PD](#).⁵

5 Using Displays with the Torpedo Development Kit

When using displays with the OMAP35x Torpedo Development Kit, the JP1 jumper must be set for the proper voltage source. JP1 selects the power source (5V or battery) for the LCD backlight. Running the backlight off the battery will affect the charging rate; for this reason, only place JP1 across pins 2–3 when running off the battery alone. Anytime the 5V power supply is being used, JP1 should be placed across pins 1–2.

Table 5.1: LCD Backlight Jumper JP1 Settings

Jumper JP1 Location	Display Type
Across pins 1–2	Jumper position when running off the 5V power supply.
Across pins 2–3	Jumper position when running off the battery power supply. NOTE: This is the default setting out of the box.

⁵ <http://support.logicpd.com/support/askaquestion.php>

6 SOM Hold-Down Clip

The Zoom OMAP35x Torpedo Development Kit includes a SOM hold-down clip that demonstrates a method of securing the SOM to an application baseboard in the field. Figure 6.1 shows the process for connecting the included clip. The standoffs, item 5, are already connected to the development kit baseboard; item 4 is the included thermal pad.

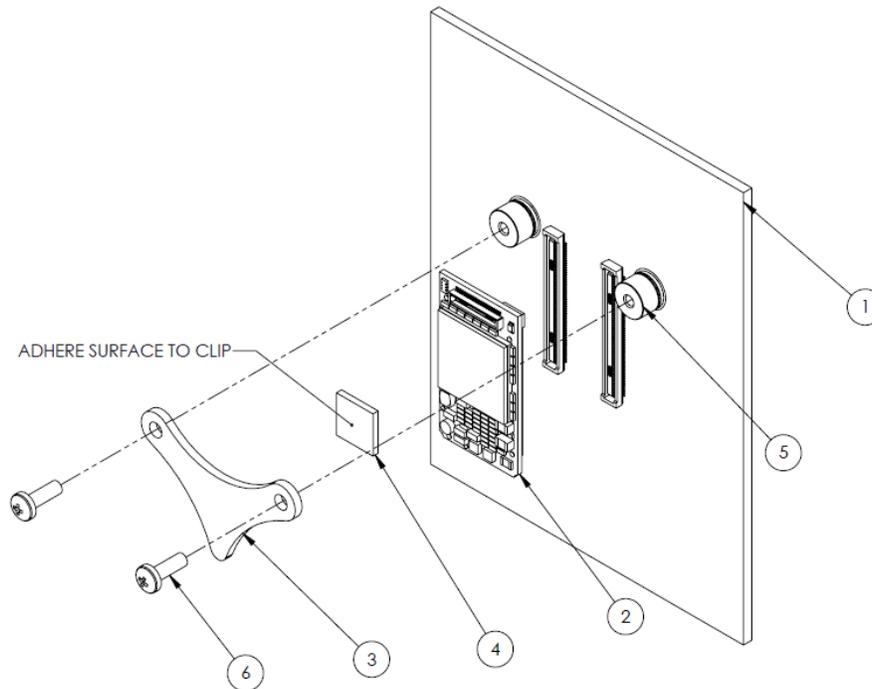


Figure 6.1: Torpedo SOM Hold-Down Clip Assembly

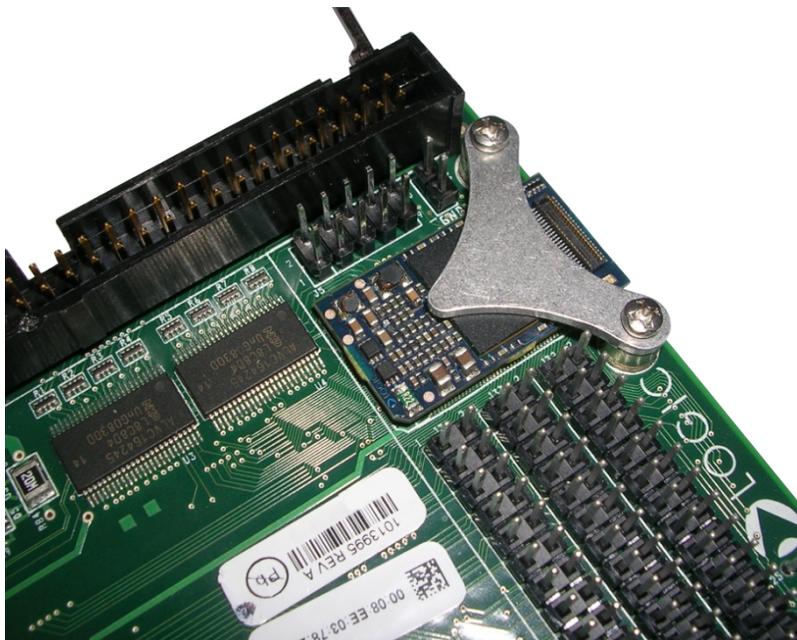


Figure 6.2: Torpedo SOM Hold-Down Clip

7 Connect the ETM Adapter Board to the SOM

The Embedded Trace Macrocell™ (ETM) adapter board provides debug and trace features for the ARM processor. Only connect the ETM adapter board if you need to debug the SOM using an ETM interface external debug tool. **NOTE:** The SOM hold-down clip cannot be attached if using the ETM adapter board.

1. Locate the ETM connector on the SOM. See Figure 7.1 below.

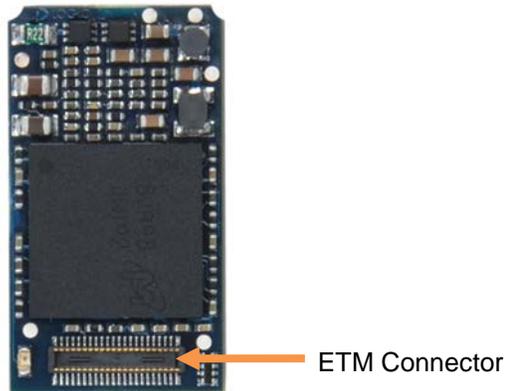


Figure 7.1: ETM Connector on SOM

2. Position the ETM adapter board so that the Logic PD name on the adapter board is oriented the same way as the Logic PD name on the baseboard.
3. Make sure the connector on the bottom of the ETM adapter board aligns correctly with the connector on the SOM.
4. Press straight down on the ETM adapter board directly over the connectors to mate the two boards. See Figure 7.2 for the final position of the connected ETM adapter board to the SOM.

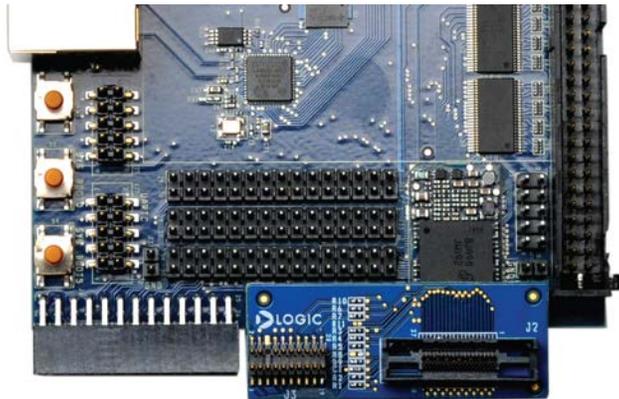


Figure 7.2: ETM Adapter Board Connected to SOM

8 Baseboard Hardware Specifications

This section describes peripherals or connectors that are located on the Torpedo Launcher Baseboard.

8.1 10/100 Ethernet PHY

The baseboard uses a SMSC LAN9221 Ethernet MAC+PHY to provide an easy-to-use networking interface. The controller is connected to the GPCM bus of the processor and uses uP_nCS1 for chip access.

8.2 USB

The baseboard supports three USB 2.0 high-speed host ports through an NXP ISP1760 controller that is connected to the 16-bit GPMC memory bus; the controller uses uP_nCS6 for chip access. All ports can operate at up to 480 Mbit/sec.

8.3 Touch

Touch is supported by a TI TSC2004 connected on the SOM's I2C3 interface. The TSC2004 provides support for 4-wire touch.

8.4 LCD

The connector located at reference designator J3 provides Logic PD's standard 60-pin LCD connection. The header located at reference designator J5 can be used to expand the LCD to 24-bit (Logic PD Display Kits do not support this mode).

8.5 Camera

The camera port of the OMAP35x Torpedo SOM is provided on J6.

8.6 S-Video

The baseboard provides support for S-Video through connector J7. TV_OUT1 and TV_OUT2 are direct connections to the OMAP35x processor.

8.7 SPI Flash

A SPI flash device, Atmel AT25160AN-10SU-1.8, is connected to McSPI1 on the baseboard. This can be used for customer storage.

8.8 Audio

Line-in and line-out connections are available on the application baseboard through J40 and J41, respectively.

8.9 MMC/SD

The baseboard has support for two MMC/SD ports through memory card slots at J21 and J29. J21 is connected to SD1 of the processor. This is the main card slot and it offers boot capabilities, depending on the boot configuration of the SOM. It also can operate at either 1.8V or 3.0V. J29 is connected to SD3 of the processor; this port can only operate at 1.8V.

IMPORTANT NOTE: At the time this document was written, most SD cards that are generally available only support 3.0V operation. Please take note of the card's operating condition before trying to use the J29 SD card slot.

8.10 UARTs

The application baseboard provides access to three UART ports. UARTA is used as the debugging port; it goes through a transceiver and is available on P1. UARTB and UARTC are available as voltage level translated signals (J25 and J27) or as 1.8V signals (J33). If used as 1.8V signals, U24 and U25 should be disabled by pulling nPWRDOWNB and/or nPWRDOWNC low.

9 Power

The baseboard utilizes the TPS65950 PMIC on the OMAP35x Torpedo SOM to allow for the following power options: battery, 5V DC, and USB.

9.1 Battery Power

The Zoom OMAP35x Torpedo Development Kit comes with a lithium-ion battery pack that connects at reference designator J20. With a valid battery voltage on this connector (2.7V–4.5V) the baseboard will derive all other necessary voltages and drive the SOM.

9.1.1 Battery Charging

The battery can be charged through either the 5V DC input (J18) or the USB1_VBUS input (J19). Charging through the 5V DC input is done automatically when the 5V power supply is connected and the battery level is below the charging threshold (software controllable). Charging through USB1_VBUS requires software to enable USB charging. Please refer to Logic PD's *AN 416 OMAP35x Torpedo SOM Power Management* for details on charging capabilities.

IMPORTANT NOTE: The charge path is run in parallel with the system voltage path on the SOM. If the system load is large or fluctuating heavily, charging will not be ideal. Please consult TI's TPS65950 documentation and Logic PD's *AN 416 OMAP35x Torpedo SOM Power Management* for implementation notes with this charger. See Appendix A for a link to this document.

9.1.2 Recovering a Completely Drained Battery

If the battery for the OMAP35x Torpedo Development Kit has become completely drained, use one of the procedures noted below to charge the battery.

If neither procedure works for your development kit, please [contact Logic PD](#).

9.1.2.1 Boot from SD Card Method

1. Make sure the OMAP35x Torpedo SOM is booting from an SD card that contains LogicLoader 2.4.10 or later.
2. Turn off the power to the kit using the power switch.
3. Disconnect the battery from the baseboard.
4. Wait five minutes. This wait time is required for the internal battery circuitry to reset.
5. Connect the battery to the baseboard and plug in the 5V power supply.
6. Power on the development kit.

NOTE: LogicLoader may reboot two times before remaining at the `l0sh>` prompt; this is expected behavior in some instances. If the kit continues to reboot, this procedure should be repeated, but this time leave the battery disconnected for several hours.

9.1.2.2 Boot from NAND Flash Method

1. Make sure the OMAP35x Torpedo SOM is booting from LogicLoader 2.4.10 or later.
2. Turn off the power to the kit using the power switch.
3. Disconnect the battery from the baseboard.
4. Wait five minutes. This wait time is required for the internal battery circuitry to reset.
5. Connect the battery to the baseboard and plug in the 5V power supply.

6. While holding down the S4 button on the baseboard, power on the development kit (holding down the S4 button changes the boot order so NAND is first; this enables charging sooner in the boot process). S4 may be released once the SOM has booted.

NOTE: LogicLoader may reboot two times before remaining at the `l0sh>` prompt; this is expected behavior in some instances. If the kit continues to reboot, this procedure should be repeated, but this time leave the battery disconnected for several hours.

9.2 5V Power

The 5V input is only used to provide a charge to the MAIN_BATTERY rail on the OMAP35x Torpedo SOM. The charge path circuit allows in-system charging of a single cell lithium-ion battery source when power is applied to the 5V supply.

Appendix A: Additional Documentation

A number of documents and resources are available on the [Zoom OMAP35x Torpedo Development Kit downloads page](#).⁶ Below is a listing of the main software and hardware documents.

Documentation Overview Flowchart

- *OMAP35x Torpedo SOM Documentation Overview*
<http://support.logicpd.com/downloads/1460/>

Software Documentation

- *LogicLoader User Manual*
<http://support.logicpd.com/downloads/1094/>
- *OMAP35x Torpedo SOM LogicLoader User Manual Addendum*
<http://support.logicpd.com/downloads/1292/>
- *LogicLoader Command Description Manual*
<http://support.logicpd.com/downloads/1095/>
- *OMAP35x LogicLoader Labs*
<http://support.logicpd.com/downloads/1096/>
- *OMAP35x Linux BSP User Manual*
<http://support.logicpd.com/downloads/1346/>
- *OMAP35x Windows CE 6.0 BSP User Manual*
<http://support.logicpd.com/downloads/1347/>

Hardware Documentation

- TI's *TPS65950 OMAP Power Management and System Companion Device ES 1.0 TRM*
<http://focus.ti.com/docs/prod/folders/print/tps65950.html#technicaldocuments>
- *Zoom OMAP35x Torpedo Development Kit QuickStart Guide*
<http://support.logicpd.com/downloads/1198/>
- *OMAP35x Torpedo Development Kit Hardware Design Files (BOM, schematic, and layout files for all boards included in the kit)*
<http://support.logicpd.com/downloads/1470/>
- *OMAP35x Torpedo SOM Hardware Specification*
<http://support.logicpd.com/downloads/1196/>
- *AN 416 OMAP35x Torpedo SOM Power Management*
<http://support.logicpd.com/downloads/1288/>

⁶ <http://support.logicpd.com/auth/downloads/Zoom%20OMAP35x%20Torpedo%20Development%20Kit/>