

M

O

O

N



We fast forward
the evolution of
new products.

Table of Contents

1	Introduction	4
1.1	Zoom OMAP35x Development Kit Contents	4
1.2	Unpack the System	4
1.3	Baseboard Connection Diagram	6
2	Development Kit Set-up	8
2.1	Connect the Wi-Fi Antenna to the SOM-LV	8
2.2	Connect the ETM Adapter Board to the SOM-LV	9
2.3	Connect the SOM-LV to the Baseboard	10
2.4	Connect an Expansion Board to the Baseboard	12
2.5	Connect LCD to Baseboard	14
2.6	Baseboard Jumper Settings	15
3	Ready for Demo Mode	17
4	Ready for Development Work	20
4.1	Register your Development Kit	20
4.2	Connect Development Kit to PC	20
4.3	Terminal Emulation Installation	22
4.4	Boot into LogicLoader	23
5	Product Notices	26
6	Product Ordering Information	27
6.1	Optional Zoom Display Kits	27
7	Support	28
7.1	Documentation and Software Downloads	28
7.2	Frequently Asked Questions	28
7.3	Technical Discussion Group	28
7.4	Warranty Statement	28
7.5	Additional Support Services Available from Logic	29

Table of Figures

Figure 1.1 –Kit Hardware Contents	5
Figure 1.2 –Connection Diagram for the Baseboard	6
Figure 2.1 –Assemble Antenna	8
Figure 2.2 –Connect Antenna to SOM-LV	9
Figure 2.3 –Position SOM-LV and ETM Adapter Board	9
Figure 2.4 –ETM Adapter Board Connected to SOM-LV	10
Figure 2.5 –Align the SOM-LV over the Baseboard	11
Figure 2.6 –Connect the SOM-LV to the Baseboard	12
Figure 2.7 –Align the Expansion Board over the Baseboard	13
Figure 2.8 –Connect the Expansion Board to the Baseboard	13
Figure 2.9 –Connect LCD to Baseboard	14
Figure 2.11 –Baseboard JTAG Settings for the OMAP35x SOM-LV	16
Figure 3.1 –Connect Power Supply and Adapter	17
Figure 3.2 –Connect Power to the Baseboard	18
Figure 3.3 –Insert SD Card	18
Figure 3.4 –Press “POWER ON/OFF” Button	19
Figure 4.1 –Connect the Null-Modem Serial Cable to Baseboard	21
Figure 4.2 –Connect USB A-to-B Cable (cable not included with kit)	21
Figure 4.3 –Connect Power to Baseboard	22
Figure 4.4 –Tera Term: Serial Port Set-up Window	23
Figure 4.5 –Press “POWER ON/OFF” Button	24
Figure 4.6 –LogicLoader Iosh Prompt	24

1 Introduction

Congratulations on your purchase of the Zoom™ OMAP35x™ Development Kit. This Zoom Development Kit provides a product-ready hardware and software platform for evaluating the functionality of the Texas Instruments™ OMAP35x processor and the Logic System on Module. Logic's embedded solutions fast forward product development and help your company stay focused on your high-value core technologies.

1.1 Zoom OMAP35x Development Kit Contents

Boards

- +OMAP35x SOM-LV System on Module (SOM)
 - +76.2 mm (3") long x 31 mm (1.22") wide x 7.4 mm (0.29") high
- +LV form factor application baseboard
 - +158.8 mm (6.25") long x 146.1 mm (5.75") wide x 17.1 mm (0.67") high
- +Three Expansion and Adapter Boards
 - +High-density breakout board
 - +High-precision analog (HPA) adapter board
 - +Embedded Trace Macrocell™ (ETM) adapter board

Display

- +4.3" WQVGA TFT LCD with touchscreen

SD Memory Card(s)

- +One or more SD cards each containing a pre-built OS image (please refer to the *Packing List* document to determine exact number of SD cards included)

Cables and Accessories

- +Serial cable (null-modem)
- +5 volt power supply with US, UK, Japan, and Europe power adapters
- +Ethernet crossover cable
- +USB A to mini-B cable
- +Antenna and RF coaxial cable

1.2 Unpack the System

Once you have verified that all the development kit items are present, carefully remove the boards from their protective anti-static bags. Check the boards for any visible damage and ensure that there are no broken, damaged, or missing parts.

Note: Avoid touching the MOS devices. Static discharge can and will damage these devices.

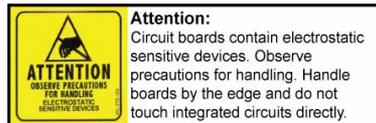
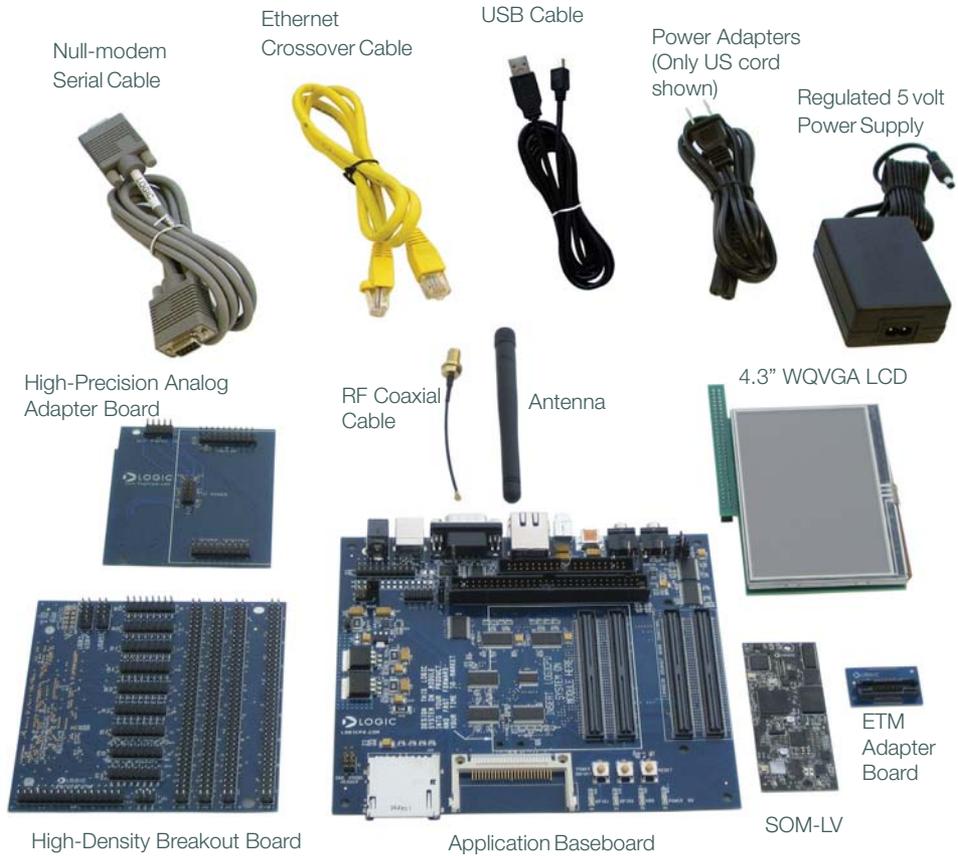


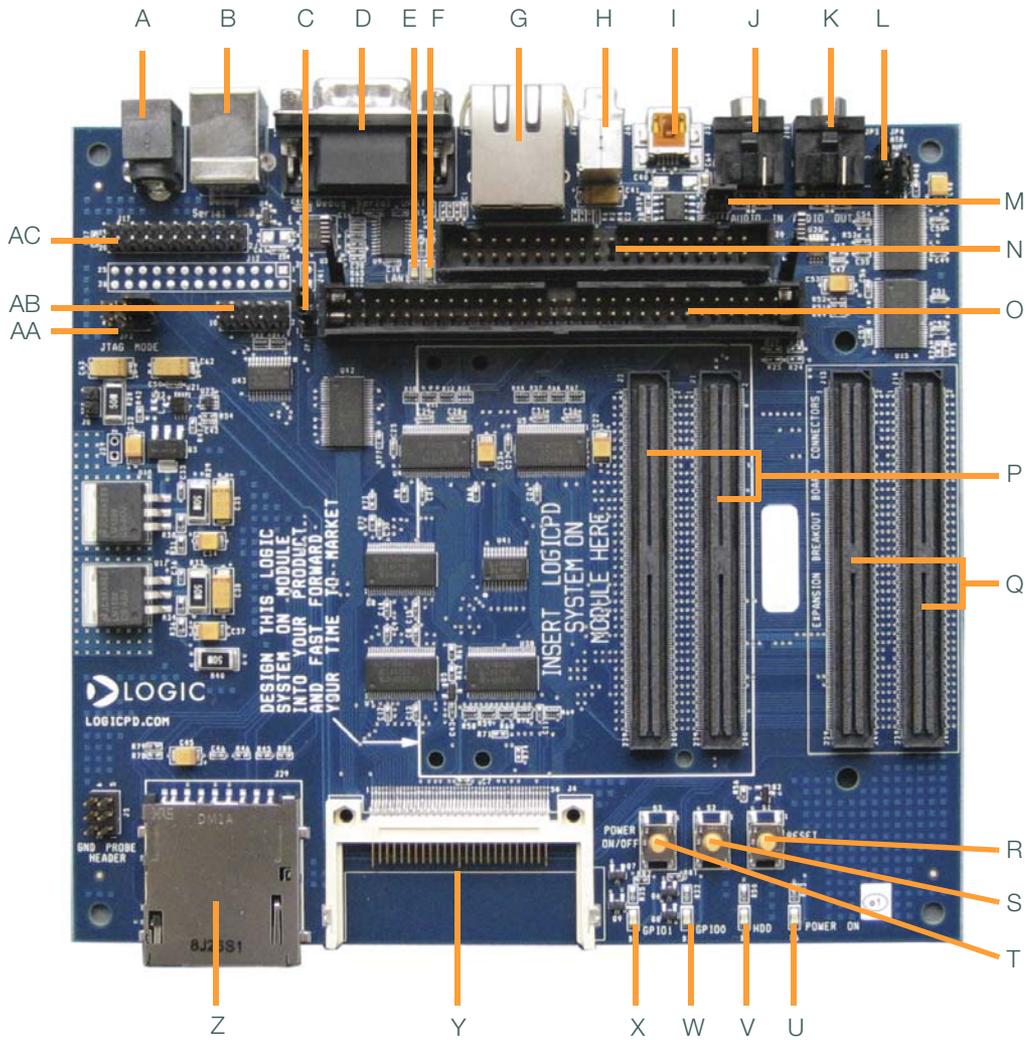
Figure 1.1 – Kit Hardware Contents



Not shown: SD card(s)

1.3 Baseboard Connection Diagram

Figure 1.2 – Connection Diagram for the Baseboard



Connection Diagram Details

- A – Power-in from 5 volt regulated power supply
- B – USB B serial debug port¹
- C – JP1 jumper location
- D – Serial port—115.2 kbps RS232 serial debug port
- E – Ethernet speed LED
- F – Ethernet link/activity LED
- G – RJ45 Ethernet jack with magnetics
- H – USB host—Type A
- I – USB On-the-Go mini-AB port
- J – Line-in stereo 3.5 mm jack
- K – Line-out stereo 3.5 mm jack
- L – JP3 & JP4 jumper location
- M – J42 jumper location
- N – 40-pin ATA header (ATA not supported on the OMAP35x SOM-LV)
- O – 60-pin header for integrated LCD, touch, backlight, connector power
- P – 240-pin BTB socket connectors for OMAP35x SOM-LV
- Q – 240-pin BTB socket connectors for high-density breakout board and HPA adapter board
- R – System reset button
- S – System wake-up button
- T – System power on/off button
- U – Power on LED
- V – ATA activity LED
- W – GPIO 0 LED
- X – GPIO 1 LED
- Y – CompactFlash Type I card slot
- Z – MMC/SD card slot
- AA – JP2 jumper location
- AB – Extra LCD bits²
- AC – JTAG header for ARM core

1. This USB B serial debug port is used to convert serial signals to USB for PCs without a DB9 COM port. See the "Connect Development Kit to PC" Section for more information.
2. The extra LCD bits may be required if using a custom display. These extra bits are not necessary for the 4.3" WQVGA LCD included with the kit or the optional Logic Zoom Display Kits.

2 Development Kit Set-up

2.1 Connect the Wi-Fi Antenna to the SOM-LV

The antenna included with the development kit provides reception for 802.11 Ethernet or Bluetooth signals. Only connect the antenna if 802.11 Ethernet or Bluetooth is required for your demo or development efforts.

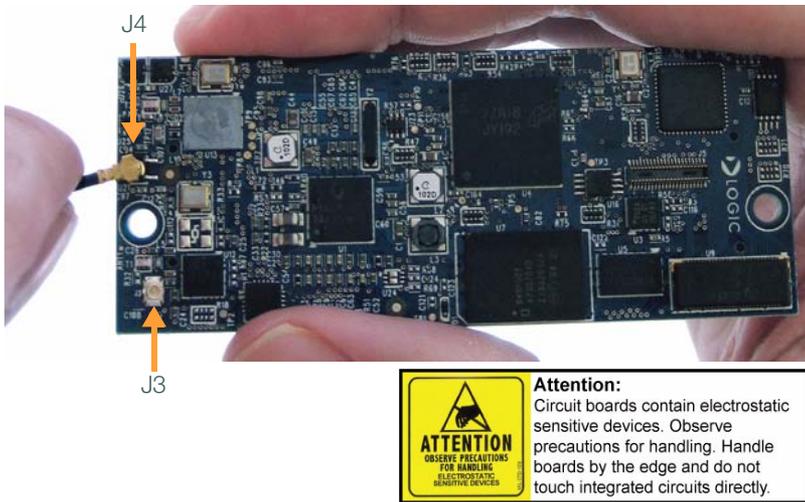
1. Insert the RF cable into the antenna and tighten the screw nut.

Figure 2.1 – Assemble Antenna



2. Connect the antenna to the SOM-LV reference designator J4 for 802.11 Ethernet reception or to reference designator J3 for Bluetooth reception. See Figure 2.2 for location of reference designators on the top of the SOM-LV.

Figure 2.2 – Connect Antenna to SOM-LV

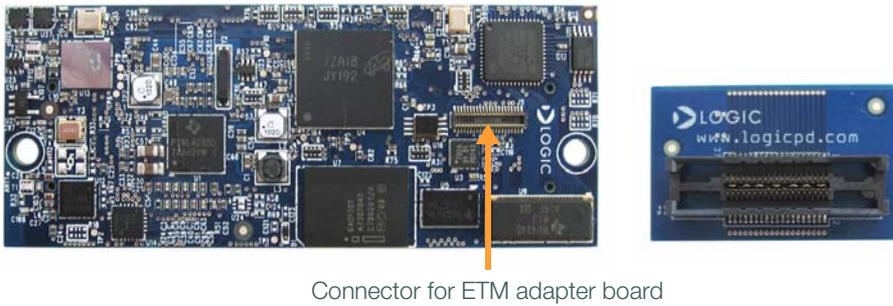


2.2 Connect the ETM Adapter Board to the SOM-LV

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-LV using an ETM interface external debug tool.

1. Position the SOM-LV so that the Logic logo is to the right; position the ETM adapter board so that the Logic name is right-side up. See Figure 2.3 below.

Figure 2.3 – Position SOM-LV and ETM Adapter Board



2. Make sure the connector on the bottom of the ETM adapter board aligns correctly with the connector on the SOM-LV. See Figure 2.3 for connector location.
3. Press straight down on the ETM adapter board directly over the connectors to mate the two boards. See Figure 2.4 for final position of the connected ETM adapter board to the SOM-LV.

Figure 2.4 – ETM Adapter Board Connected to SOM-LV

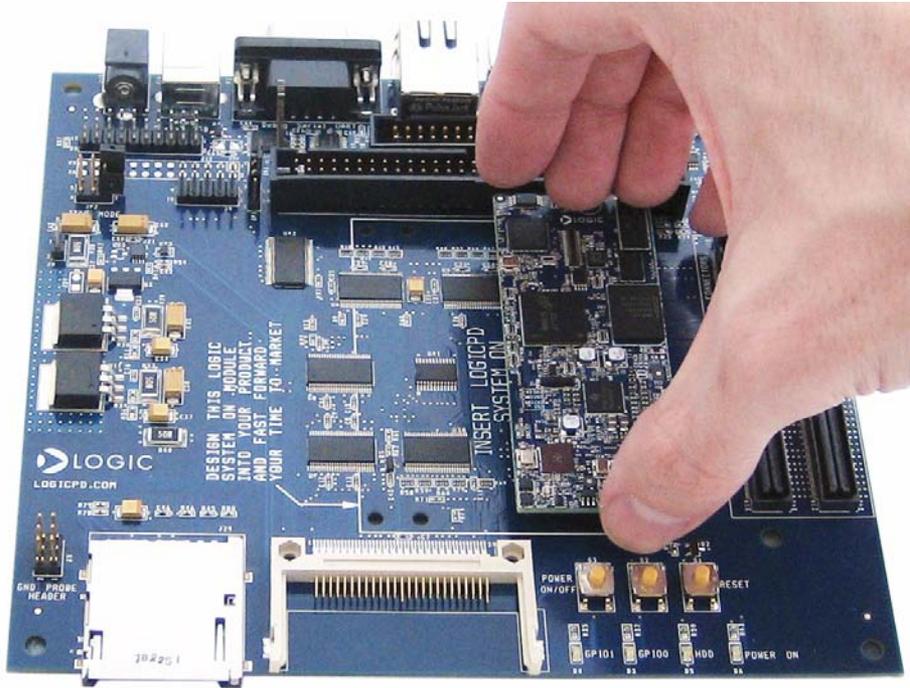


2.3 Connect the SOM-LV to the Baseboard

The SOM-LV connects to the baseboard via two BTB socket connectors.

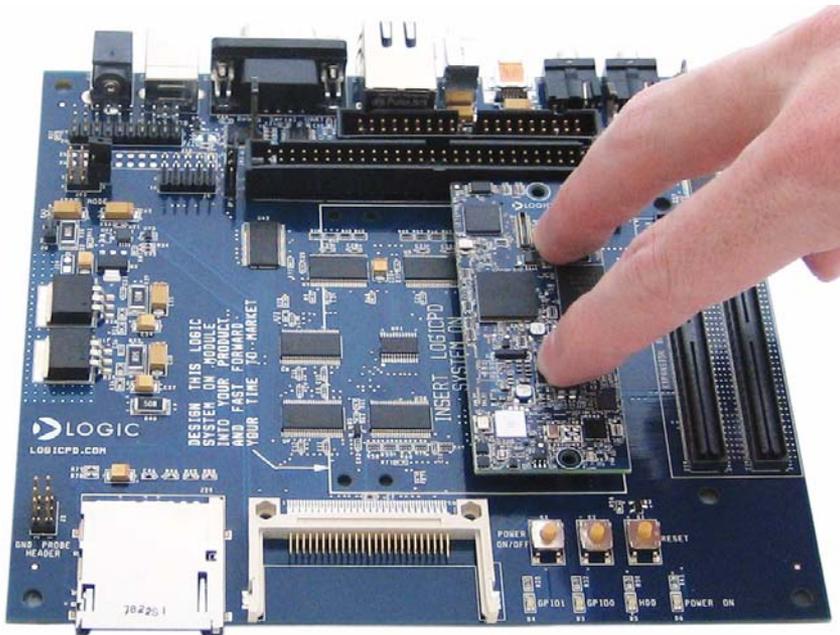
1. Align the SOM-LV over the two connectors farthest in from the edge of the board. See Figure 2.5. (There is an outline of the SOM-LV on the baseboard silkscreen to show proper placement.)

Figure 2.5 – Align the SOM-LV over the Baseboard



2. Press straight down on the SOM-LV, applying even pressure over the two baseboard socket connectors. See Figure 2.6.

Figure 2.6 – Connect the SOM-LV to the Baseboard



3. Visually verify that the socket connectors on the SOM-LV and baseboard have mated correctly. To remove the SOM-LV, pull up on the board above the socket connectors. Attempt to pull straight up and refrain from flexing the printed circuit board (PCB) to avoid damaging the SOM-LV.

2.4 Connect an Expansion Board to the Baseboard

This section applies to both the high-density breakout board and the high-precision analog adapter board. The high-density breakout board provides access to all of the SOM-LV signals. The high-precision analog (HPA) adapter board provides connectors to evaluate TI HPA development kits. Both boards connect to the baseboard using the same BTB connectors; consequently, only one board can be used at a time.

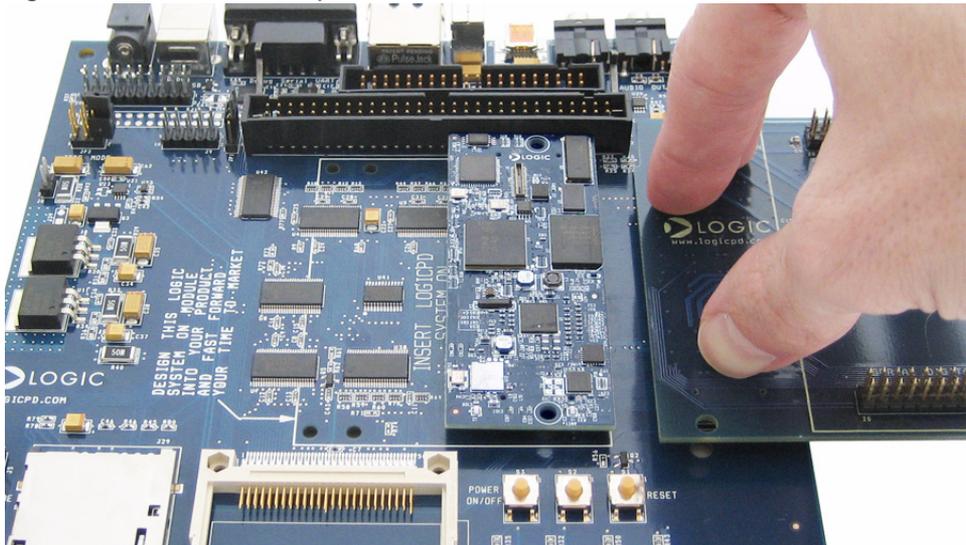
1. Align the expansion board over the two BTB connectors closest to the baseboard edge. See Figure 2.7. (There is an outline on the baseboard silkscreen that specifies the expansion breakout board connectors). When aligned correctly, the majority of the expansion board will overhang the side of the baseboard.

Figure 2.7 – Align the Expansion Board over the Baseboard



2. Press straight down on the expansion board, applying even pressure over the two baseboard socket connectors. See Figure 2.8.

Figure 2.8 – Connect the Expansion Board to the Baseboard



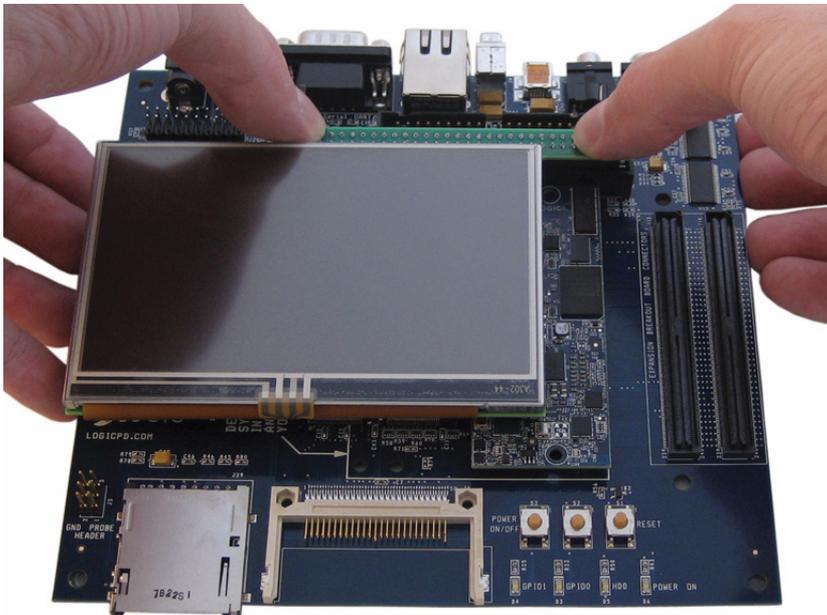
3. Visually verify that the socket connectors on the expansion board and baseboard have mated correctly. To remove the expansion board, pull up on the board above the socket connectors. Attempt to pull straight up and refrain from flexing the PCB to avoid damaging the breakout board.
4. This same process is used to connect either the high-density breakout board or the HPA adapter board. Only one board can be connected at a time.

2.5 Connect LCD to Baseboard

The 4.3" WQVGA LCD included with the development kit connects to the baseboard 60-pin LCD connector.

1. Align the connector on the LCD board with the baseboard 60-pin LCD connector. **Note:** Make sure that all the pins on the baseboard connector line up with all the holes on the LCD connector.
2. Press straight down on the LCD board until the baseboard connector ejector levers move into a vertical position. **Note:** Use caution when pressing down on the LCD board as the solder points may be sharp.

Figure 2.9 – Connect LCD to Baseboard



3. Before using the LCD touch screen, remove the protective plastic film covering the display.
4. To remove the LCD board from the baseboard, pull back on the ejector levers until the connector on the display board moves up and disengages from the baseboard 60-pin LCD connector.

2.6 Baseboard Jumper Settings

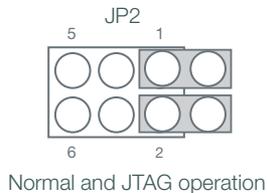
The following table describes the function of the jumpers on the application baseboard. By default, most of the jumpers are placed in position for normal operation modes (please refer to the baseboard connection diagram in Figure 1.2 for jumper locations).

Table 2.10 – Jumper Table

Jumper Settings		Function
JP1	Jmp 2–3	Normal LCD operation ^a . Default is when jumper is across pins 2 and 3.
JP2	Jmp 1 Jmp 2	Normal operation. An individual jumper is placed on each pin and not connected to another pin. (See Figure 2.11 for a graphical description.)
JP3	Jmp 2–3	ATA Operating Voltage ^b . Default is when jumper is across pins 2 and 3.
JP4	Jmp 1–2	ATA Disable ^b . When the jumper is placed across pins 1 and 2, ATA functionality is disabled for the board. This is the default and recommended position of the JP4 jumper for use with the OMAP35x SOM-LV.
	Jmp 1	ATA Enable ^b . When the jumper is placed only on pin 1 and not connected to another pin, ATA functionality is enabled for the board.
J42	Jmp 1–2	USB 5V control (OMAP35x SOM-LV acting as USB host). When the jumper is across pins 1 and 2, the baseboard supplies 5V to USB1_VBUS signal. This is the default and recommended position of the J42 jumper.
	No jumper	USB 5V control (OMAP35x SOM-LV acting as USB device). When the jumper is removed from J42, the connected USB host must supply 5V to USB1_VBUS.

- a. Normal LCD operation is the proper setting for the included 4.3" WQVGA LCD and for the optional Zoom Display Kits.
 - b. ATA is not supported on the OMAP35x SOM-LV.
1. Confirm baseboard ATA jumper (JP4) is set to disable ATA.
 2. Confirm baseboard LCD jumpers (JP1) are set for normal LCD operation.
 3. Confirm baseboard USB 5V control jumper (J42) is set for the OMAP35x SOM-LV to act as USB host.
 4. Confirm baseboard JTAG jumpers (JP2) are set for normal operation with the OMAP35x SOM-LV, as shown in Figure 2.11 below. **Note:** For the OMAP35x SOM-LV, the jumpers should remain in the same position for both normal and JTAG operation modes.

Figure 2.11 – Baseboard JTAG Settings for the OMAP35x SOM-LV



3 Ready for Demo Mode

The OMAP35x Development Kit comes with one or more SD cards, each containing a pre-built OS image. Booting directly into these SD cards allow you to demonstrate the capabilities of the development kit for the specific operating system. The following steps will walk you through the set-up process.

1. Connect the regulated 5V power supply to the appropriate power adapter for the location in which you are using the development kit.

Figure 3.1 – Connect Power Supply and Adapter



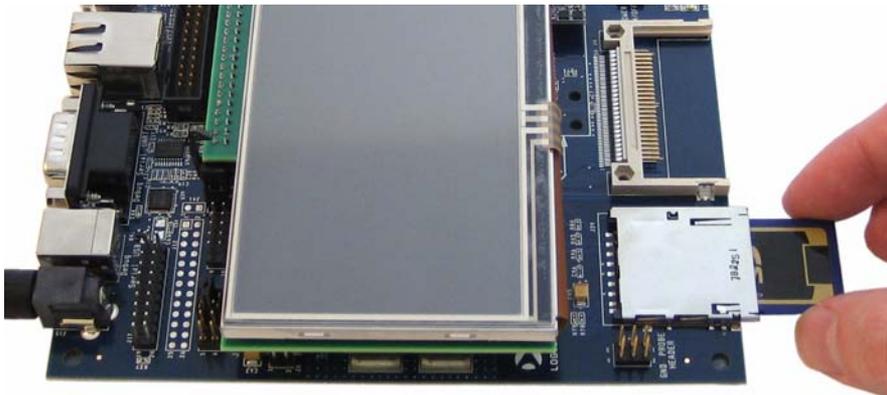
2. Plug the power adapter into an electrical outlet and the 5V line output connector into the power-in connector on the baseboard.

Figure 3.2 – Connect Power to the Baseboard



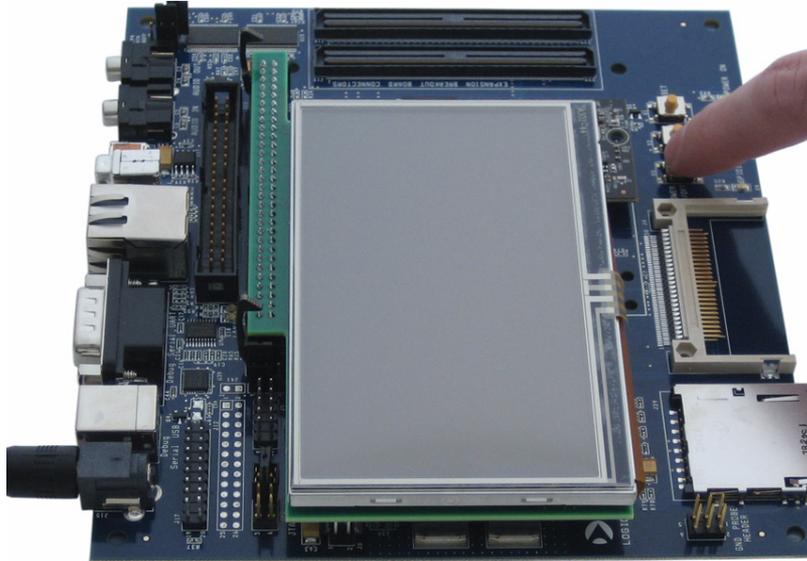
3. Insert the SD card into the SD card slot on the baseboard.

Figure 3.3 – Insert SD Card



4. Press the “POWER ON/OFF” button on the baseboard to boot the development kit.

Figure 3.4 – Press “POWER ON/OFF” Button



5. After a few moments, you will see the graphical user interface (GUI) of the pre-built OS image.
6. You are now ready to demonstrate the capabilities of the OMAP35x SOM-LV.
7. To demo a different pre-built OS image, press the “POWER ON/OFF” button to power down the kit. Remove the SD card and follow the same steps as above to insert a different SD card.

4 Ready for Development Work

Interacting with your OMAP35x Development Kit (e.g., to update the bootloader software, to download sample images or custom BSPs) requires a connection between your kit and a PC. This connection is established with both software and hardware components. The following sections will walk you through the set-up process, beginning with registering your development kit.

4.1 Register your Development Kit

Registration provides you access to the latest revision of this manual, as well as other documentation and software tools. In addition to downloads access, registration provides future notifications when Logic releases documentation and software updates for your product.

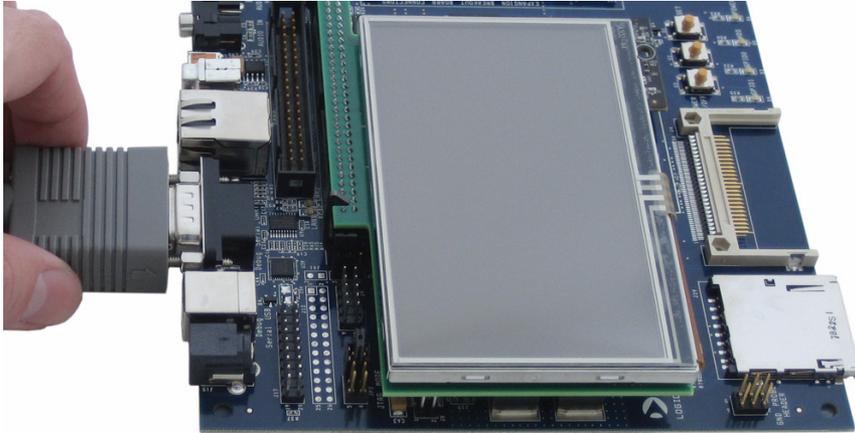
1. To register, visit the Logic Support website at www.logicpd.com/support/ and click on “Create Account”.
2. Fill in the on-screen form and click the “Submit” button.
3. You will receive an e-mail with a URL link to confirm account creation. Click on the link to finalize account creation.
4. You will be directed to a page on Logic’s website that states “Account Activated”. At this point you can register your product. Click on the link to “register your development kit and get access to downloads”.
5. Fill in the on-screen form (all fields are required) and click the “Submit” button.
6. Your product is now registered. Click on the “Return to your Account Overview” link and you will see the list of registered products for your account.
7. Under the heading for “OMAP35x Zoom Development Kit”, click the “All Downloads” link to access the downloads associated with your OMAP35x Development Kit.

4.2 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 the your PC. See Figure 4.1.

Figure 4.1 – Connect the Null-Modem Serial Cable to Baseboard



2. **Note:** If your computer does not contain a serial port, you can use the USB B serial debug port on the baseboard to connect to a USB port on your computer. See Figure 4.2. The application baseboard is equipped with an FTDI virtual COM port (VCP) chip that causes the USB device to appear to your computer as an additional COM port. Settings for the terminal emulation program will remain the same; however, a driver must be installed on your computer and a USB A-to-B cable must be purchased separately for proper operation. A link to the driver and instructions for using the USB-to-UART VCP chip can be found on Logic's website: www.logicpd.com/downloads/910/

Figure 4.2 – Connect USB A-to-B Cable (cable not included with kit)



3. Connect the regulated 5V power supply to the appropriate power adapter for the location in which you are using the development kit.
4. Plug the power adapter into an electrical outlet and the 5V line output connector into the power-in connector on the baseboard.

Figure 4.3 – Connect Power to Baseboard



5. Before powering on your kit, you will have to install a terminal emulation program to communicate with the development kit. Please proceed to the next section for details.

4.3 Terminal Emulation Installation

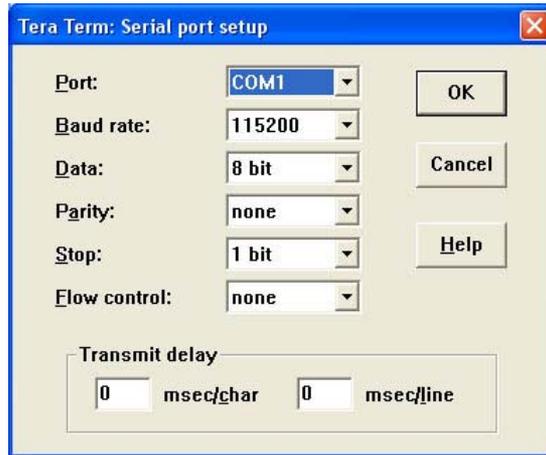
The Zoom OMAP35x Development Kit is designed to communicate with terminal emulation programs using the included null-modem serial cable. The terminal emulation program must support binary transfers in order to download software to the kit. Although Logic does not support any particular terminal emulation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

1. Download the.zip file from Logic's website and unzip the contents:
www.logicpd.com/downloads/240/
2. After unzipping the contents, locate the "setup.exe" file and double-click it.
3. Follow the on-screen instructions to install Tera Term.

Once the terminal emulation program has been installed on your PC, open a new serial port connection using the COM port where the null-modem serial cable is connected to the host PC. Set the 'baud-rate' to 115200, 'data' to 8-bit, 'parity' to none, 'stop' to 1-bit, and 'flow control' to none. (**Hint:** In Tera Term, you can save these serial port settings by selecting

'Setup -> Save setup...' from the file menu. After saving, these serial port settings will be in place every time you launch the Tera Term application.)

Figure 4.4 – Tera Term: Serial Port Set-up Window

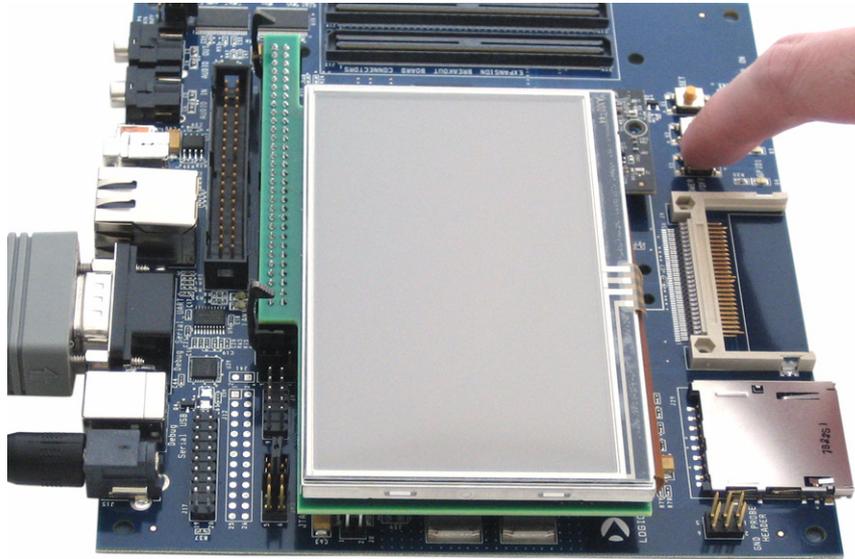


4.4 Boot into LogicLoader

LogicLoader is a bootloader program created by Logic that provides the capability for loading operating systems and applications. In addition, it provides a full suite of commands for interfacing to the SOM-LV. These commands load operating systems, configure hardware platforms, bring up hardware, customize applications, perform tests, and manage in-field devices.

1. Make sure the development kit is set-up as described in the "Connect Development Kit to PC" Section.
2. **Remove** the pre-built OS image SD card from the baseboard, if one is inserted. This step is important because LogicLoader boots from onboard flash.
3. Start the terminal program you installed on your PC in the "Terminal Emulation Installation" Section above.
4. Verify that the serial port settings are correct (see Figure 4.4 in the previous section).
5. Press the "POWER ON/OFF" button on the baseboard to boot the development kit.

Figure 4.5 – Press “POWER ON/OFF” Button



6. In your PC's terminal program you should see a LogicLoader screen similar to that below (version numbers and other details may differ from what is shown below).

Figure 4.6 – LogicLoader Iosh Prompt



7. You are now ready to work with the OMAP35x SOM-LV using LogicLoader. For information on how to load pre-built images, as well as build custom Linux and Windows CE BSPs, please refer to the *Zoom OMAP35x Development Kit User Manual*, available on the Logic website: www.logicpd.com/downloads/1093/

For more information on LogicLoader and its capabilities, please see the

LogicLoader documentation provided by Logic. These documents are available on the Logic website:

+*OMAP35x SOM-LV LogicLoader Labs*: www.logicpd.com/downloads/1096/

+*LogicLoader User Manual*: www.logicpd.com/downloads/1094/

+*LogicLoader Command Description Manual*: www.logicpd.com/downloads/1095/

5 Product Notices

This development kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI and Logic to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This development kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

ESD

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI and Logic from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

FCC Warning

This development kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI and Logic to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

6 Product Ordering Information

Zoom OMAP35x Development Kits and SOM-LVs are available from Texas Instruments or Logic distributors. Please visit Logic's website for configuration options and ordering information:

+www.logicpd.com/products/devkit/ti/zoom_omap3_development_kit

+www.logicpd.com/products/som/ti/omap35x

6.1 Optional Zoom Display Kits

Zoom Display Kits are ideal for embedded solutions requiring a graphical user interface and are available in different display sizes and resolutions. Zoom Display Kits are sold separately. Contact Logic for other display requirements.

Visit Logic's website at www.logicpd.com/products/displaykits/ for a complete listing of Display Kits and specifications.

7 Support

7.1 Documentation and Software Downloads

Logic provides additional documentation and software resources for the Zoom OMAP35x Development Kit. These additional resources are available as downloads from the “My Account” section of the Logic website. Click on the “Log In” link at the top of any logicpd.com web page and enter your username and password to access the downloads available for your product.

Additional documentation includes:

- +SOM-LV Schematics (.pdf), Layout Files (.pdf), and BOM (.pdf)
- +Application Baseboard Schematics (.pdf & .dsn), Layout Files (.pdf & .max), and BOM (.pdf)
- +*Zoom OMAP35x Development Kit QuickStart Guide*
- +*Zoom OMAP35x Development Kit User Manual*
- +*OMAP35x SOM-LV Hardware Specification*
- +White Papers, Application Notes, and Product Change Notifications (PCNs) as they become available

7.2 Frequently Asked Questions

Visit www.logicpd.com/support/ for FAQs regarding the Zoom OMAP35x Development Kit and SOM-LVs.

7.3 Technical Discussion Group

Visit www.logicpd.com/support/ to join our Technical Discussion Group (TDG) and share valuable information with other designers. Please note that the TDG site requires its own account creation that is separate from the account for the main Logic website.

7.4 Warranty Statement

Refer to the “Development Kit Important Notice” document enclosed with the Zoom OMAP35x Development Kit for warranty information.

7.5 Additional Support Services Available from Logic

Support Packages for Dedicated Technical Support

Visit www.logicpd.com/support/ for complete descriptions, prices, and purchase options.

Product Development Services

Logic offers product development and manufacturing services from initial product concept and design to volume production and fulfillment.

- +Industrial Design
- +Mechanical Engineering
- +Electrical Engineering
- +Systems & Software Engineering
- +PCB Design & Layout
- +FPGA/DSP Design
- +Manufacturing Services

Revision History

REV	EDITOR	REVISION DESCRIPTION	APPROVAL	DATE
1 PN 1009512	JCA	+Preliminary release	JCA	04/17/08
2 PN 1009512	JCA	+Updated after internal review	JCA	05/09/08
A PN 1009512	JCA	+Official release	KTL	05/13/08
B PN 1010324	JCA	+Section 1.1: Updated SD Memory Card listing +Section 2.1: Updated instructions for antenna connectors that were moved to top of SOM-LV; Updated Figure 2.2 +Section 2.6: Corrected JP2 jumper settings location from pins 5 & 6 to pins 1 & 2; Updated Figure 2.11 to correct JP2 jumper settings; Updated JP4 information for the default jumper location on pins 1 & 2 to disable ATA + Updated Figure 4.6 to reflect current LoLo version	KTL	06/18/08
C PN 1013445	JCA	+Section 1.3: Added J42 jumper location; removed SOM-LV from picture to show BTB connectors; +Section 2.6: Added J42 jumper information	NJK	06/11/09

Please check www.logicpd.com for the latest revision of this manual and other documentation.

OMAP is a registered trademark of Texas Instruments Incorporated.



embedded product solutions

411 N. Washington Ave. Suite 400 Minneapolis, MN 55401

T : 612.672.9495 F : 612.672.9489 I : www.logicpd.com

Logic Product Development makes no warranty for the use of its products. The Company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. The names of the sample source code files and the platform dependent environment variables may be subject to change without notice. Some steps and figures may vary between different versions of tools. No licenses to patents or other intellectual property of Logic are granted by the company in connection with the sale of Logic products, expressly or by implication.

All rights reserved. Logic Product Development. Intel, Renesas, and Sharp are registered trademarks. Pentium is a registered trademark of Intel. Windows is a registered trademark of Microsoft Corporation. Zoom and LogicLoader are trademarks of Logic Product Development. Terms and product names in this document may be trademarks of others.