MultiModem® CDMA

Cellular Modem

MTCBA-C1X

User Guide

MultiTech®
Systems

MultiModem® CDMA User Guide
Cellular Modem
MTCBA-C1X
S000492B, Revision B

Revision History

Revision	Date	Description
A	11/17/10	Initial release.
B	12/14/10	Add cellular activation web site.

Trademarks and Logos

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Contacting Multi-Tech Support

In order to better serve our customers, manage support requests and shorten resolution times, we have created the online web portal allowing you to submit questions regarding Multi-Tech products directly to our technical support team. Get answers to your most complex questions, ranging from implementation, troubleshooting, product configuration, firmware upgrades and much more.

To create an account and submit a Support Case on the Portal, visit   https://support.multitech.com

Online Web Portal   https://support.multitech.com

The Knowledge Base provides immediate answers to your questions and gives you access to support resolutions for all Multi-Tech products. Visit our support area on the website for other support services.

Knowledge Base and Support Services   www.multitech.com/support.go

Cellular Activation web site   http://www.multitech.com/activation.go

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Warranty

To read the warranty statement for your product, please visit: http://www.multitech.com/warranty.go

Contents

Chapter 1 – Product Description and Specifications

Product Description

The Multi-Tech MultiModem® CDMA Cellular Modem is an external data only cellular modem. It also supports Short Message Service (SMS) such as text and PDU mode, point-to-point (MT/MO) and cell broadcast. It offers standards-based dual-band CDMA2000 1xRTT performance. This ready-to-deploy, standalone modem allows developers to add cellular communication to products with a minimum of development time and expense. The MultiModem CDMA Cellular Modem is based on industry-standard open interfaces, is fully type approved and can be desktop or panel mounted.
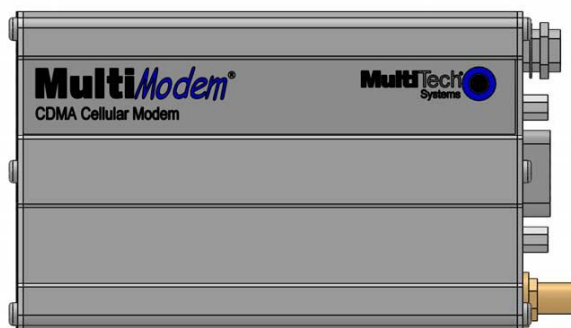
MTCBA-C1X

Features

- CDMA2000 1xRTT
- Dual-band 800/1900 MHz CDMA
- Supports Short Message Service such as text, UCS-2, point-to-point (MT/MO) and cell broadcast
- Available with RS-232 interface
- Packet data up to 153.6K bps
- Circuit-switched data up to 14.4K bps
- IS-95A, IS-95B backwards compatible
- SMA antenna connector
- Configured using CDMA AT commands
- Multiple LEDs provide ongoing operational status
- Over-the-Air activation
- Desktop or panel mounting
- CDG 1 and 2 network certified
- Two-year warranty

Related Documentation

AT Commands: The MultiModem MTCBA-C1X cellular modem is configured using the CDMA AT Commands. These commands are documented in the Reference Guide for the MultiModem CDMA Modems, document number S000478*x*.

Safety
General Safety

The modem is designed for and intended to be used in fixed and mobile applications. "Fixed" means that the device is physically secured at one location and is not able to be easily moved to another location. "Mobile" means that the device is designed to be used in other than fixed locations.

> **Caution:** Maintain a separation distance of at least 20 cm (8 inches) between the transmitter's antenna and the body of the user or nearby persons. The Modem is not designed for or intended to be used in portable applications within 20 cm. (8 inches) of the body of the user.

RF Interference Issues

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

- Switch OFF your MultiModem when in an aircraft. The use of cellular telephones in an aircraft may endanger the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.
- Switch OFF your MultiModem when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your MultiModem in hospitals and any other place where medical equipment may be in use.
- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or where blasting operations are in progress.
- There may be a hazard associated with the operation of your MultiModem close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.
- Operation of your MultiModem close to other electronic equipment may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.

Vehicle Safety

- Do not use your MultiModem while driving.
- Respect national regulations on the use of cellular telephones in vehicles. Road safety always comes first.
- If incorrectly installed in a vehicle, the operation of MultiModem telephone could interfere with the correct functioning of vehicle electronics. To avoid such problems, be sure that qualified personnel have performed the installation. Verification of the protection of vehicle electronics should be part of the installation.
- The use of an alert device to operate a vehicle's lights or horn on public roads is not permitted.

Maintenance of the Cellular MultiModem

Your cellular MultiModem is the product of advanced engineering, design, and craftsmanship and should be treated with care. The suggestions below will help you to enjoy this product for many years.
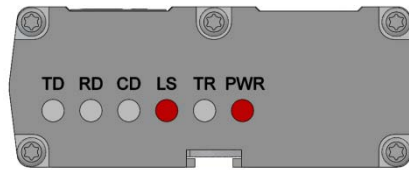
- Do not expose the MultiModem to any extreme environment where the temperature or humidity is high.
- Do not attempt to disassemble the MultiModem. There are no user serviceable parts inside.
- Do not expose the MultiModem to water, rain, or spilled beverages. It is not waterproof.
- Do not abuse your MultiModem by dropping, knocking, or violently shaking it. Rough handling can damage it.
- Do not place the MultiModem alongside computer discs, credit or travel cards, or other magnetic media. The information contained on discs or cards may be affected by the phone.
- The use of accessories not authorized by Multi-Tech or not compliant with Multi-Tech's accessory specifications may invalidate the warranty of the MultiModem.
- In the unlikely event of a fault in the MultiModem, contact Multi-Tech Technical Support.

Handling Precautions

All devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. Although input protection circuitry has been incorporated into the devices to minimize the effect of this static build up, proper precautions should be taken to avoid exposure to electrostatic discharge during handling and mounting.

Front Panel

The front panel is designed with LEDs that display modem activity. The LEDs display modem activity, such as transmit and receive data, carrier detection, link status, terminal ready indicating connection to the pc, and the power indicator.

LEDs

LED Indicators	
TD	**Transmit Data.** Light is on when the modem is transmitting data.
RD	**Receive Data.** Light is on when the modem is receiving data.
CD	**Carrier Detect.** Light is on when a data connection has been established.
LS	**Line Status.** **Continuous "on" state -** indicates that the wireless modem is not registered on the network. **Flashing states:** *200 ms on / 2 sec off -* Indicates registration on network. *200 ms on / 600 ms off -* Indicates it is registered on a network and communication is in progress. **Off state.** Modem is off (not ready) or in download mode.
TR	**Terminal Ready.** Commonly called "Data Terminal Ready." This is a readiness signal from the PC.
PWR	**Power.** Light is on continuously to when power on.

Package Contents

Unbundled Package with No Accessories	Bundled Package With Accessories
1 modem 1 mounting bracket 1 MultiModem CD **Note:** You must supply mounting screws, AC or DC power supply, and an antenna.	1 modem 1 antenna 1 mounting bracket 1 RS232 cable 1 power supply 1 MultiModem CD **Note:** You must supply mounting screws.

Specifications

General Specifications	
Standards	CDMA2000 1xRTT operation
Band, Frequency	Dual-band 800/1900 MHz CDMA; 800 MHz or 800/1900 MHZ with R-UIM support
Packet Data	Up to 153K bps forward and reverse
Circuit Switched Data	IS-95-A, IS-95B up to 14.4K bps forward and reverse
Short Message Services – SMS	Text & PDU, point-to-point (MO/MT), cell broadcast
RS232 Connector	DB15
Power Connector	2.5mm miniature (screw-on)
Voltage	5 V to 32VDC

Power*	**Sleep:** 0.020A, 0.19W @9V **Typical:** 0.109A, 1.01W @9V
	   0.012A, 0.24W @20V 0.054A, 1.08W @20V
	   0.008A, 0.26W @32V 0.036A, 1.15W @32V
	Max: 0.340A, 3.12W @9V
	   0.175A, 3.50W @20V
	   0.110A, 3.52W @32V

Mechanical Dimensions & Weight	4.3" L x 2.4" W x 0.94" H; 4.2 oz. (11 cm x 6.1 cm x 2.4 cm; 119 g)
Operating Temperature**	-40° to +85°C UL listed @ 40° C
Storage Temperatures	-40° to +85°C
Humidity	Relative humidity 20% to 90% noncondensing
Certifications	**EMC:** FCC Part 15 **Radio Compliance:** FCC Part 22, 24 RSS132, 133 **Safety:** UL 60950-1 cUL 60950-1, IEC 60950-1 **Network:** CDG 1 & 2

* Multi-Tech Systems, Inc recommends that the customer incorporate a 10% buffer into their power source when determining product load.

** UL Listed @ 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C.

"UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C."

Cellular Information

Antenna System for Cellular Devices

The cellular performance is completely dependent on the implementation and antenna design. The integration of the antenna system into the product is a critical part of the design process; therefore, it is essential to consider it early so the performance is not compromised. If changes are made to the certified antenna system of the MultiModem, then recertification will be required by specific network carriers such as Sprint. The Antenna System is defined as the UFL connection point from the MultiModem to the specified cable specifications and specified antenna specifications.

PTCRB Requirements for the Antenna

There cannot be any alteration to the authorized antenna system. The antenna system must maintain the same specifications. The antenna must be the same type, with similar in-band and out-of-band radiation patterns.

FCC Requirements for the Antenna

The antenna gain, including cable loss, for the radio you are incorporating into your product design must not exceed the requirements at 850 MHz and 1900 MHz as specified by the FCC grant for mobile operations and fixed mounted operations as defined in 2.1091 and 1.1307 of the FCC rules for satisfying RF exposure compliance. The antenna used for transmitting must be installed to provide a separation distance of at least 20cm from all persons and must not transmit simultaneously with any other antenna transmitters. User and installers must be provided with antenna installation instructions and transmitter operating conditions to satisfying RF exposure compliance.
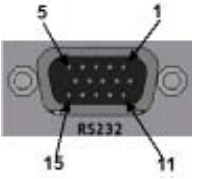
Antenna Specifications

CDMA RF Specifications

	CDMA 800	CDMA 1900
Frequency RX	869 to 894 MHz	1930 to 1990 MHz
Frequency TX	824 to 849 MHz	1850 to 1910 MHz

CDMA Antenna Requirements/Specifications

|	
Frequency Range	824 – 894 MHz / 1850 – 1990 MHz
Impedance	50 Ohms
VSWR	VSWR shall not exceed 2.0:1 at any point across the bands of operation
Typical Radiated Gain	3 dBi on azimuth plane
Radiation	Omni-directional
Polarization	Vertical
Antenna Loss	Free space not to exceed -3dB
TRP/TIS	The total radiated power (TRP) at the antenna shall be no less than +21/20 dBm for PCS/Cell channels respectively, and the total isotropic sensitivity (TIS) at the antenna shall be no less than -104/104 dBm for PCS/Cell channels respectively.

RS232 15-Pin Connector

The following table explains the pin functions.

	PIN	EIA	CCIT	Designation	
RS-232	1	DCD	109	Data Carrier Direct	
	6	RX	104	Receive Data (out)	
	2	TX	103	Transmit Data	
	8	DTR	108.2	Data Terminal Ready	
	9	GND		Signal Ground	
	7	DSR	107	Data Set Ready	
	12	RTS	105	Request to Send	
	11	CTS	106	Clear to Send	
	13	RI	125	Ring Indicator	
Reset	14	RESET		To reset, connect to GND momentarily (typical: 20mSec). Open for normal operation.	

Chapter 2 – Installation

Connect the Antenna, Serial and Power Cables
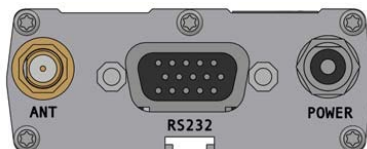
1. Connect a suitable antenna to the ANT connector on the back of the unit, refer to Cellular Information in Chapter 1 for antenna specifications.
2. Connect a serial cable to the RS232 connector on the back of the unit and connect the other end of the cable to the serial port on your PC.
3. Depending on the power source, connect either the power supply module with the appropriate blade or a customer-supplied DC power cable. If you are using the power supply module, remove the protective shipping cover. Attach the appropriate interchangeable blade piece to the power supply module.
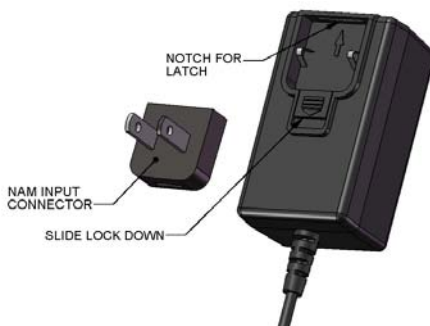
4. Screw-on the power lead from the power supply module to the power connection on the modem. Now, plug the power supply into your power source.

   For customer-supplied DC Power
   - Screw-on a customer-supplied DC power cable to the power connector on the modem.
   - Then attach the two wires at the other end of the DC power cable to a DC fuse/terminal block.
   - Connect the red wire to the "+" (positive) terminal and the black wire to the "–" (negative) terminal. Be sure the GND connection is correct.

   Warning: Over-voltage protection is provided on the device. To ensure complete protection, you may want to add additional filtering to the DC input.

   Note: For automotive application: according to the type of application, you can use permanent "+" or   key-switched "+" source. Connect the power supply to its source (for example, in a mobile situation, to the vehicle's DC fuse/terminal block).

   ### Powering Down and Hardware Resetting a MTCBA-C1X Modem

   It is recommended to follow the following shutdown sequence, when possible, prior to a hardware reset or turning off of power to the modem.

   The shutdown sequence informs the network that the mobile station is going offline, and saves critical data to the module's non-volatile memory (flash).

   AT+CFUN=0 (issue this command)
   +WIND:10   (Wait for this response from the modem)

   Modem is now ready to be powered off or reset.

   If you do not see the +WIND:10 response, you may need to activate the unsolicited message by using the command AT+WUSLMSK=00020000,0

Optional Mounting

Before you mount your modem to a permanent surface, ensure that you have a strong enough (average) signal, refer to Verify Signal Strength in Chapter 3.

Once you have verified that you have a good signal, you can panel mount your modem with the screws spaced according to the measurement shown below.

Note: Use, for example, two 6-3 self-tapping screws 5/8" in length to mount the unit.
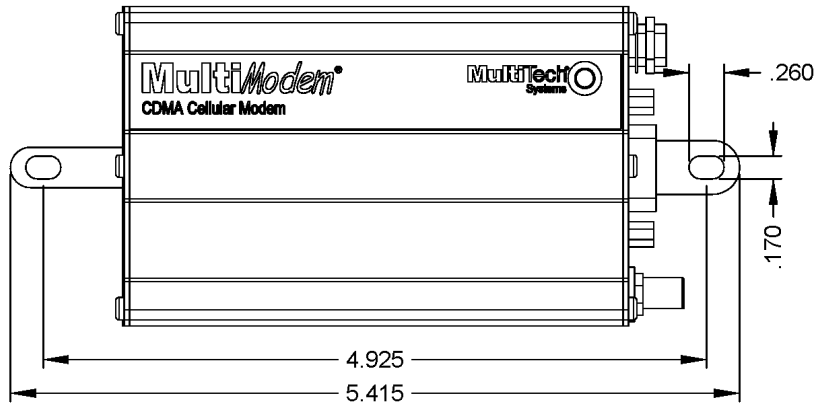

ALL DIMENSIONS IN INCHES ±.025

Install the Modem Driver

The cellular modem is compatible with Windows 7, Vista, XP, 2003 Server, and 2008 Server (32-bit or 64-bit). Linux does not require a driver for serial modems.

Windows operating systems require a modem driver to be installed in your computer's program directory. The Windows driver is located on your MultiModem product CD. Refer to the example below for installing the Windows driver onto your PC.

To load the modem's driver on to your PC, select the Control Panel's *Phone and Modem Options* option. During this installation, you will be required to browse to the MultiModem CD to load the modem's .inf file. This file is located in the Drivers folder on the MultiModem CD.

1. Go to **Start**, and then click on **Control Panel**.
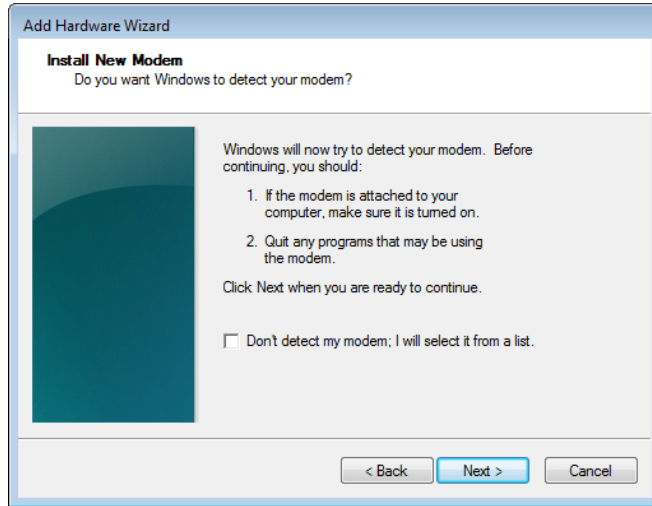2. In the Control Panel, double-click on **Phone and Modem Options**.
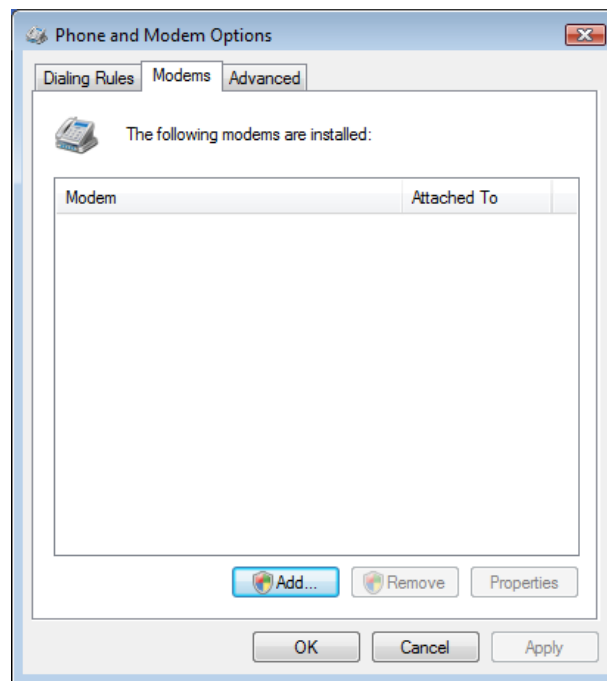
3. When the *Phone and Modem Options* screen appears, click on the tab labeled **Modems**.
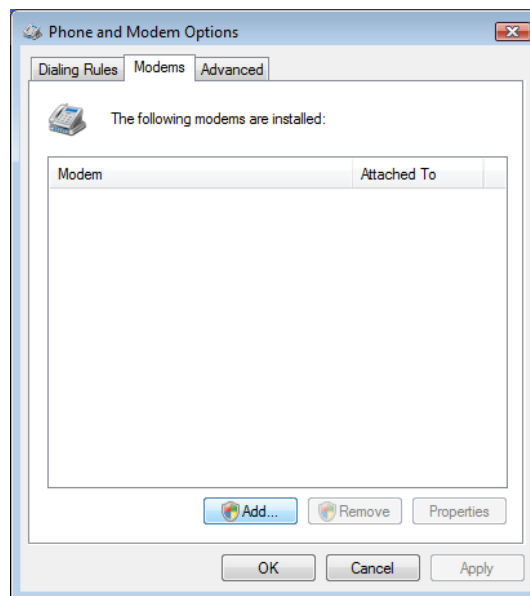
Click on **Add** to add a new modem.

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4. On the *Install New Modem* screen, click **Don't detect my modem, I will select it from a list**.
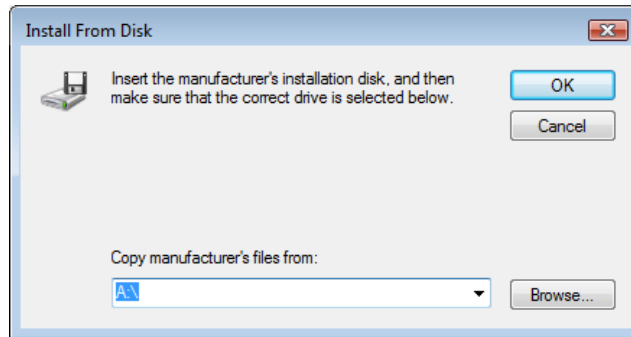
Then click **Next >**.

5. On the Install New Modem screen, click the **Have Disk** button to browse to the driver file on the MultiModem CD.
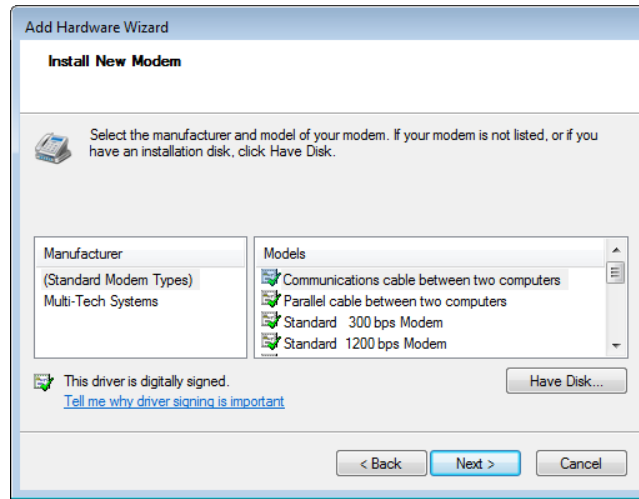
6. Make sure that the MultiModem CD is inserted into your CD-ROM.

7. Browse to your MultiModem CD and select **Drivers/Windows Drivers**.
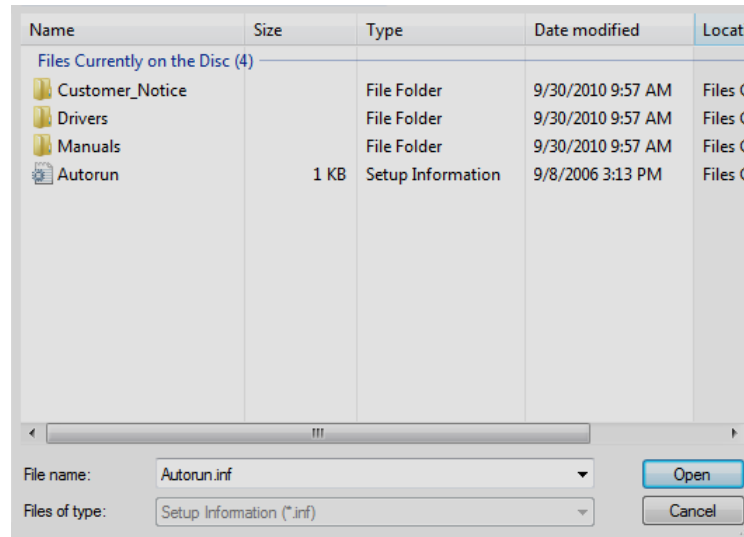
Then select **MTSWireless** file.

8. On Install New Modem screen, scroll down the list of modems and select MultiTech – CDMA Modem.

Once you have selected your model, click on **Next>**.

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9. Choose which com port to connect your MultiModem to.

If you know exactly which port your modem is on, click on that port; other wise, choose COM2 (most common). Click **Next >**.
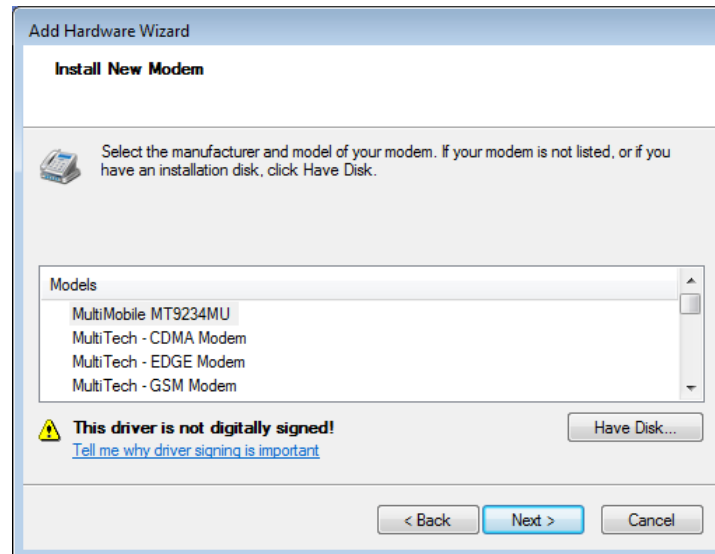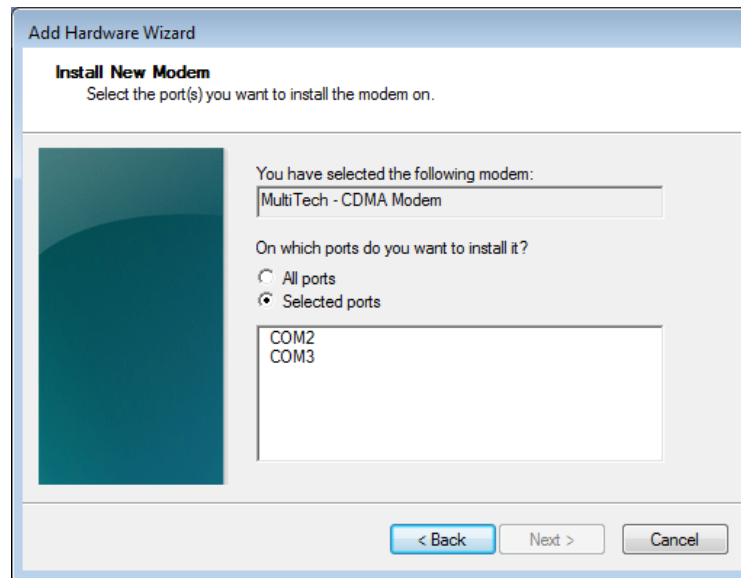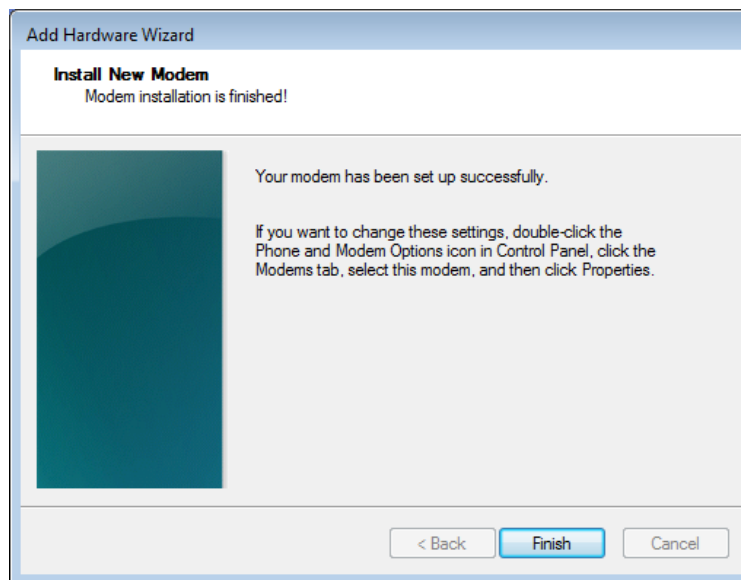
10. To finish the install, click on **Finish**.

You have now successfully installed the MultiModem.

Verifying That Your Modem Has Been Installed Successfully

1. After you have successfully installed the Multi-Tech modem driver as stated above, you should be brought back to the *Phone and Modems Options* screen. Make sure that the modem is now listed under the columns **Modem** and **Attached To** (the correct com port).

2. Highlight the modem and then click **Properties**.

3. A **Properties** screen will open for the Multi-Tech modem. Click on the tab labeled **Diagnostics**.

4. In the middle of the screen, click on the **Query Modem** button. Windows will now try to query the Multi-Tech modem. If this process passes, the second box on this screen will show the columns **Command** and **Response**.
Note: To make sure that the modem is correctly being queried, look at the LED lights of the modem after you click on *Query Modem*. The TR light should come on and the TD and RD lights should flicker.

5. If this process passes, then the modem should be properly installed and ready for use. Click **OK** to close the modem *Properties* window. Then click on **OK** to close the *Phone and Modem Options* window.

Chapter 3 – Using Your Cellular Modem

Account Activation for Wireless Devices

Please refer to Multi-Tech's Cellular Activation Web site at http://www.multitech.com/activation.go for information on activating your cellular modem.

Verify Signal Strength

Before you mount your modem to a permanent surface, ensure that you have a strong enough (average) signal.

1. Using Hyperterminal or an equivalent terminal program, type **AT+CSQ**. The modem responds with the receive signal strength (rssi).

Signal Strength Verification – RSSI	
AT+CSQ xx Values	**Signal Strength**
0 - 10	Weak or Insufficient
11 - 20	Average
21 – 31	Exceptional
99	No signal

2. Once you have a good signal for where you are going to permanently mount the modem, refer back to Optional Mounting in Chapter 2.

Connecting to the Internet

Internet access can be setup in Windows Dial-Up Networking (DUN) of the computer that the MultiModem is serving.

Connecting to a CDMA Network for Internet Access

Once you have activated your cellular account, you can establish your Internet connection through a Windows dial-up session.

Requirements

- One CDMA capable MultiModem modem
- The modem must be getting a proper signal and be showing a network registration through the cellular provider's network.
- A PC running Windows 7, Vista, or XP with the Multi-Tech drivers installed for your particular model.

The following instructions are for Windows7, Vista, or XP. Every PC may have slight differences which may cause the instructions to be different. Use these instructions as a guide to help you understand what is required to set up an Internet connection through your cellular service provider for all operating systems.

Create Your Dial-Up Connection in Windows Vista and XP

1. Click on **Start** and then click on **Control Panel**.
2. In the *Control Panel*, double-click on **Network Connections**.
3. On the *Network Connections* screen on the left-hand side under **Network Tasks**, click on **Create a new connection**.
4. The *New Connection Wizard* should appear. It will walk you through setting up your Internet connection. Click on **Next >** to begin.
5. On the *Network Connection Type* screen, select **Connect to the Internet**, and then click **Next >**.
6. On the *Getting Ready* screen, select **Set up my connection manually**, and then click **Next >**.
7. On the *Internet Connection* screen, select **Connect using a dial-up modem**, and then click **Next >**.
   Note: After clicking on Next, you may or may not be asked to select which modem to use. If you have more than one modem installed in your PC, you will be required to select the proper modem to use. If asked, please select the Multi-Tech cellular modem that has been installed.
8. On the *Connection Name* screen in the **ISP Name** box, type in a name for your new connection. You can give it any name that you would like. After you have typed in a name, click **Next >**.
9. On the *Phone Number to Dial* screen, type in the number that specifies to the modem to connect to your provider's Internet service.

   Type in the number **#777.**
   Then click **Next >**.

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10. On the *Connection Availability* screen, specify if this connection is for anyone's use or for your use only by checking the appropriate button. Choose your preference, and then click **Next>**.

11. On the *Internet Account Information* screen, type the user name and the password for your account. In many cases, a user name and a password are not required, but some cellular providers require it. Check with your provider to see if they are needed.

    Check the following two options if you would like them activated:
       Check the box if you want this account name and password to be used by everyone.
       Check the box if you want this as your default Internet connection. Then click **Next >**.

12. On the *Completing the New Connection Wizard* screen, your last task is to place a check in the box if you would like to add a shortcut to your desktop. Then click **Finish**.

13. A *Connection* screen displays on your desktop. Click the **Properties** button on the bottom of this screen.

14. The *Properties* window will open for you to make your connection.

    Important: Make sure that *Use dialing rules* is not selected, and then click **OK**.

15. Once back at your *Connection* screen, click the **Dial** button at the bottom of the screen to start the connection.

16. The connection will now tell the modem to connect to your provider's Internet service. Once connected, you should see the connection status icon in your system tray at the bottom right-hand corner of your screen.

    You should now be able to open Internet Explorer or any other browser of your preference to surf the Internet.

Disconnecting the Connection:

1. To disconnect the connection, right click on the connection icon in your system tray at the bottom right-hand corner of your screen.

2. Scroll up and click on **Disconnect**.
   You should now be disconnected from the Internet.

Appendix A – Regulatory Compliance

C€

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 2004/108/EC of 31 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 2006/95/EC of 12 December 2006 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.

FCC Part 15 Class B Statement

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 numérique de la classe B respecte toutes les exigences du Reglement Canadien sur le matériel brouilleur.