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Spec Title: AN63019 - Multiple IDE Drives Access Using
                   AT2LP(TM)

Replaced by: None

Multiple IDE Drives Access Using AT2LP™

Author: Narayana Murthy M
Associated Part Family: CY7C68300C/301C/320C/321C
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This application note explains how to access multiple IDE drives using AT2LP™. During boot-up, the AT2LP chip reads the configuration data from the electrically erasable programmable read-only (EEPROM) and configures itself to communicate with the IDE drives in either bus-powered or self-powered mode. This application note describes the step-by-step process of how to achieve the objective of communicating with two self-powered IDE drives simultaneously using an AT2LP board.

1   Introduction

The EZ-USB® AT2LP is a fixed-function device used to connect one or two ATA/ATAPI-based devices to a PC using a USB 2.0 port. The AT2LP family of chips adheres to the Mass storage BOT-specification, ATA-ATAPI-6 standard, and is intended for use in bus- and self-powered devices. Based on the package type, pin configuration and mode of power, different parts are available under AT2LP.

Table 1. AT2LP Part Family List

Part Number	Package Type	Power Mode Designs
CY7C68300C	56-pinSSOP/56-pin QFN	Self or Bus powered mode designs
CY7C68301C	56-pinSSOP/56-pin QFN	Battery powered mode designs
CY7C68320C	56-pin QFN/100-pin TQFP	Self or Bus powered mode designs
CY7C68321C	56-pin QFN/100-pin TQFP	Battery powered mode designs

For more details on AT2LP, refer to the datasheet.

2   Hardware Requirements

- **AT2LP Board:** The board used to demonstrate this feature should be designed based on the AT2LP family of chips listed in Table 1. The board should support an IDE connector and necessary jumper connections for IDE drives. In this application note, the CY4615B Reference Design Kit, built around AT2LP, is used. The board is based on CY7C68320C.

- **IDE Drives:** The drives can be either bus- or self-powered devices. In writing this application note, the IBM TravelStar IC35L040 40-GB hard drive and the Marvel D740-6L 80-GB hard drive were used. These drives are self-powered and they require an external power supply. The drives have 4-pin power sockets designed to fit into standard power cables emerging from a SMPS (Switch Mode Power Supply) supply. The methods described in this application note should work with all standard IDE drives.

- **80 Conductor IDE Cable:** To connect the two IDE drives with an AT2LP board, this type of cable must be used. This cable is supplied with the CY4615B Reference Design Kit.

- **USB A-B Cable:** This cable is used to connect the AT2LP board to a PC and is supplied with the CY4615B Reference Design Kit.

- **Power Supply:** The IDE drives require power supplies from an SMPS box. Two large 4-pin connectors supply power to each IDE drive, and the smaller 4-pin connector supplies power to the AT2LP in self-power mode.

- **System Requirements:** The EEPROM on the AT2LP board needs to be programmed using the USB application tool (Blaster) provided in CY4615B kit.

3   Programming the AT2LP Board

The AT2LP board should detect the two IDE drives in a self-powered configuration. The configuration file for a self-powered configuration needs to be programmed to EEPROM onboard. Here are the programming steps:

1. Short pins 1-2 of Jumpers J4 and J13. This sets the AT2LP board into bus-powered configuration. See Figure 1.

Figure 1. Bus Power Mode Jumper Settings
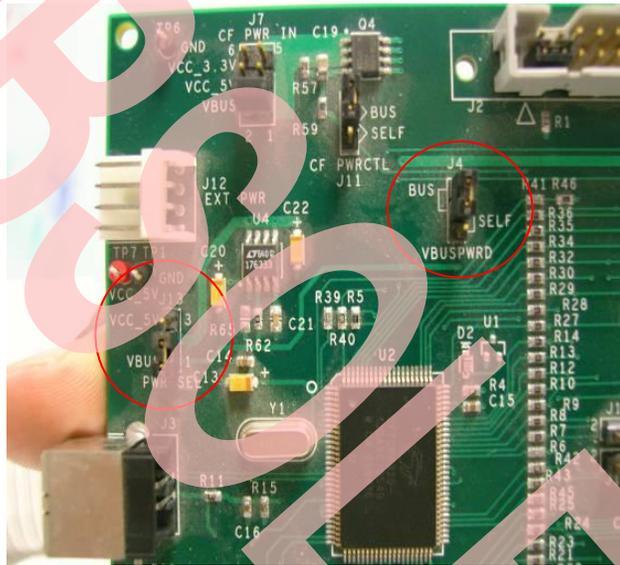
2. Short pin 1-3 of the 40-pin IDE connector on the AT2LP board is shown in the following figure. This setting forces the AT2LP board to boot in Manufacturing mode. In this mode, the board allows the USB PC application software to program EEPROM on board.

Figure 2. 40-pin IDE Connector Pins 1-3 Short
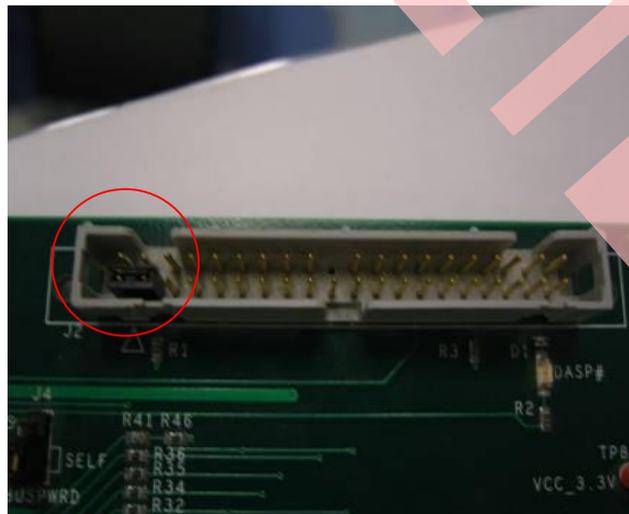
3. Connect the USB cable between the AT2LP board and the Host PC. In Manufacturing mode, the AT2LP device by default enumerates with VID/PID values of 0x04B4 / 0x6830.

4. The Windows Hardware update wizard pops-up Windows Update window. Select 'No, Not this time' and click Next, as shown in Figure 3.

Figure 3. Hardware Update – Display 1
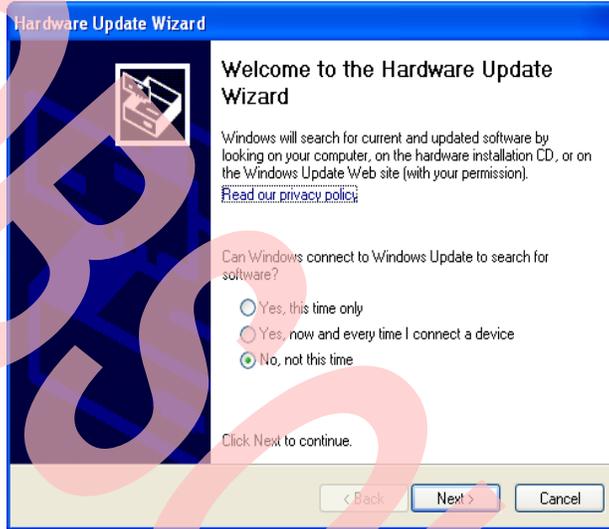
5. The next window allows you either to do the install yourself or use Windows. Select 'Install from specific location' because we require the Cypress driver to be installed for the AT2LP device in Manufacturing mode. Click Next to proceed.

Figure 4. Hardware Update – Display 2
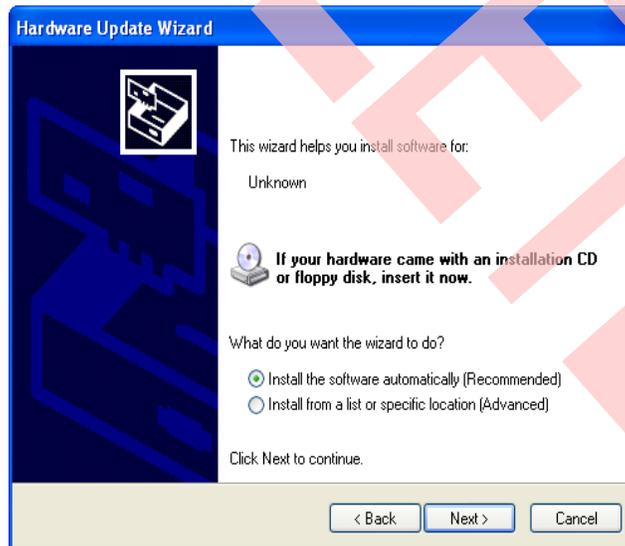
6. In the next window, select 'Search for the best driver in these locations' and select the checkbox with description 'Include this location in the search', as shown in the following figure. The software and driver required to work on this board are available in the CY4615B-AT2LP Reference Design Kit. Download the software and unzip the folders to a local directory in your PC. Then point to the driver directory of the kit in the driver installation window.

Figure 5. Hardware Update – Display 3
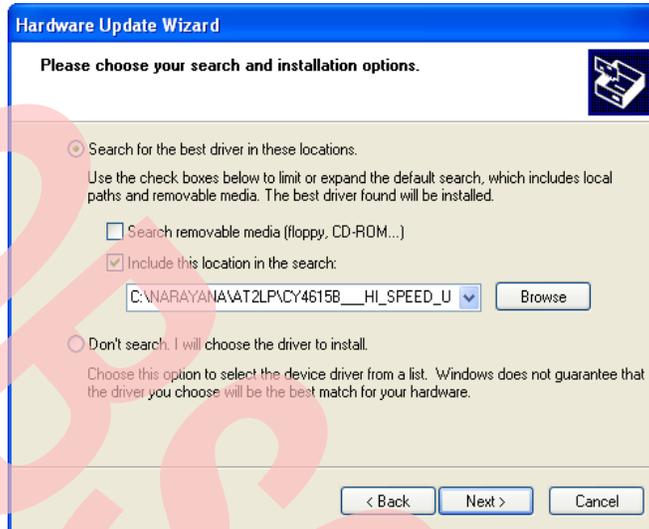
Figure 6. AT2LP-CY4615B DVK Software Driver Directory
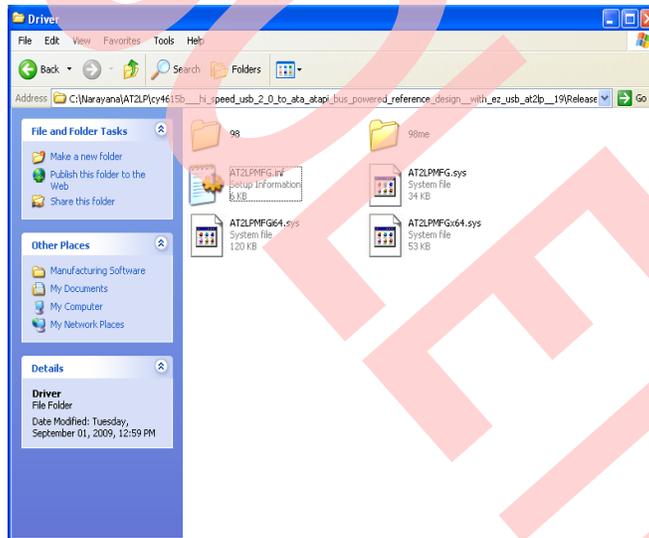
7. The hardware wizard accepts the driver files *AT2LPMFG.inf* and *AT2LPMFG.sys* and displays the AT2LP device name in the device manager window. To verify this, click Windows → Start → Run. In the Run box, type the command *Devmgmt.msc*. Expand the USB device list in the pop-up. It displays the AT2LP in the list of USB devices, as shown in Figure 7.

Figure 7. AT2LP Manufacturing Mode in Device Manager
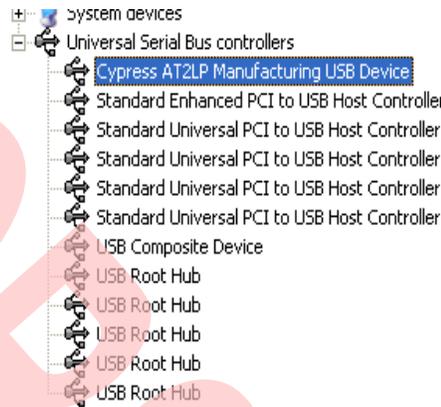
8. In this mode, the AT2LP board configuration settings can be changed by loading a new EEPROM configuration file (*.iic*). The CY4615B kit provides Blaster.exe, a PC software tool that programs the EEPROM on the AT2LP board using vendor commands.

9. Start Blaster.exe software and click 'Read from File' button. This prompts you to select the appropriate configuration file (*.iic*) into EEPROM for self-power mode. Go to the local directory where CY4615B kit is located and point to *Config_files/100_self_ATA.iic.* The Blaster tool reads the file content and displays it as shown in the following figure.

Figure 8. 100_self_ATA.iic File in Blaster.exe
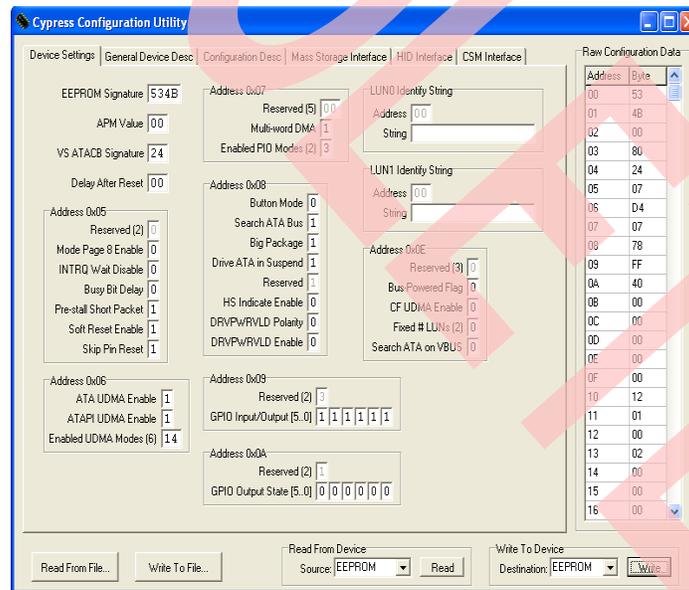
10. Make sure that EEPROM is selected in the Destination drop-down box. Program this file to the on-board EEPROM by clicking the 'Write' button at the bottom right corner of the software tool window. The tool then pops up a window to indicate the successful programming of the device, as shown in Figure 9.

Figure 9. Blaster Tool – EEPROM Program Status
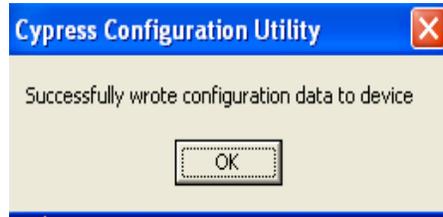
11. The AT2LP board should then be powered OFF and set to NORMAL mode by removing Manufacturing mode jumper settings. Remove the short on Pins 1-3 of the AT2LP 40-pin IDE connector.

4   Hardware Connections

The AT2LP board, IDE drives, and power supply cables should be connected properly before testing the setup. The cable select method (CSEL) is used to connect the two IDE drives to AT2LP. There are two methods to connect more than one IDE drive to the same IDE controller (AT2LP in this case).

▪ **Master-Slave Method:** For older IDE drives, there are jumpers next to the power connector. Connect these jumpers manually to set each of these IDE drives into master-slave combination. One IDE drive must be designated as Device0 (Master) and the other as Device1 (Slave). The jumper settings for both modes are displayed on the IDE drives. Both IDE drives are connected using a single 40- or 80-conductor IDE cable.

▪ **Cable Select Method:** This is a more recent method of connecting more than one IDE drive to a single IDE controller. In this, the master-slave hard drive selection is done automatically using the cable color-coding scheme. First, set both drives to cable select mode using the jumper settings displayed on the IDE drive. Then, using an 80-conductor, the IDE cable master-slave device is determined based on the color of the connector attached to each of these drives. Which method the IDE drives support should be selected before proceeding. Both IDE drives selected for a demo in this application note support the cable select method. The highlighted parts in the following diagrams show jumper settings for the cable select method of each of these drives.

Figure 10. Cable Select (CSEL) for IBM IDE

Figure 11. Cable Select (CSEL) for Maxtor IDE
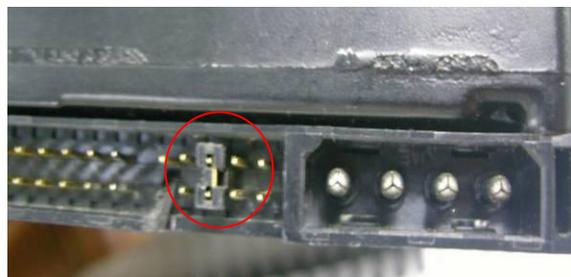
Now, connect the 80-conductor IDE cable that has three connectors of different colors on the AT2LP board and IDE drives. These colors make it easy to locate which connector goes to which device.
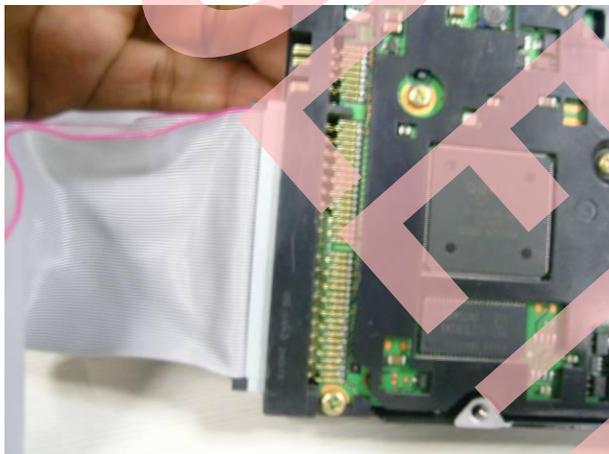
- **Blue Connector:** This should be connected to host controller or to the motherboard. In this setup, the AT2LP board is the host.

Figure 12. Blue Connector Setting on AT2LP Board
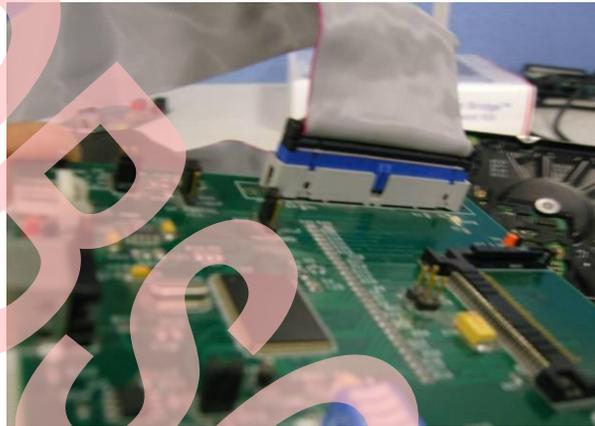
- **Gray Connector:** This connector is in the middle of the cable and goes to the slave device. In this setup, it is connected to the Maxtor D740X-6L hard drive.

Figure 13. Gray Connector to Slave IDE drive

- **Black Connector:** This connector is in the middle of the cable and goes to the master device. In this setup, it is connected to the IBM TravelStar IC35L040 40 GB IDE hard drive.

Figure 14. Black Connector to Master IDE Drive

Power Supply Cable Connections: The AT2LP board, along with the IDE drives, is in self-powered mode and, therefore, requires an external power supply. The SMPS box displayed in the following figure has several cables projecting out of it. These cables are of different voltage configurations, such as 3.3 V, 5 V, and 12 V.

Figure 15. SMPS Supply - Projecting Power Cables
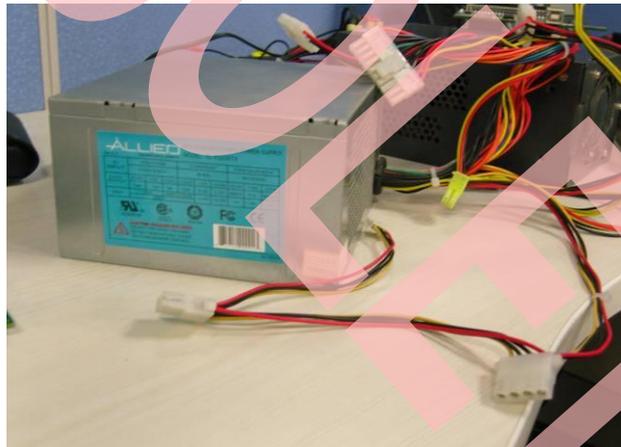
▫ Select three 5-V power cables as shown in the following figure. The 4-wire larger slot cables on the left and right sides should be connected to each of the IDE drives, and the middle, smaller 4-wire cable should be connected to the AT2LP board.

Figure 16. SMPS' Three Pairs of 4-Wire Cables
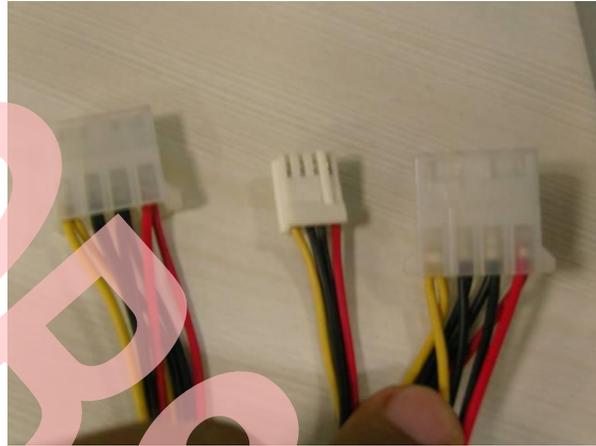
❑ Short pins 2-3 of J13 and J4 in self-power mode, as shown in the following figure.

Figure 17. Self-Power Mode AT2LP -4615B Board Jumper Settings
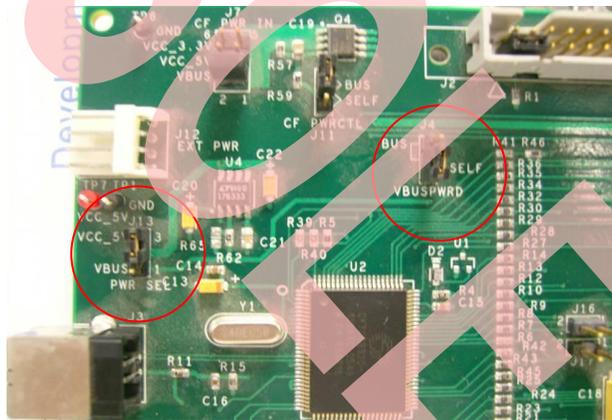
Switch on the SMPS supply. This supplies power to the two IDE drives and to the AT2LP board. Now connect a USB cable from the AT2LP board to the PC. The AT2LP board enumerates as a 'USB Mass Storage Device', as shown in the device manager window of the PC. Click on the My Computer icon in Windows. The window displays all the multiple disk partitions available on both IDE drives. Adding the capacity of each drive to determine the combined capacity of the drives.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	2986946	NMMA	07/27/2006	New application note.
*A	3158113	LIP	03/21/2007	Added link to AT2LP, MSC Class BOT Spec and AT2LP Board. Added SMPS definition.
*B	4089945	GMRL	08/07/2013	Used updated app note template. Minor edits.
*C	5428481	LIP	09/07/2016	Updated template

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