MultiMobile™ USB

V.92 Portable USB Modem

MT9234MU

User Guide

MultiTech® Systems

MultiMobile USB User Guide
V.92 Portable USB Modem
MT9234MU
S000409C Rev. C

Copyright

Revision	Date	Description
A	10/01/07	Initial release.
B	03/11/08	Added Vista Operating System support.
C	05/14/09	Update Windows Drivers, add Windows Server 2008 support, update Linux Drivers, update FCC Part 15, and Thailand approval. Added link to website for warranty information.

Patents

This device is covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; D353,598; 5,355,365; 5,309,562; 5,301,274. Other patents pending.

Trademarks

Multi-Tech and the Multi-Tech logo are registered trademarks of Multi-Tech Systems, Inc. MultiMobile is a trademark of Multi-Tech. All other brand and product names mentioned in this publication are trademarks or registered trademarks of their respective companies.

World Headquarters

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112 U.S.A.
(763) 785-3500 or (800) 328-9717
Fax (763) 785-9874
Internet Address: http://www.multitech.com

Technical Support

Country	By Email	By Phone
Europe, Middle East, Africa	support@multitech.co.uk	+(44) 118 959 7774
U.S., Canada, all others	support@multitech.com	(800) 972-2439 or +763-717-5863

Warranty

Warranty information can be found at: http://www.multitech.com

Contents

Chapter 1 – Product Description

Introduction

The MultiMobile USB V.92 Portable USB modem MT9234MU provides V.92/56K data rates, fax and file transfer capabilities and a hot-swappable USB interface. This modem, weighing only 2 ounces, is ideal for mobile users who want email and Internet access on the road. The MT9234MU modem can also serve as the mobile user's home office desktop modem.

This user's guide will help you install, configure, test and use your modem.

Features

Command Buffer	40 characters
Diagnostics	Power-on self test, local analog & local digital loop, remote digital loop.
LED Indicators	LEDs for Data, Carrier Detect, Off Hook, Terminal Ready
Intelligent Features	Fully AT command compatible; autodial, redial, repeat dial; pulse or tone dial; dial pauses; auto answer; caller ID; EIA extended automode; adaptive line probing; automatic symbol and carrier frequency during start-up, retrain, and rate renegotiation; call status display, auto-parity and data rate selections; keyboard-controlled modem options; non-volatile memory; on-screen displays for modem option parameters; command lines of up to 40 characters each; help menus; remote configuration.

Telecom Safety Warnings

- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
- This product is to be used with UL and cUL listed computers.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
- Do not use a telephone in the vicinity of a gas leak.
- To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.
- This product must be disconnected from the telephone network interface when servicing.

Shipping Package Contents

- MT9234MU modem
- One RJ-11 cable
- A printed Quick Start Guide
- One MultiMobile USB CD

Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit. Contact Multi-Tech's Technical Support for advice.

You Supply

- A computer with an unused USB port
- A nearby telephone line jack

Technical Specifications

Trade Name	MultiMobile™ USB
Model Number	MT9234MU
Data Rates	56K download speeds from digital V.92/V.90 servers; 33.6K upload and download speeds from non-V.92/V.90 servers and other client modems
Fax Rates	33.6K and below
Standards:	
Data	V.92, V.90 enhanced, V.34 and below
Error Correction	V.42
Data Compression	V.44, V.42bis, MNP Class 5
Fax	V.34, Class 2.1 & 1.0, V.17, Group 3; Class 1 & 2, Error Correction Mode
Video	V.80
Cables	1 USB series A 1 RJ-11
Operation	USB Port: 12M bps Line Type: Dial-up
Operating System Support	Windows Vista, XP, 2003, 2000 Linux 2.4 kernel versions 2.4.28 and above Linux 2.6 kernel versions 2.6.8 through 2.6.10 Linux 2.6 kernel versions 2.6.11 and above (with a kernel patch for 2.6.20.4, which may be applicable to earlier 2.6 kernel versions, as well)
Physical Description	1.3” w x 1.0” h x 3.1” d; 2 oz 3.0 cm w x 2.5 cm h x 8.0 cm d; 62 g
Operating Environment	Operating Temperature: +32° to +120° F (0° to 50° C) Humidity Range: 25–85% non-condensing
Approvals	**CE Mark** **EMC:** FCC Part 15 Class B EN 55024 **Safety:** UL/cUL 60950-1 EN 60950-1 **Telecom:** 47CFR Part 68 CS03 TBR21
Limited Warranty	2 years

About AT Commands

AT Commands for this product are published in a separate document and included on the MT9234MU CD that accompanies your modem.

Chapter 2 – Installation

Setup

To use your modem, you must connect the MT9234MU's USB cable connector to your computer ("USB") and to a telephone line ("LINE").

Connect the Modem to Your System

Connect the MT9234MU to your computer's USB port and connect the telephone line to your MT9234MU and a telephone wall jack.

USB Connection

Plug the USB cable connector on the modem into a USB port connector on your computer.

Line Connection

Plug one end of the phone cable into the modem's LINE jack, and the other end into a phone line wall jack.

Note: The Federal Communications Commission (FCC), and Industry Canada impose certain restrictions on equipment connected to public telephone systems. See Appendix A for more information.

Install the Modem Driver

Introduction

Compatibility: This MultiMobile MT9234MU MultiModem is compatible with Windows Operating Systems Vista, XP, 2003, Server 2008, and Linux.

Windows Drivers: The MultiMobile MT9234MU driver must be installed in your computer's program directory. The Windows drivers are located on the MultiMobile MT9234MU CD in the Drivers I Windows Drivers folder. A complete set of drivers for each operating system is organized into Vista and XP with either 32-bit or 64-bit processor. Most users will select either the 32-bit Vista or 32-bit XP drivers (Windows 2003 also use the XP drivers). Server users can select either 32-bit or 64-bit depending on their application. For server users to determine whether they have a 32-bit or 64-bit operating system, go to **Start I All Programs I Accessories I System Tools I Computer** and click on the **System Properties** button. Under **System** you will see **System Type: 64-bit Operating System**.

Linux Drivers: Linux Operating System drivers are also located on the CD in the **Drivers I Linux Folder**. Refer to the Readme file (also in the Linux directory) for the correct driver file and installation guide for your distribution/version of Linux.

Overview of Windows Driver Installation: Three install wizards guide you through the software Installation in this order:

Part A installs the Serial Port.

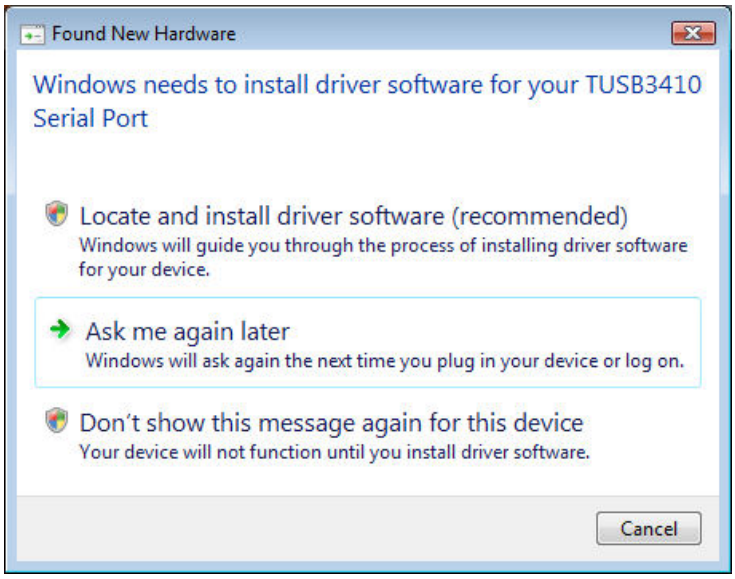
Part B installs the modem driver.

Installing the Modem Driver in Windows Vista

1. Power up your computer.
2. If you have not already done so, connect the modem's USB cable to a USB port on the computer and connect the phone line between the modem and a telephone wall jack.
3. Windows will detect that the new modem is present.

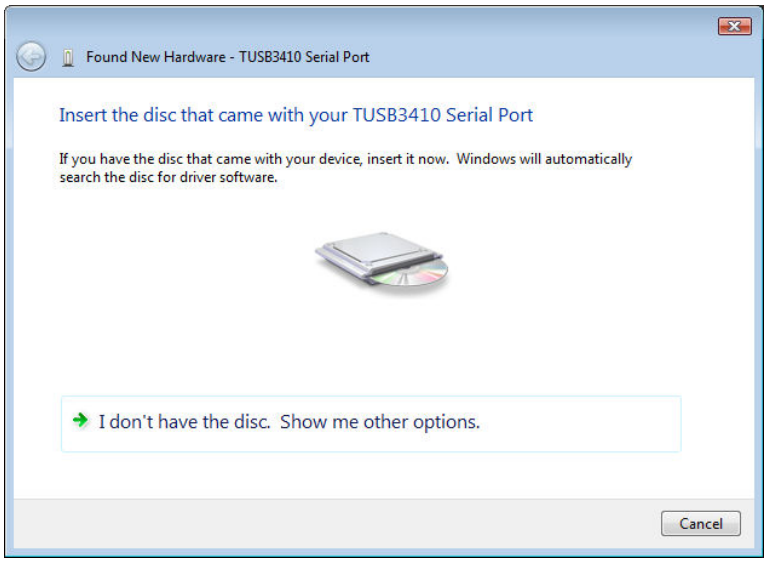
Driver *Installation of your TUSB3410 Serial Port*

4. The Found New Hardware screen appears with Windows needs to install driver software for your TUSB3410 Serial Port.

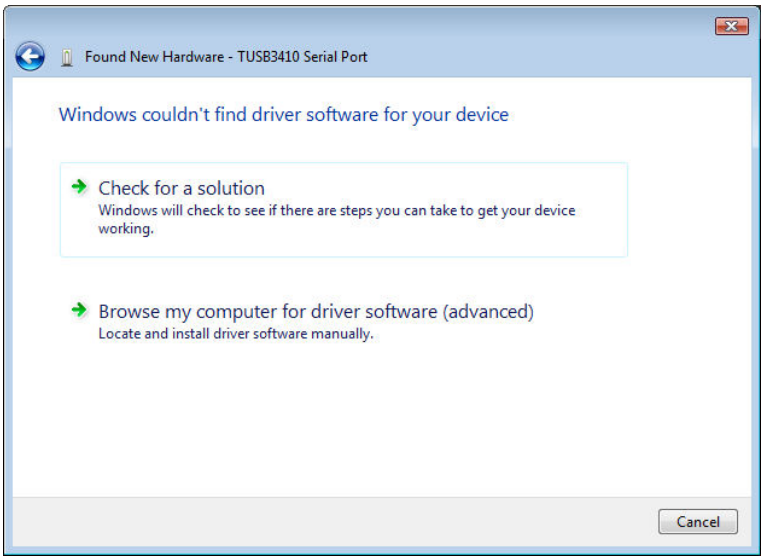


Click on **Locate and install driver software (recommended)**. Windows will guide you through the process of installing driver software for your device.

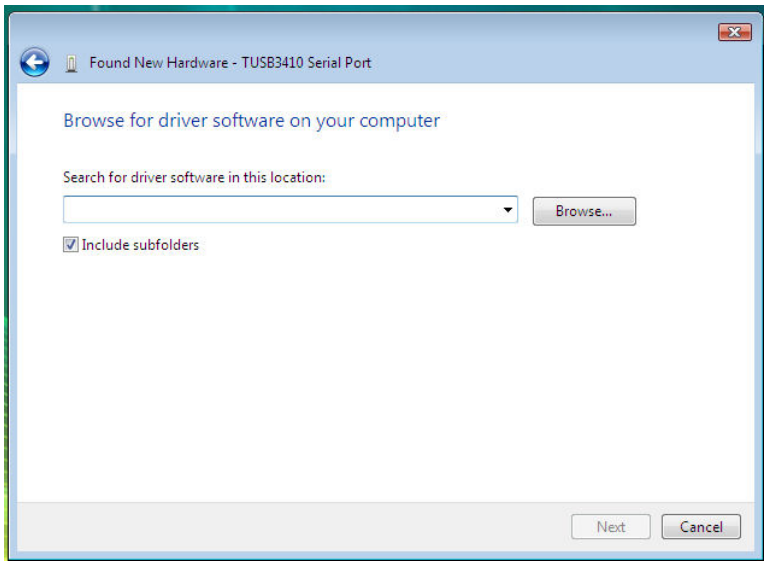
5. The next screen prompts you to insert the disc that came with your MultiMobile MT9234MU. If you have the disc that came with your device, insert it now. Then, click on I don't have the disc. Show me other options. Windows may prompt you to search online, but this is not necessary.



6. Choose **Browse my computer for driver software (advanced).**

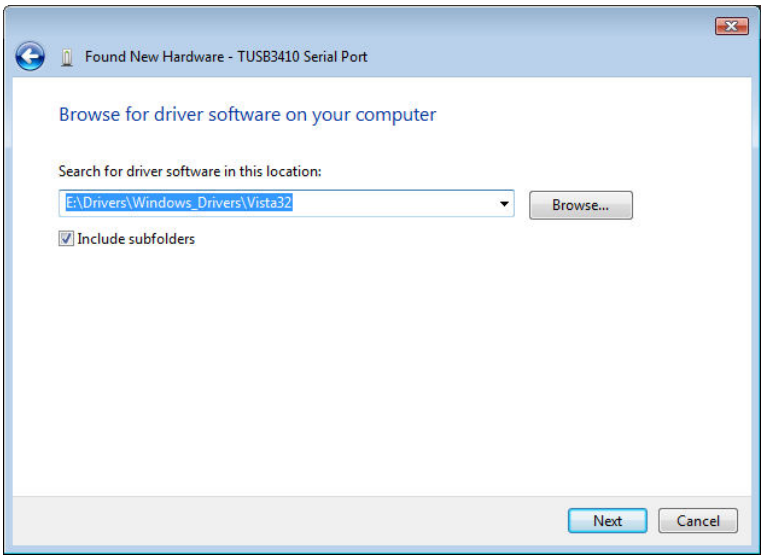


7. At the Browse for driver software on your computer screen,



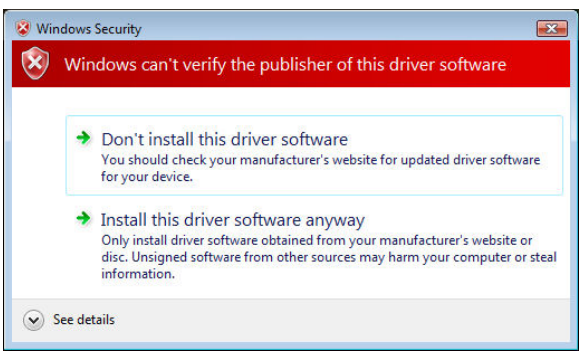
Click the **Browse** button.

8. Browse to the Drivers folder on your MultiMobile MT9234MU CD, then select the Windows_Drivers folder and then the Vista32 folder. If you were installing drivers on a Vista 64-bit Operating System, you would browse to the Vista64 folder. Click OK, then



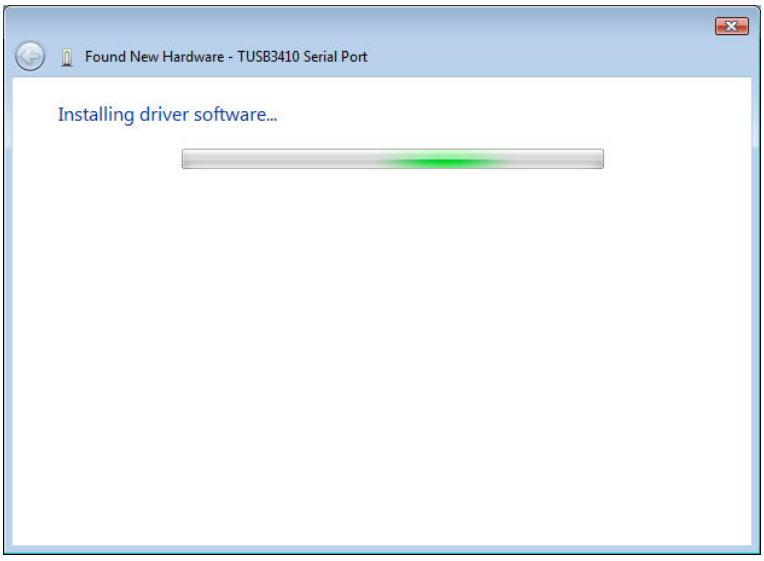
Click **Next**.

9. Windows can't verify the publisher of this driver software screen appears.

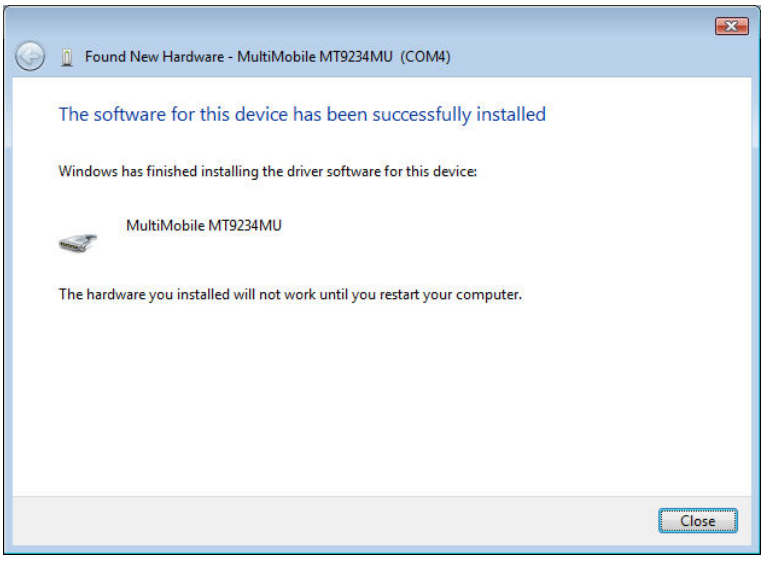


Select **Install this driver software anyway**.

10. Installing driver software… screen appears.



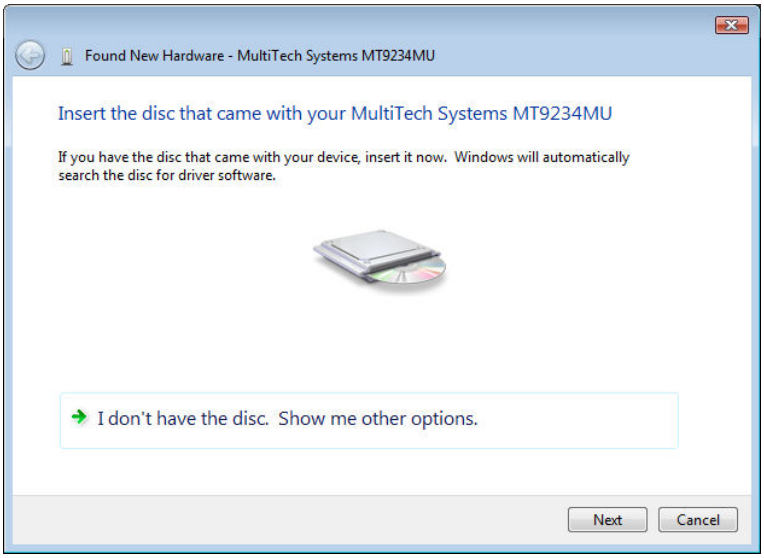
11. When the software for this device has been successfully installed screen appears with Windows has finished installing the driver software for this device: MultiMobile MT9234MU.



Click **Close**.

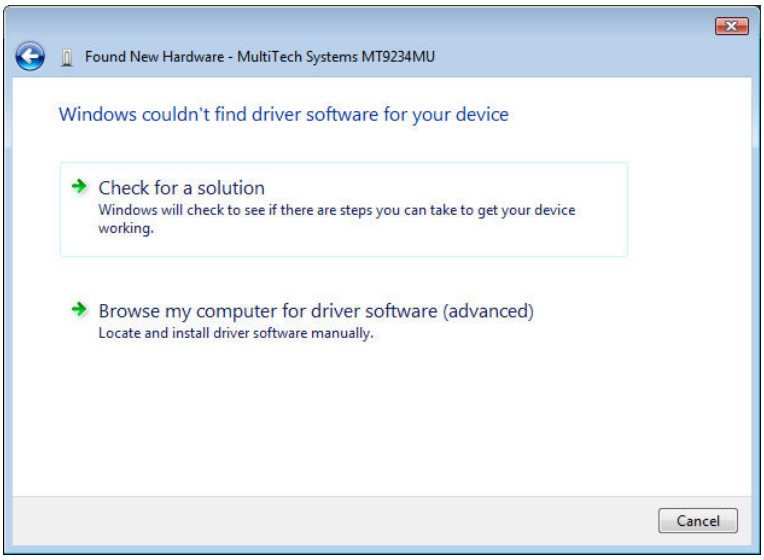
Installation of the Modem

12. The Found New Hardware – MultiTech Systems MT9234MU screen appears. If you have the disc that came with your device, insert it now.

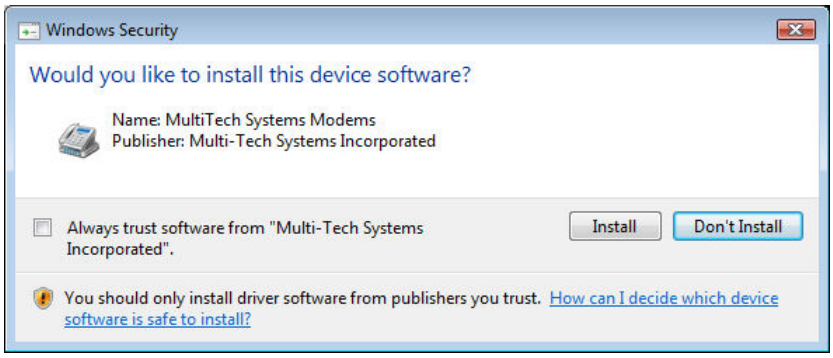


The MultiMobile MT9234MU product CD is still in the CD ROM drive. Click **Next**.

13. Choose **Browse my computer for driver software (advanced).**

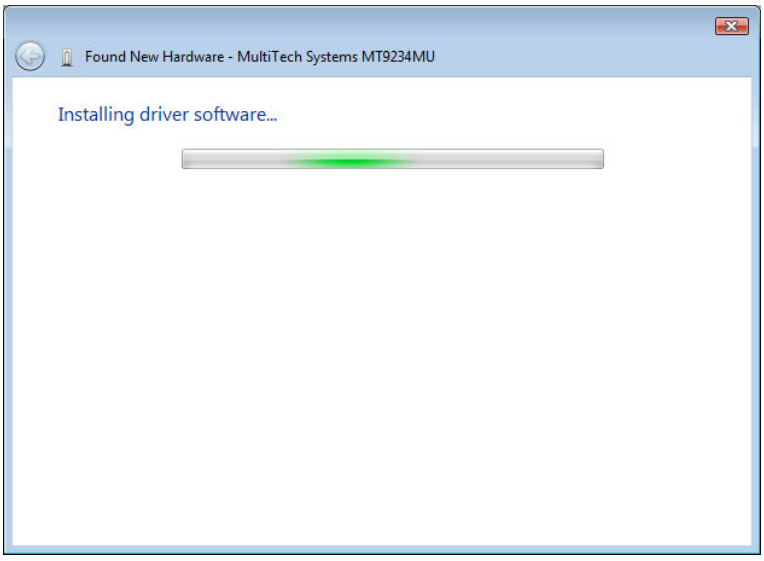


14. Windows software screen appears – Would you like to install this device software?.

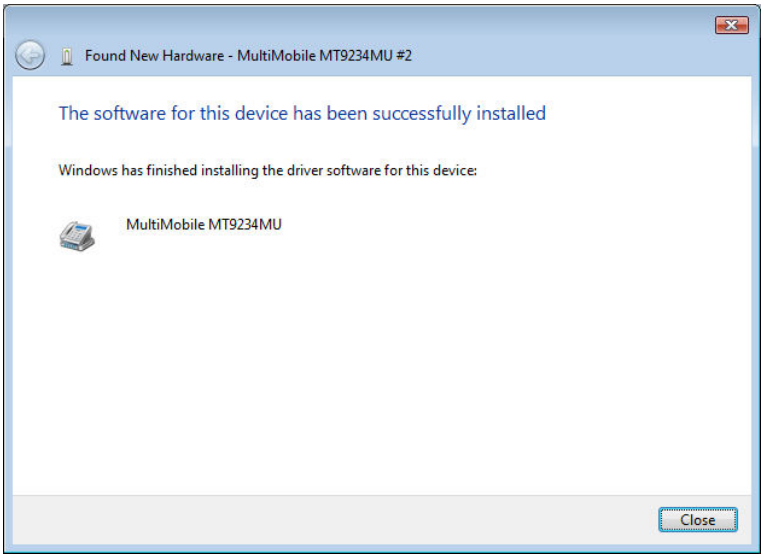


Click **Install**.

14. Installing driver software progress screen appears.



15. **The software for this device has ~~be~~e~~n~~been successfully installed** screen appears. Windows has finished installing the driver software for this device: MultiMobile MT9234MU



Click **Close**. The installation of drivers is now complete.

After installation has been completed, you should test the operation of your new MT9234MU by registering it. Key in the URL given below and follow the on-line instructions:

http://www.multitech.com/register

Installing the Modem Driver in Windows Server 2008, XP, 2003

This installation assumes a Windows Server 2008, XP, or 2003 operating system.

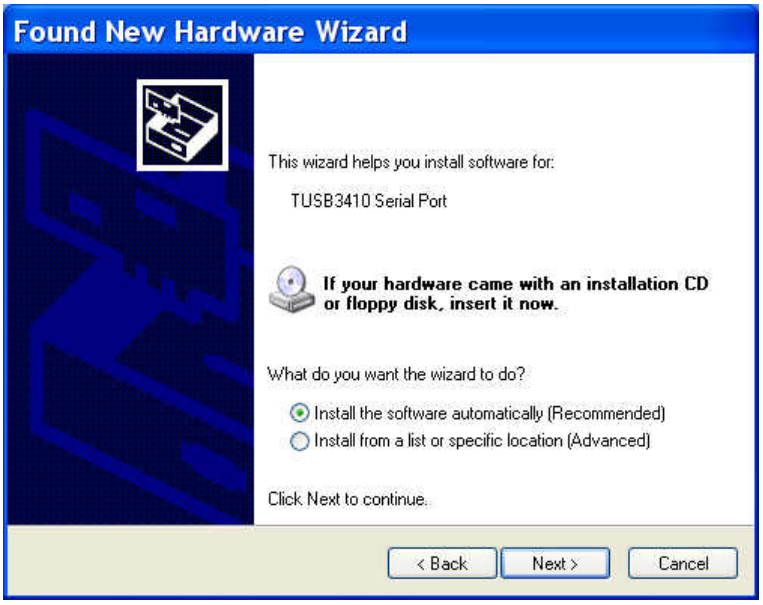
Part A for Windows Server 2008, XP, 2003: Installing the Serial Port

1. Connect the USB cable between the MultiModem and the PC.
2. Insert the MultiMobile MT9234MU CD into your CD-ROM drive. The CD uses the Autorun feature, and after a brief delay, the *MultiMobile MT9234MU Setup – Welcome* screen appears. Close the *Welcome* screen.

   In some situations the operating system will display a *Found New Hardware Wizard* screen and asks you: *Can Windows connect to Windows Update to search for software*?

   Select **No, not this time**. Then click **Next**.

3. The *Found New Hardware Wizard* screen helps you install the software for – TUSB3410 Serial Port.



   Click **Install from a list or specific location (Advanced)**, and then click **Next**.

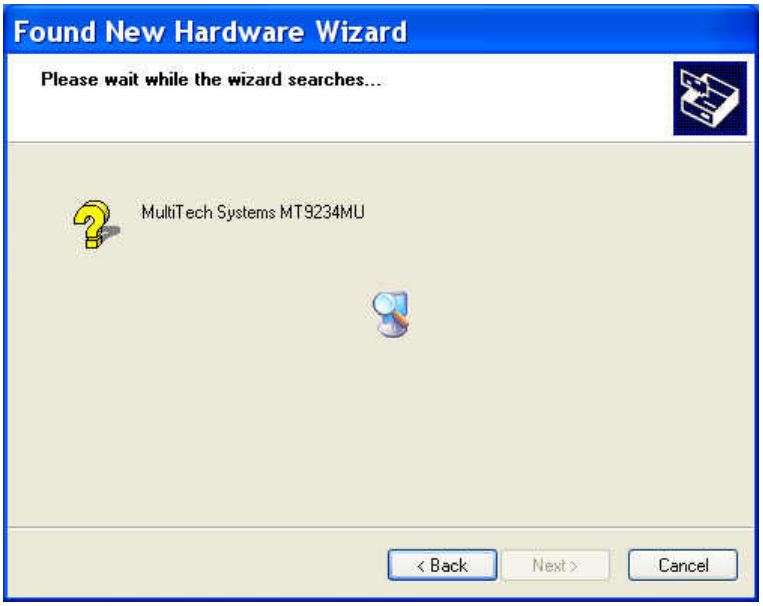
4. The next screen is the **Please choose your search and installation options**.

Select only **~~Search rem~~ovable media (floppy, CD-ROM…)** ~~and~~ **Include this location in the search.** Click the **Browse** button.

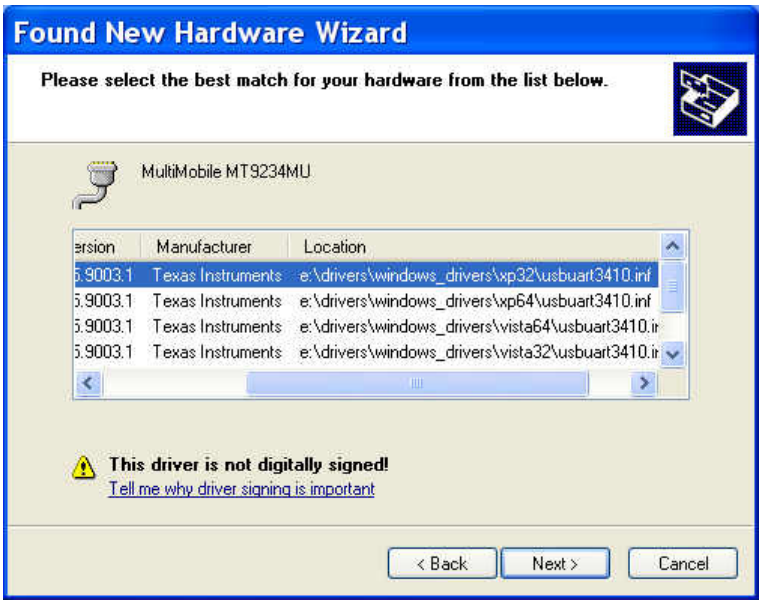
5. **Browse** to the Drivers folder on your MultiMobile MT9234MU CD, then select the Windows_Drivers folder and then the XP32 folder. If you are installing drivers on an XP 64-bit Operating System, you would browse to the ~~Vista64~~ XP64 folder.

Click **Next**.

6. Please wait while the wizard searches for the MT9234MU.

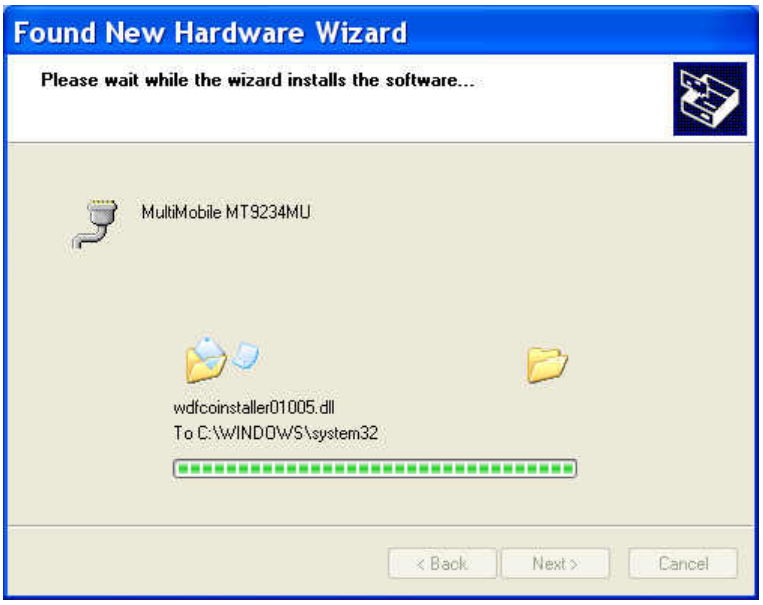


7. Please select the best match for your hardware from the list below.

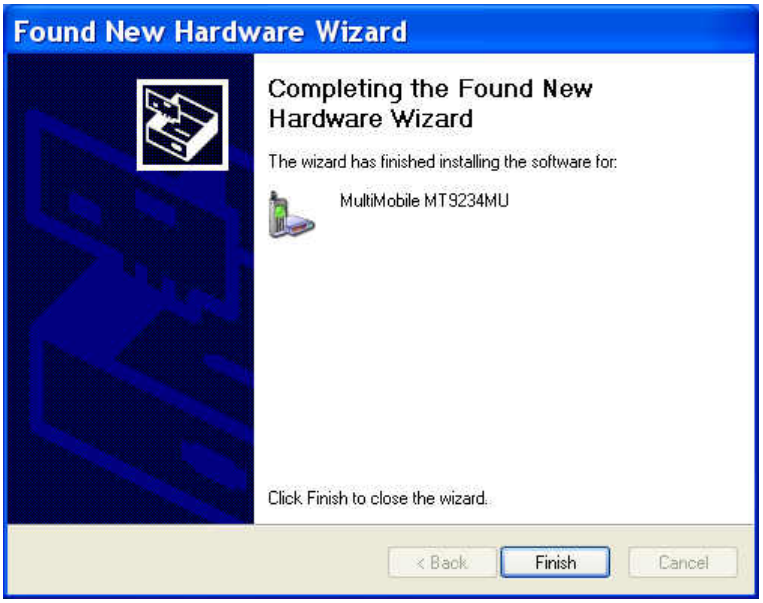


Select either **MultiMobile MT9234MU xp32 or xp64** depending on your operating system.

8. Please wait while the wizard installs the software.



9. At the Completing the Found New Hardware Wizard for the MultiMobile MT9234MU screen.



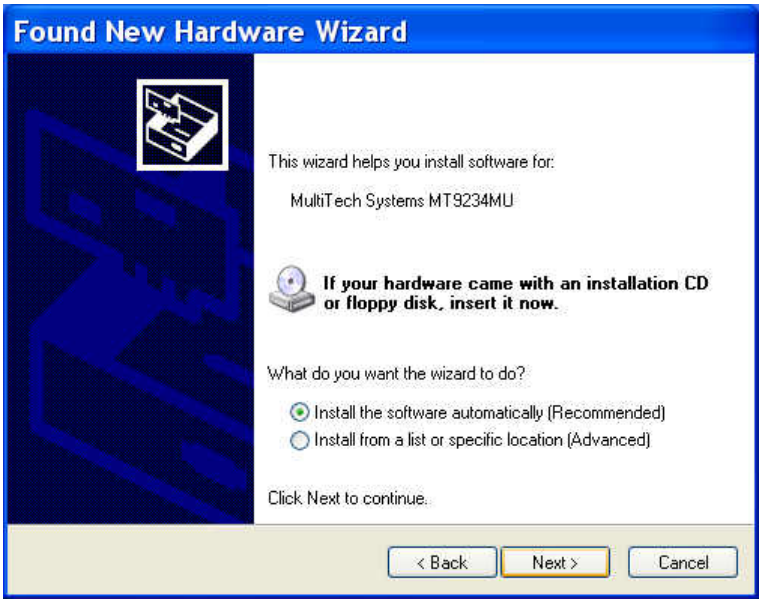
Click **Finish**. Installation of the Serial Port is now complete.

Part B for Windows Server 2008, XP, 2003: Installing the Modem

10. If the Welcome to the Found New Hardware Wizard screen asking – **Can Windows connect to Windows update to search for software?**

Select **No, not this time**. Then click **Next**.

11. This wizard helps you install software for Multi-Tech ~~Systems~~ MT9234MU.

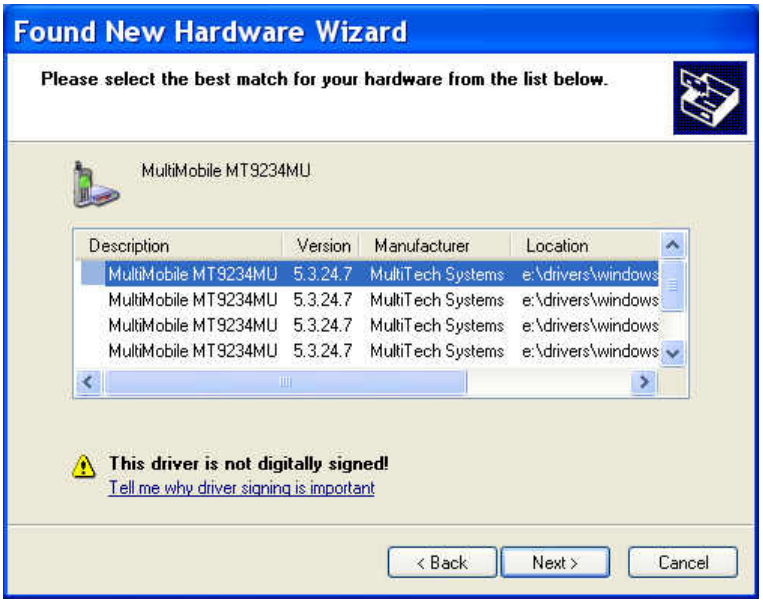


Click on **Install from a list or specific location (Advanced)**. Then click **Next**.

12. The Please choose your search and installation options screen appears.

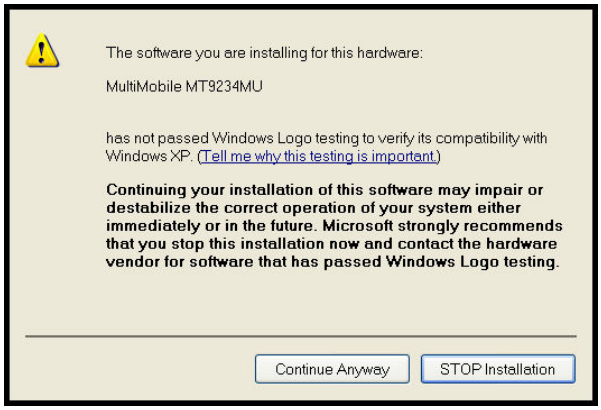
Ensure that ~~**Search removable media (floppy, CD-ROM...) is selected and il**~~**nclude this location in the search** is also selected. Click the **Browse** button.

13. **If necessary,** **Browse** to the Drivers folder on your MultiMobile MT9234MU CD, then select the Windows_Drivers folder and then the ~~xp~~XP32 folder. If you are installing drivers on an XP 64-bit Operating System, you would browse to the XP64 folder.



Click **Next**.

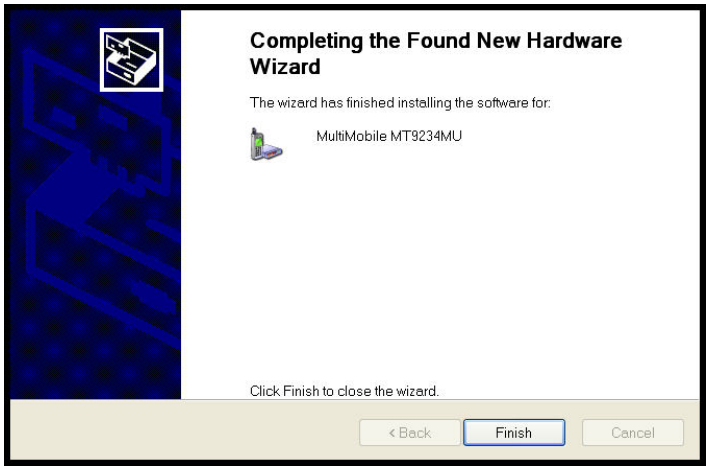
14. The final *Windows Logo Testing* screen may appear depending on operating system settings. This screen pertains to the creation of a modem entity in the operating system that accommodates the MultiMobile MT9234MU.



Click **Continue Anyway**.

15. Please wait while the wizard installs the software.

16. The Completing the Found New Hardware Wizard screen appears.



Click **Finish**.

With the modem is successfully installed, the entire software installation procedure for the MultiMobile MT9234MU is complete.

After the installation has been completed, you should test the operation of your new MT9234MU by registering it. Key in the URL given below and follow the on-line instructions:

http://www.multitech.com/register

Configuring the Modem for Your Country

Different countries have different requirements for how modems must function. Therefore, before you use the modem, you must configure it to match the defaults of the country in which you are using it. You can configure the MT9234MU either manually using AT commands or with the Global Wizard. Both methods are described below.

Using the Global Wizard Utility to Configure Country Code

The Global Wizard configuration utility is recommended for computers running Windows Vista, Windows Server 2008, XP, and 2003. The Global Wizard can configure your modem for a specific country with just a few mouse clicks.

1. Insert the MT9234MU Installation CD into the CD-ROM drive. The Autorun dialog box appears.
2. Click Initial Setup and Country Selection. The Global Wizard dialog box appears. Click **Next**.
3. View the Global Wizard as it searches for your modem and identifies it. Click **Next**.
4. Select the country in which the modem will be used, and then click **Next**.
5. Review your choice of country. If it is correct, click **Next** to configure the modem.
6. When Global Wizard announces that the parameters have been set, click **Finish** to exit.

Using AT Commands to Configure Country Code

If you are comfortable using AT commands, you can configure your modem using AT commands. You must enter these commands in your communication program's terminal window.

To configure the modem for a specific country, execute the following AT commands:

1. Type **AT%T19,0,nn** (where *nn* represents the country code). Press **Enter**.
2. The modem will respond "OK."
3. Type **AT&F&W** (this saves changes). Press **Enter**.
4. The modem will respond "OK."
5. Type **ATI9** (this verifies that country code has been chosen). Press **Enter**.
6. The modem will display the country code in decimal format followed by an "OK."
7. Check to be sure the code for your country is displayed.
   If not, repeat procedure to correct.

Here are two examples of country, command, and result codes.

Example	Country/Region	AT Command (Hexidecimal)	Country Code (Decimal)
	Euro/NAM*	AT%T19,0,34 (default)	52

The complete list of country/region codes can be found on the Multi-Tech Web site at

http://www.multitech.com/PRODUCTS/Categories/Modems/global/configuration.asp#chart

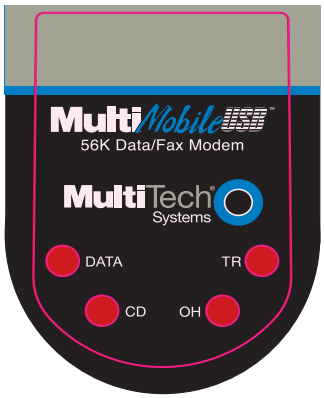
Then click on global modems. The Global Modem Country Approvals page displays. On this page you can view approvals, configuration strings and responses by country and product.

Chapter 3 - Operation

Front Panel

The MT9234MU has 4 LEDs on the front panel indicating status, configuration, and activity:

- **Data.** The Data LED flashes when the modem is transmitting/receiving data to/from another modem.
- **Carrier Detect.** The CD LED lights when the modem detects a valid carrier signal from another modem. It is on when the modem is communicating with the other modem and off when the link is broken.
- **Off-Hook.** The OH LED lights when the modem is off-hook, which occurs when the modem is dialing, online, or answering a call. The LED flashes when the modem pulse-dials.
- **Terminal Ready.** The TR LED lights when Windows detects and initializes the modem.



Connecting to the Internet

Your Multi-Tech modem is your gateway to the Internet and the World Wide Web. To access the Internet and Web via your modem, you must establish a dial-up account with an Internet service provider (ISP). To locate an ISP near you, look in a local directory or computer publication. Your ISP should provide you with the following information:

- User name (also called user ID)
- Password
- Access number (the number you call to connect to the server)
- Host name and/or domain name
- Domain Name Server (DNS) server address

If, besides the Web, you use the Internet for e-mail and newsgroups, your ISP should also provide you with the following information:

- E-mail or POP mail address
- POP server address
- Mail or SMTP address
- News or NNT server address

Internet Connection

Before you can connect to the Internet, you must set up a remote-node client program on your computer. Windows uses HyperTerminal to establish your connection to the ISP's server, which is the shared computer that manages calls from clients (your computer) to the Internet. Most, if not all, Windows browsers can automatically open this connection. For instructions on how to set up this connection, consult your ISP or your operating system's online help or printed documentation. Many ISPs include with their service a program that will install and configure this connection automatically for you.

Chapter 4 - Remote Configuration

Remote configuration is a network management tool that allows you to configure modems anywhere in your network from one location. With password protected remote configuration, you can issue AT commands to a remote MT9324MU modem for maintenance or troubleshooting as if you were on site.

Basic Procedure

The following steps are valid regardless of whether the connection is established by the local or the remote Multi-Tech modem.

1. Establish a data connection with a remote MT9324MU modem.
2. Send three remote configuration escape characters followed by **AT** and the setup password, and press ENTER. Example: **%%%ATMTSMODEM**. You have four tries to enter the correct password before being disconnected. If the password is correct, the remote modem responds with **OK**.
3. You can now send AT commands to configure the remote modem.
4. When you have finished configuring the remote modem, save the new configuration by typing **AT&W0**, and pressing **Enter**.
5. Type **ATO** and press **Enter** to exit remote configuration. You can then break the connection in the normal way.

CAUTION: If you hang up while you are in remote configuration mode, it may lock up the remote modem.

Setup

Multi-Tech modems are shipped with a default setup password (MTSMODEM). Because anyone who has an owner's manual knows the default setup password, for security you should change the password and possibly also the remote configuration escape character.

Changing the Setup Password

1. Open a data communications program such as HyperTerminal.
2. To change the password, type **AT#S=xxxxxxxx**, where xxxxxxxx stands for the password, and press ENTER. The password can include any keyboard character, and must be one to eight characters long. The modem responds with **OK**.
3. The new password is saved automatically. You can now either enter more AT commands or exit the data communications program. The next time you remotely configure the modem you must use the new setup password.

Note: You can only change the setup password locally; you cannot do it remotely. Also, passwords are case sensitive. The next time you enter the password, it must be in the same case as you set it up.

Changing the Remote Escape Character

To increase security, you can change a remote modem's remote configuration escape character. The remote configuration escape character is stored in register ***S9***. The factory default is 37, which is the ASCII code for the percent character (%). For ASCII code characters, refer to Appendix E. Setting ***S9*** to 0 (zero) disables remote configuration entirely—but if you do this remotely, you won't be able to change it back remotely!

1. Establish a remote configuration link with the remote modem as described in "Basic Procedure."
2. Type **ATS9=*n***, where *n* is the ASCII code for the new remote configuration escape character, then press ENTER.
3. Save the new value by typing **AT&W** and pressing ENTER.
4. Type **ATO<CR>** to exit remote configuration.

Appendix A – Regulatory Compliance

FCC Part 15 Class B Statements

This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to 47 CFR Part 15 regulations. The stated limits in this regulation are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the CFR 47 rules. Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

Warning: Changes or modifications to this unit not expressly approved by the party responsible

for compliance could void the user's authority to operate the equipment.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material brouilleur du Canada.

FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.
11. Manufacturing Information:

Manufacturer:	Multi-Tech Systems, Inc.
Trade Name	MultiMobile USB
Model Number:	MT9234MU
Registration Number:	AU7MM04B9234MU
Service Center in USA:	Multi-Tech Systems, Inc. 2205 Woodale Drive Mounds View, MN 55112 U.S.A. (763) 785-3500 (763) 785-9874 Fax

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada label does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment or equipment malfunctions may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

CE

EMC, Safety, and R&TTE Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

  and

- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

  and

- Council Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national telecom requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.

New Zealand Telecom Warning Notice

1. The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

   This equipment is not capable under all operating conditions of correct operation at the higher speed which it is designated. 33.6 kbps and 56 kbps connections are likely to be restricted to lower bit rates when connected to some PSTN implementations. Telecom will accept no responsibility should difficulties arise in such circumstances.
2. Immediately disconnect this equipment should it become physically damaged, and arrange for its disposal or repair.
3. This modem shall not be used in any manner which could constitute a nuisance to other Telecom customers.
4. This device is equipped with pulse dialing, while the Telecom standard is DTMF tone dialing. There is no guarantee that Telecom lines will always continue to support pulse dialing.

   Use of pulse dialing, when this equipment is connected to the same line as other equipment, may give rise to 'bell tinkle' or noise and may also cause a false answer condition. Should such problems occur, the user should not contact the Telecom Faults Service.

   The preferred method of dialing is to use DTMF tones, as this is faster than pulse (decadic) dialing and is readily available on almost all New Zealand telephone exchanges.
5. Warning Notice: No '111' or other calls can be made from this device during a mains power failure.
6. This equipment may not provide for the effective hand-over of a call to another device connected to the same line.

7. Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom's Specifications:

   For repeat calls to the same number:

   - There shall be no more than 10 call attempts to the same number within any 30-minute period for any single manual call initiation, and
   - The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.

   For automatic calls to different numbers:

   - The equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another.

     For automatically answered incoming calls:

   - The equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing.

8. For correct operation, total of the RNs of all devices connected to a single line at any time should not exceed 5.

South African Notice

This modem must be used in conjunction with an approved surge protection device.

Thailand Approval

Translation in Thai

"This telecom device and equipment is conform to technical standard no…."
or
"This telecom device and equipment is conform to requirement to NTC"

"เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามมาตรฐานทางเทคนิค เลขที่....."
or
"เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามข้อกำหนดของ กทช."

Appendix B - Linux Installations

Introduction

The MT9234MU supports Linux 2.4 kernel versions (2.4.28 and above), 2.6 kernel versions 2.6.8 through 2.6.10, and, with a special patch, Linux kernel versions 2.6.11 through 2.6.20.4 and above. There are three separate installation procedures for these ranges of kernel versions. When installation is complete, you must use AT commands to configure the modem for the country in which it is operating.

Installation in Computers Using the Linux 2.4 Kernel

Introduction

This procedure applies to Linux 2.4 kernel versions 2.4.28 and above.

These tgz and source RPM packages (ti_usb-1.2.tgz and ti_usb-1.2-1.src.rpm) contain a device driver for the MT9234MU's TI USB 3410 processor in the Linux 2.4 kernels.

This package is designed for these hardware platforms: a standard PC with i486, Pentium, or compatible CPUs (32 bit x86).

This package has been tested on these Linux distributions:

- Red Hat 8.0
- Red Hat 9.0
- SUSE Linux Standard Server 8.0

Most likely this package will work on many other Linux distributions based on the 2.4 kernels, but this has not yet been tested. Note that different distributions can make custom changes to the Linux kernel, and there is a small chance that these changes might be incompatible with this package.

This package will not work in the Linux 2.6 kernels. Separate packages of the TI USB 3410/5052 driver are available for the Linux 2.6 kernels.

These packages are available from http://www.brimson.com/downloads

The tgz package will be named ti_usb-X.Y.tgz, and the source RPM package will be named ti_usb-X.Y-Z.src.rpm, where X.Y-Z is the version number. See www.brimson.com/downloads/README for a description of the packages available.

If you have questions or problems with this package please contact Texas Instruments technical support or Brimson technical support.

Installation Steps

Install the Kernel Sources

To build the TI USB driver you must have the matching kernel sources for your kernel.

To verify that you have matching kernel sources, run "uname -r" to get the version of the running kernel. Then check for the directory /usr/src/linux-<version>, /lib/modules/<version>/source, /lib/modules/<version>/build, or /usr/src/linux-<stripped_version>, where stripped_version has the extra version information removed. In these directories look for the files include/linux/autoconf.h and .config.

If you do not find the correct kernel source directory, you must find and install the kernel sources from your distribution CDs or other media.

Prepare the Kernel Sources

This step may or may not be necessary, depending on how your Linux distribution installs the kernel sources.

Log in as root and do the following:

Command	Explanation
1. cd /usr/src/linux-<version>	Change to the source directory.
2. make mrproper	Clean up any old files.
3. *Use either of these commands:* make oldconfig -OR- make cloneconfig	Make a configuration file to match your running kernel. *for Red Hat* *for SUSE* For other distributions these same commands might work, or you might need to find a config file in /boot or in a configs directory, copy it to .config, and run "make oldconfig".
4. make dep	Create the dependency and version files.

If you have built your own kernel, the kernel sources will already be installed and prepared. If you are using a kernel that came with a Linux distribution, it can sometimes be difficult to get the kernel sources correctly installed and prepared, since each Linux distribution handles kernel sources slightly differently.

For example, if you get errors about the wrong kernel version, you may have installed the wrong kernel sources, or you may need to edit the kernel version in the top level Makefile of the kernel sources. If you get compilation errors, perhaps you forgot to run "make oldconfig" and "make dep".

If you have difficulties, look carefully at the error messages when installing the TGZ or RPM packages--those messages should give you an indication of just what the error is.

Build and Install the TI USB Driver from the Source RPM Package

Follow this step if your distribution supports RPM packages; otherwise, follow the next step on installing from a TGZ package.

You will need the TI USB source RPM package for this step. The Introduction section above describes where to find the latest TI USB source RPM.

Log in as root and do the following:

Command	Explanation
1. rpmbuild --rebuild ti_usb-X.Y-Z.src.rpm -- OR -- rpm --rebuild ti_usb-X.Y-Z.src.rpm	This command builds the driver package for your kernel. For Red Hat. For SUSE.
2. cd /usr/src/redhat/RPMS/i386 -- OR -- cd /usr/src/packages/RPMS/i386	 For Red Hat. For SUSE. Or use the appropriate path for your Linux distribution.
3. rpm -Uvh ti_usb-X.Y-Z.i386.rpm	This command installs the driver package.

If there are problems in this process, you may need to go back to install and prepare the kernel sources as described above. You may need to remove the RPM package with "rpm -e ti_usb-X.Y-Z" or remove RPM temporary files. Red Hat stores RPM temporary files in /var/tmp and /usr/src/redhat/BUILD; other distributions may store them in other places.

Build and Install the TI USB Driver from the TGZ Package

You will need the TI USB tgz package for this step. The Introduction section above describes where to find the latest TI USB tgz package.

Log in as root and do the following:

Command	Explanation
1. tar xvzf ti_usb-X.Y.tgz	Un-package the files.
2. cd ti_usb-X.Y	
3. ./configure	Configure the package for your distribution and kernel.
4. make	Build the driver.
5. make install	Install the ti_usb driver.

If there are problems in this process, you may need to go back to install and prepare the kernel sources as described above.

Load the TI USB Driver

The ti_usb driver should be automatically loaded when you plug in the TI USB 3410 device, provided your device uses the default vendor and product ids. If it does not, see the section entitled "VENDOR and PRODUCT IDS" in the Release Notes file for Linux 2.4 kernel installations (on the product CD as file name ti_usb_release_notes-1 2.txt).

The first TI USB 3410 device plugged in will appear as /dev/ttyTIUSB0, the next as /dev/ttyTIUSB1, and so on.

Note that these device names are different from the device names used by the Linux usbserial driver. See the section below entitled "DEVICE FILES" for more information.

If TI USB devices had been in use before installing the new TI USB driver, old versions of the drivers will still be loaded. These old versions must be unloaded before the newly installed driver will be used.

The simplest way to unload the old drivers and load the new is to reboot.

Alternatively, you can close all open TI USB serial ports, disconnect the TI USB serial devices, and then unload the old TI USB serial driver with the command

```
rmmod ti_usb
```

Completion. Then reconnect the TI USB serial devices and the new driver will be loaded.

Device Files

Because the TI USB driver does not use usbserial (to avoid known problems with usbserial) it uses its own device file names, /dev/ttyTIUSB0, /dev/ttyTIUSB1, and so on.

The device files are created automatically when the ti_usb driver is loaded. This is done by the module post-install command in /etc/modules.conf, which runs the script /etc/ti_usb/make_devices.

You can change the device names that ti_usb uses. First you should remove the old device files by running

```
/etc/ti_usb/make_devices remove
```

Then edit /etc/ti_usb/make_devices. At the top of this file you will find the parameters DEVICE_NAME which determines the basename of the TI USB device files, DEVICE_COUNT which determines the number of device files created, DEVICE_GROUP which determines the group owner of the device files, and DEVICE_PERMISSIONS which determines the device file permissions.

For example, to create 8 TI USB device files named /dev/ttyusb0 through /dev/ttyusb7, owned by the uucp group, and having permissions 0660, change the parameters like this

```
DEVICE_NAME=/dev/ttyusb
DEVICE_COUNT=8
DEVICE_GROUP=uucp
DEVICE_PERMISSIONS=0660
```

After editing make_devices, run the script to create the new device files, like this

```
/etc/ti_usb/make_devices
```

If you use devfs, the ti_usb devices will be /dev/usb/ti/0, /dev/usb/ti/1, and so on in the order they are plugged in. The ti_usb driver has not been tested with devfs.

Uninstalling the TI USB Driver (for 2.4 kernel versions)

If you installed the TI USB RPM package, you can uninstall it by logging in as root and running the command

rpm -e ti_usb-X.Y-Z

If you installed the TI USB TGZ package, you can uninstall it by logging in as root and running the following commands:

Command	Explanation
cd ti_usb-X.Y	You will need to give a full or relative path to the unpacked source file directory.
make uninstall	

Installation in Computers Using the Linux 2.6 Kernel

Introduction

This procedure applies to Linux 2.6 kernel versions 2.6.8 through 2.6.10.

These tgz and source RPM packages (ti_usb_2.6-1.2.tgz and ti_usb_2.6-1.2-1.src.rpm) contain a device driver for the MT9234MU's TI USB 3410 processor in the Linux 2.6 kernels.

These packages have been tested on the Fedora Core 2 Linux distribution.

Most likely these packages will work on many other Linux distributions based on the 2.6 kernels, but this has not yet been tested. Note that different distributions can make custom changes to the Linux kernel, and there is a small chance that these changes might be incompatible with this package.

The TI USB 3410/5052 driver has been tested in the kernel.org kernels 2.6.5 through a pre-release version of 2.6.10, and in the Fedora Core 2 kernels 2.6.5-1.358 and 2.6.9-1.6. There are limitations in kernels before 2.6.8; see the section on Known Limitations in the Release Notes file for kernel 2.6 (the file name is ti_usb_2 6_release_notes-1 2.txt and it is on the product CD).

These packages will not work in the Linux 2.4 kernels (however, installation in the 2.4 kernels is covered earlier in this chapter).

These packages are available from http://www.brimson.com/downloads

The tgz package will be named ti_usb_2.6-X.Y.tgz, and the source RPM package will be named ti_usb_2.6-X.Y-Z.src.rpm, where X.Y-Z is the version number. See www.brimson.com/downloads/README for a description of the packages available.

If you have questions or problems with this package, please contact Texas Instruments technical support or Brimson technical support.

Installation Steps

Install the Kernel Sources

To build the TI USB driver you must have the matching kernel sources for your kernel.

In particular, you must have the file usb-serial.h for your kernel sources. Sometimes Linux distributions will include the kernel headers but not the complete kernel sources, and usb-serial.h will be missing. However, the complete kernel sources should still be available as a separate add-on package.

To verify that you have matching kernel sources, run "uname -r" to get the version of the running kernel. Then check for the directory /usr/src/linux-<version>, /lib/modules/<version>/source, /lib/modules/<version>/build, or /usr/src/linux-<stripped_version>, where stripped_version has the extra version information removed. In these directories look for the files include/linux/autoconf.h, .config, and drivers/usb/serial/usb-serial.h.

If you do not find the correct kernel source directory, you must find and install the kernel sources from your distribution CDs or other media.

Prepare the Kernel Sources

This step may or may not be necessary, depending on how your Linux distribution installs the kernel sources.

Log in as root and do the following:

Command	Explanation
1. cd /usr/src/linux-<version>	Change to the source directory.
2. make mrproper	Clean up any old files.
3. *Use either of these commands:* make oldconfig -OR- make cloneconfig	Make a configuration file to match your running kernel. *for Red Hat* *for SUSE* For other distributions these same commands might work, or you might need to find a config file in /boot or in a configs directory, copy it to .config, and run "make oldconfig".
4. make prepare	To prepare the kernel sources for your machine.

If you have built your own kernel, the kernel sources will already be installed and prepared. If you are using a kernel that came with a Linux distribution, it can sometimes be difficult to get the kernel sources correctly installed and prepared, since each Linux distribution handles kernel sources slightly differently.

For example, if you get errors about the wrong kernel version, you may have installed the wrong kernel sources, or you may need to edit the kernel version in the top level Makefile of the kernel sources. If you get errors about a missing usb-serial.h, you may only have the kernel headers installed. If you have trouble getting the full kernel sources installed and prepared, you can copy the correct version of usb-serial.h to drivers/usb/serial in the kernel headers directory and then the other kernel sources are not needed.

If you have difficulties, look carefully at the error messages when installing the TGZ or RPM packages. Those messages should give you an indication of just what the error is.

Build and Install the TI USB Driver from the Source RPM Package

Follow this step if your distribution supports RPM packages; otherwise, follow the next step on installing from a TGZ package.

You will need the TI USB 3410/5052 source RPM package for this step. The Introduction section above describes where to find the latest TI USB 3410/5052 source RPM.

Log in as root and do the following:

Command	Explanation
1. rpmbuild --rebuild ti_usb_2.6-X.Y-Z.src.rpm -- OR -- rpm --rebuild ti_usb_2.6-X.Y-Z.src.rpm	This command builds the driver package for your kernel. For Red Hat. For SUSE.
2. cd /usr/src/redhat/RPMS/i386 -- OR -- cd /usr/src/packages/RPMS/i386	 For Red Hat. For SUSE. Or use the appropriate path for your Linux distribution.
3. rpm -Uvh ti_usb_2.6-X.Y-Z.i386.rpm	This command installs the driver package.

If there are problems in this process, you may need to go back to install and prepare the kernel sources as described above. You man need to remove the RPM package with "rpm -e ti_usb_2.6-X.Y-Z" or remove RPM temporary files. Red Hat stores RPM temporary files in /var/tmp and /usr/src/redhat/BUILD; other distributions may store them in other places.

Build and Install the TI USB Driver from the TGZ Package

Follow this step if your distribution does not support RPM packages; otherwise, follow the previous step on installing from an RPM package.

You will need the TI USB 3410/5052 tgz package for this step. The Introduction section above describes where to find the latest TI USB 3410/5052 tgz package.

Log in as root and do the following:

Command	Explanation
1. tar xvzf ti_usb_2.6-X.Y.tgz	Un-package the files.
2. cd ti_usb_2.6-X.Y	
3. ./configure	Configure the package for your distribution and kernel.
4. make install	Build and install the ti_usb_3410_5052 driver.

If there are problems in this process, you may need to go back to install and prepare the kernel sources as described above.

Load the TI USB 3410/5052 Driver

The ti_usb_3410_5052 driver should be automatically loaded when you plug in the TI USB 3410/5052 devices, provided your device uses the default vendor and product ids. If it does not, see the section of the Release Notes file "VENDOR and PRODUCT IDS" (on the product CD as file name ti_usb_2.6_release_notes-1.2.txt).

The first TI USB 3410/5052 device plugged in will appear as /dev/ttyUSB0, then next as /dev/ttyUSB1, and so on. These device names are shared with other USB serial devices.

If TI USB devices had been in use before installing the new TI USB driver, old versions of the drivers will still be loaded. These old versions must be unloaded before the newly installed driver will be used.

The simplest way to unload the old drivers and load the new is to reboot.

Alternatively, you can close all open TI USB serial ports, disconnect the TI USB serial devices, and then unload the old TI USB serial driver with the command

```
rmmod ti_usb_3410_5052
```

Completion. Then reconnect the TI USB serial devices and the new driver will be loaded.

Uninstalling the TI USB Driver (for 2.6 kernel versions)

If you installed the TI USB RPM package, you can uninstall it by logging in as root and running the command

rpm -e ti_usb_2.6-X.Y-Z

If you installed the TI USB TGZ package, you can uninstall it by logging in as root and running the following commands:

Command	Explanation
cd ti_usb_2.6-X.Y	You will need to give a full or relative path to the unpacked source file directory.
make uninstall	

Installation in Computers Using the Linux 2.6.20 Kernel and above

Introduction

This procedure applies to Linux 2.6 kernel versions 2.6.11 through 2.6.20 and higher.

This tgz package contains a patch for the Linux kernel version 2.6.20 and later to add support for MultiTech modems. The patch was generated from the 2.6.20.4 kernel source. Additional support files like hotplug scripts, udev rules and firmware images are also included.

The TI USB 3410/5052 driver should be included in the official Linux kernel in version 2.6.20 or later. The official Linux kernel does not yet have support for the Multitech modems, however; to add that support you need this package.

This package has been tested on these Linux distributions: (a) Fedora Core 6, and (b) CentOS 5.

Most likely this package will work on many other Linux distributions based on the 2.6 kernels, but this has not yet been tested. Note that different distributions can make custom changes to the Linux kernel, and there is a small chance that these changes might be incompatible with this package.

These packages are available from http://www.brimson.com/downloads

If you have questions or problems with this package, please contact Texas Instruments technical support or Brimson technical support.

Installation Steps

Patching and Rebuilding the Kernel

Apply the patch ti_usb_multitech_2.6.20.4.patch. This patch should apply to 2.6.20.4 and later kernels. Then rebuild and reinstall your kernel and/or kernel modules. Be sure the TI USB driver is configured on.

Detailed instructions on patching and building a kernel can be found elsewhere.

Installing the Hotplug Scripts

The ti_usb_3410_5052 driver needs a hotplug script to work correctly. This hotplug script is used to change the device configuration.

Copy ti_usb_3410_5052 to /etc/hotplug/usb/ti_usb_3410_5052. Be sure the script is owned by root:root and has permissions r-xr-xr-x.

If the device configuration is not being set properly, you might need a slightly different hotplug script, depending on your Linux distribution. If this does not work, remove /etc/hotplug/usb/ti_usb_3410_5052 and instead copy /etc/ti_usb/ti_usb_3410_5052.hotplug into /etc/hotplug.d/usb.

Some distribution have deprecated hotplug scripts. If this is the case, you will most likely need a udev rule to perform this function.

Installing udev Rules

The ti_usb_3410_5052 driver needs a udev rule to work correctly. This udev rule is used to change the device configuration.

Copy 25_ti_usb_3410_5052.rule to /etc/udev/rules.d. Be sure the rule is owned by root:root and has permissions r-xr-xr-x.

If the device configuration is not being set properly, you might need a slightly different udev rule, depending on your Linux distribution.

Note: This is only needed if firmware is not built into the driver.

Installing the Firmware Images

Copy ti_mts_fw_cdma, ti_mts_fw_edge, ti_mts_fw_gsm, ti_mts_fw_mt9234mu and ti_mts_fw_mt9234zbausb to /usr/lib/hotplug/firmware/ or /lib/firmware depending on your distribution. Be sure the files are owned by root:root and have permissions r--r--r--.

Load the TI USB 3410/5052 Driver

The ti_usb_3410_5052 driver should be automatically loaded when you plug in the TI USB 3410/5052 devices, provided your device uses the default vendor and product ids. If it does not, see the section below titled "VENDOR and PRODUCT IDS".

The first TI USB 3410/5052 device plugged in will appear as /dev/ttyUSB0, then next as /dev/ttyUSB1, and so on. These device names are shared with other USB serial devices.

If TI USB devices had been in use before installing the new TI USB driver, old versions of the drivers will still be loaded. These old versions must be unloaded before the newly installed driver will be used.

The simplest way to unload the old drivers and load the new is to reboot.

Alternatively, you can close all open TI USB serial ports, disconnect the TI USB serial devices, and then unload the old TI USB serial driver with the command

```
rmmod ti_usb_3410_5052
```

Then reconnect the TI USB serial devices and the new driver will be loaded.

Uninstalling the TI USB Driver (for 2.6 kernel versions)

If you installed the TI USB RPM package, you can uninstall it by logging in as root and running the command

```
rpm -e ti_usb_2.6-X.Y-Z
```

If you installed the TI USB TGZ package, you can uninstall it by logging in as root and running the following commands:

Command	Explanation
cd ti_usb_2.6-X.Y	You will need to give a full or relative path to the unpacked source file directory.
make uninstall	

Appendix C – Waste Electrical and Electronic Equipment

July, 2005

The WEEE directive places an obligation on EU-based manufacturers, distributors, retailers, and importers to take-back electronics products at the end of their useful life. A sister Directive, ROHS (Restriction of Hazardous Substances) complements the WEEE Directive by banning the presence of specific hazardous substances in the products at the design phase. The WEEE Directive covers all Multi-Tech products imported into the EU as of August 13, 2005. EU-based manufacturers, distributors, retailers and importers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the seller from whom you purchased the product.

Appendix D - C-ROHS HT/TS Substance Concentration

依照中国标准的有毒有害物质信息

根据中华人民共和国信息产业部 (MII) 制定的电子信息产品 (EIP)
标准－中华人民共和国《电子信息产品污染控制管理办法》（第 39 号），也称作中国 RoHS，下表列出了 Multi-Tech Systems Inc. 产品中可能含有的有毒物质 (TS) 或有害物质 (HS)
的名称及含量水平方面的信息。

成分名称	有害/有毒物质/元素					
	铅 (PB)	汞 (Hg)	镉 (CD)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板	O	O	O	O	O	O
电阻器	X	O	O	O	O	O
电容器	X	O	O	O	O	O
铁氧体磁环	O	O	O	O	O	O
继电器/光学部件	O	O	O	O	O	O
IC	O	O	O	O	O	O
二极管/晶体管	O	O	O	O	O	O
振荡器和晶振	X	O	O	O	O	O
调节器	O	O	O	O	O	O
电压传感器	O	O	O	O	O	O
变压器	O	O	O	O	O	O
扬声器	O	O	O	O	O	O
连接器	O	O	O	O	O	O
LED	O	O	O	O	O	O
螺丝、螺母以及其它五金件	X	O	O	O	O	O
交流-直流电源	O	O	O	O	O	O
软件/文档 CD	O	O	O	O	O	O
手册和纸页	O	O	O	O	O	O
底盘	O	O	O	O	O	O

X 表示所有使用类似材料的设备中有害/有毒物质的含量水平高于 SJ/Txxx-2006 限量要求。

O 表示不含该物质或者该物质的含量水平在上述限量要求

Appendix E – ASCII Conversion

ASCII Conversion Chart

CTRL	CODE	HEX	DEC	CODE	HEX	DEC	CODE	HEX	DEC	CODE	HEX	DEC
@	NUL	00	0	SP	20	32	@	40	64	`	60	96
A	SOH	01	1	!	21	33	A	41	65	a	61	97
B	STX	02	2	"	22	34	B	42	66	b	62	98
C	ETX	03	3	#	23	35	C	43	67	c	63	99
D	EOT	04	4	$	24	36	D	44	68	d	64	100
E	ENQ	05	5	%	25	37	E	45	69	e	65	101
F	ACK	06	6	&	26	38	F	46	70	f	66	102
G	BEL	07	7	'	27	39	G	47	71	g	67	103
H	BS	08	8	(	28	40	H	48	72	h	68	104
I	HT	09	9	)	29	41	I	49	73	i	69	105
J	LF	0A	10	*	2A	42	J	4A	74	j	6A	106
K	VT	0B	11	+	2B	43	K	4B	75	k	6B	107
L	FF	0C	12	,	2C	44	L	4C	76	l	6C	108
M	CR	0D	13	-	2D	45	M	4D	77	m	6D	109
N	SO	0E	14	.	2E	46	N	4E	78	n	6E	110
O	SI	0F	15	/	2F	47	O	4F	79	o	6F	111
P	DLE	10	16	0	30	48	P	50	80	p	70	112
Q	DC1	11	17	1	31	49	Q	51	81	q	71	113
R	DC2	12	18	2	32	50	R	52	82	r	72	114
S	DC3	13	19	3	33	51	S	53	83	s	73	115
T	DC4	14	20	4	34	52	T	54	84	t	74	116
U	NAK	15	21	5	35	53	U	55	85	u	75	117
V	SYN	16	22	6	36	54	V	56	86	v	76	118
W	ETB	17	23	7	37	55	W	57	87	w	77	119
X	CAN	18	24	8	38	56	X	58	88	x	78	120
Y	EM	19	25	9	39	57	Y	59	89	y	79	121
Z	SUB	1A	26	:	3A	58	Z	5A	90	z	7A	122
[	ESC	1B	27	;	3B	59	[	5B	91	{	7B	123
\	FS	1C	28	<	3C	60	\	5C	92	|	7C	124
]	GS	1D	29	=	3D	61	]	5D	93	}	7D	125
^	RS	1E	30	>	3E	62	^	5E	94	~	7E	126
_	US	1F	31	?	3F	63	_	5F	95	DEL	7F	127

NUL	Null, or all zeros	VT	Vertical Tab	SYN	Sync.
SOH	Start of Header	FF	Form Feed	ETB	End Transmission Block
STX	Start of Text	CR	Carriage Return	CAN	Cancel
ETX	End of Text	SO	Shift Out	EM	End of Medium
EOT	End of Transmission	SI	Shift In	SUB	Substitute
ENQ	Enquiry	DLE	Data Link Escape	ESC	Escape
ACK	Acknowledge	DC1	Device Control 1	FS	File Separator
BEL	Bell or Alarm	DC2	Device Control 2	GS	Group Separator
BS	Backspace	DC3	Device Control 3	RS	Record Separator
HT	Horizontal Tab	DC4	Device Control 4	US	Unit Separator
LF	Line Feed	NAK	Negative Acknowledge	DEL	Delete

Index