MULTITECH®

QuickCarrier™ USB-D

MTD-H5 User Guide

QuickCarrier USB-D MTD-H5 User Guide

Models: MTD-H5

Part Number: S000551, Version 2.0

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The Knowledge Base provides immediate access to support information and resolutions for all MultiTech products. Visit http://www.multitech.com/kb.go.

Support Portal

To create an account and submit a support case directly to our technical support team, visit: https://support.multitech.com.

Support

Business Hours: M-F, 8am to 5pm CT

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

To read the warranty statement for your product, visit www.multitech.com/warranty.go. For other warranty options, visit www.multitech.com/es.go.

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Chapter 1 – Product Overview

Overview

The QuickCarrier USB-D is a cellular dongle designed and built for M2M applications.

Documentation

The following documentation is available on the MultiTech website at
http://www.multitech.com/brands/quickcarrier-usb-d.

Document	Description
QuickCarrier USB-D MTD-H5 MTD-EV3 User Guide	This document. Provides an overview, specification, safety and regulatory information, and SIM cards and basic operations.
USB Driver Installation Guide for H5 and G3 DevicesEV3 and C2 Devices	Instructions for installing USB drivers on Linux and Windows Systems (Part number S000553)(Part number S000569)
HSPA+EV-DO and CDMA AT Commands Reference Guide	Configure your device with the HSPA+ EV-DO and CDMA AT Commands Reference Guide (Part number S000574)(Part number S000546)

MTD-H5 Specifications

Category	MTD-H5
General	
Frequency Band	Refer to the following Frequency Bands table for details.
Speed	
Data Speed	Up to 21.0 Mbps downlink/5.76 Mbps uplink
Interface, Antenna, SIM Holder	
USB Interface	USB 2.0 high speed compatible
Antenna	Internal
SIM Holder	Standard Mini SIM 1.8/3Volt
Environment	
Operating Temperature	-40° C to +50° C
Storage Temperature	-40° C to +85° C
Humidity	15%-93% RH, non-condensing
Power Requirements	
Operating Voltage	5 volts from USB port
Input Power	Via USB Bus
SMS	

Category	MTD-H5
SMS	Text mode and PDU mode per 3GPP TS27.005 set for SMS and CBS (cell broadcast)
	Mobile-Terminated SMS
	Mobile-Originated SMS
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN301 489-1
	EN301 489-52
Radio Compliance	FCC Part 22
	FCC Part 24
	FCC Part 27
	RSS 132
	RSS 133
	RSS 139
	CE RED Radio
Safety Compliance	UL 60950-1
	cUL 60950-1
	IEC 60950-1

Frequency Bands (H5)

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels	TX - RX offset
GSM850	824.2- 848.8	869.2 - 893.8	128 - 251	45 MHz
EGSM900	890.0 - 914.8	935.0 - 959.8	0 - 124	45 MHz
	880.2 - 889.8	925.2 - 934.8	975 - 1023	45 MHz
DCS1800	1710.2 - 1784.8	1805.2 - 1879.8	512 - 885	95MHz
PCS1900	1850.2 - 1909.8	1930.2 - 1989.8	512 - 810	80MHz
WCDMA850 (band V)	826.4 - 846.6	871.4 - 891.6	Tx: 4132 - 4233 Rx: 4357 - 4458	45MHz
WCDMA900 (band VIII)	882.4 - 912.6	927.4 - 957.6	Tx: 2712 - 2863 Rx: 2937 - 3088	45MHz
WCDMA1700 (band IV)	1710.4 - 1755.6	2112.4 - 2167.6	Tx: 1312 - 1513 Rx: 9662 - 9938	400MHz

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels	TX - RX offset
WCDMA1900 (band II)	1852.4 - 1907.6	1932.4 - 1987.6	Tx: 9262 - 9538 Rx: 9662 - 9938	80MHz
WCDMA2100 (band I)	1922.4 - 1977.6	2112.4 - 2167.6	Tx: 9612 - 9888 Rx: 10562 - 10838	190MHz

HE910 Telit Transmission Output Power

Band	Power Class
GSM 850/900 MHz	4 (2W)
DCS 1800, PCS 1900 MHz	1 (1W)
EDGE, 850/900 MHz	E2 (0.557W)
EDGE, 1800/1900 MHz	Class E2 (0.4W)
WCDMA 850/900, AWS 1700, 1900/2100 MHz	Class 3 (0.25W)

Dimensions

13.42 [340]

1.575 [40.01]

3.100 [78.73]

.740 [18.80]
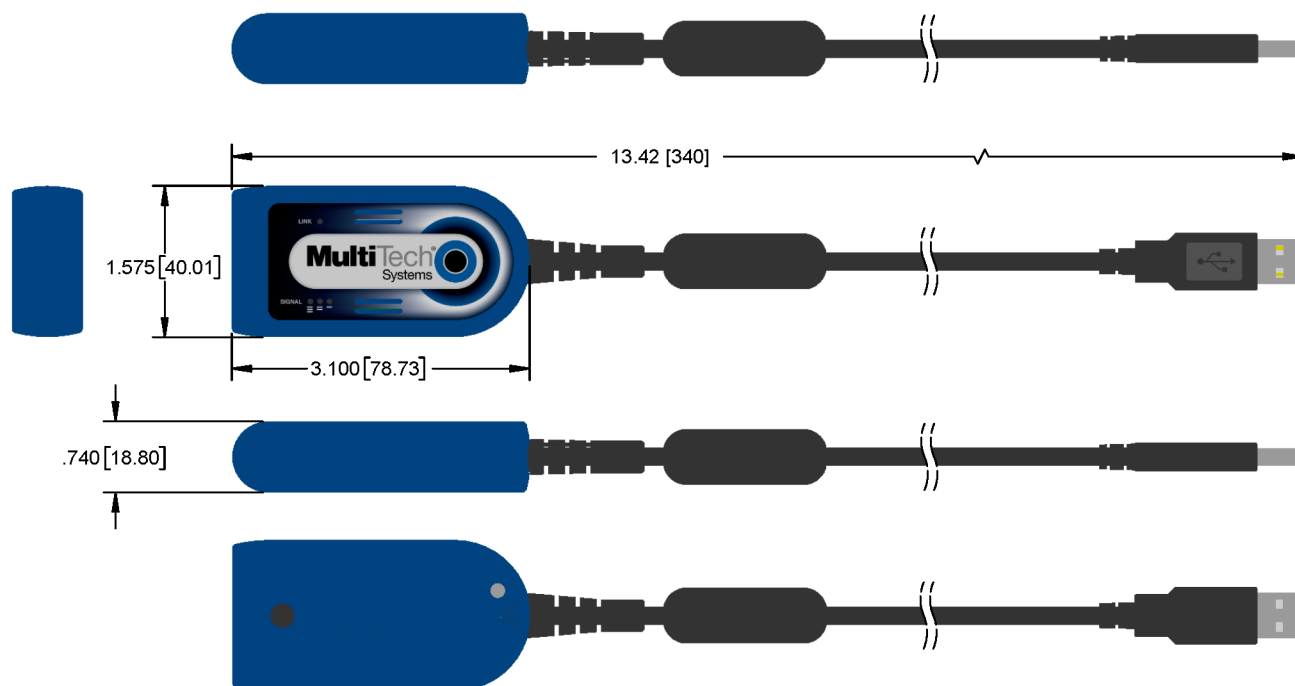
ALL DIMENSIONS IN In [mm]

MTD-H5

LEDs

The QuickCarrier USB-D HSPA+ includes four LEDs; the three signal status LEDs are programmable.

Link Status LED

Link Status	Description	
Off	No power to unit.	
On	Continuously lit	Powered on.
	Slow blink (-0.2Hz)	Registered on network.

Signal Strength LEDs

Signal Strength	Description
One bar	Weak signal
Two bars	Medium signal
Three bars	Strong signal

Note: If the signal strength LEDs are not working as expected and you recently installed or updated device drivers, disconnect the device from the USB port for a few seconds and reconnect to the same USB port.

Programming LEDs

Signal strength LEDs are pre-programmed. However, you can change the pre-programmed settings with the AT#GPIO command. For details, refer to the HSPA+ AT Command Reference Guide

Power Draw

Radio	Voltage		Expected Current Values			InRush Charge Current in Coulombs/charge time
		Registration Pulse	Steady State without Data (max)	Steady State with Data (max)	Peak Tx Pulse/Duration (max)	
GSM850	5	350ma/577usec	56ma	252ma	1.25A/577usec	670mC/600usec
HSPA	5	N/A	56ma	480ma	N/A	670mC/600usec

Note:

- **Registration Pulse:** Current pulse seen when modem registered to tower and current draw is different from the steady state current. (GSM850 only).
- Peak Tx pulse current is negligible for all but GSM850.
- **Steady State Maximums:** Radio is registered and is transmitting at the highest values allowed by the carrier. The continuous current with data being sent and without data being sent.
- **InRush Current:** The input current during power up or a device reset (capacitors are charging).

Chapter 2 – Safety Notices and Warnings

General Safety

The device is designed for and intended to be used in fixed and mobile applications. Fixed means the device is physically secured at one location and cannot be easily moved to another location. Mobile means the device is 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 device is not designed for or intended to be used in portable applications within 20 cm (8 inches) of the user's body.
Attention: Maintenir une distance d'au moins 20 cm (8 po) entre l'antenne du récepteur et le corps de l'utilisateur ou à proximité de personnes. Le modem n'est pas conçu pour, ou destinés à être utilisés dans les applications portables, moins de 20 cm du corps de l'utilisateur.

Power Supply Caution

CAUTION: Do not replace the power supply with one designed for another product; doing so can damage the modem and void your warranty. Adapter shall be installed near the equipment and shall be easily accessible.
CAUTION: Pour garantir une protection continue contre les risques d'incendie, remplacez les fusibles uniquement par des fusibles du même type et du même calibre. L'adaptateur doit être installé à proximité de l'appareil et doit être facilement accessible.

Radio Frequency (RF) Safety

Due to the possibility of radio frequency (RF) interference, it is important that you follow any special regulations regarding the use of radio equipment. Follow the safety advice given below.

- Operating your device close to other electronic equipment may cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.

- Different industries and businesses restrict the use of cellular devices. Respect restrictions on the use of radio equipment in fuel depots, chemical plants, or where blasting operations are in process. Follow restrictions for any environment where you operate the device.

- Do not place the antenna outdoors.

- Switch OFF your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and is illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.

- Switch OFF your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.

- Switch OFF your wireless device in hospitals and any other place where medical equipment may be in use.

Sécurité relative aux appareils à radiofréquence (RF)

À cause du risque d'interférences de radiofréquence (RF), il est important de respecter toutes les réglementations spéciales relatives aux équipements radio. Suivez les conseils de sécurité ci-dessous.

- Utiliser l'appareil à proximité d'autres équipements électroniques peut causer des interférences si les équipements ne sont pas bien protégés. Respectez tous les panneaux d'avertissement et les recommandations du fabricant.

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- Certains secteurs industriels et certaines entreprises limitent l'utilisation des appareils cellulaires. Respectez ces restrictions relatives aux équipements radio dans les dépôts de carburant, dans les usines de produits chimiques, ou dans les zones où des dynamitages sont en cours. Suivez les restrictions relatives à chaque type d'environnement où vous utiliserez l'appareil.
- Ne placez pas l'antenne en extérieur.
- Éteignez votre appareil sans fil dans les avions. L'utilisation d'appareils électroniques portables en avion est illégale: elle peut fortement perturber le fonctionnement de l'appareil et désactiver le réseau cellulaire. S'il ne respecte pas cette consigne, le responsable peut voir son accès aux services cellulaires suspendu ou interdit, peut être poursuivi en justice, ou les deux.
- Éteignez votre appareil sans fil à proximité des pompes à essence ou de diesel avant de remplir le réservoir de votre véhicule de carburant.
- Éteignez votre appareil sans fil dans les hôpitaux ou dans toutes les zones où des appareils médicaux sont susceptibles d'être utilisés.

Interference with Pacemakers and Other Medical Devices

Potential interference

Radio frequency energy (RF) from cellular devices can interact with some electronic devices. This is electromagnetic interference (EMI). The FDA helped develop a detailed test method to measure EMI of implanted cardiac pacemakers and defibrillators from cellular devices. This test method is part of the Association for the Advancement of Medical Instrumentation (AAMI) standard. This standard allows manufacturers to ensure that cardiac pacemakers and defibrillators are safe from cellular device EMI.

The FDA continues to monitor cellular devices for interactions with other medical devices. If harmful interference occurs, the FDA will assess the interference and work to resolve the problem.

Precautions for pacemaker wearers

If EMI occurs, it could affect a pacemaker in one of three ways:

- Stop the pacemaker from delivering the stimulating pulses that regulate the heart's rhythm.
- Cause the pacemaker to deliver the pulses irregularly.
- Cause the pacemaker to ignore the heart's own rhythm and deliver pulses at a fixed rate.

Based on current research, cellular devices do not pose a significant health problem for most pacemaker wearers. However, people with pacemakers may want to take simple precautions to be sure that their device doesn't cause a problem.

- Keep the device on the opposite side of the body from the pacemaker to add extra distance between the pacemaker and the device.
- Avoid placing a turned-on device next to the pacemaker (for example, don't carry the device in a shirt or jacket pocket directly over the pacemaker).

Device Maintenance

Do not attempt to disassemble the device. There are no user serviceable parts inside.

When maintaining your device:

- Do not misuse the device. Follow instructions on proper operation and only use as intended. Misuse could make the device inoperable, damage the device and/or other equipment, or harm users.

- Do not apply excessive pressure or place unnecessary weight on the device. This could result in damage to the device or harm to users.

- Do not use this device in explosive or hazardous environments unless the model is specifically approved for such use. The device may cause sparks. Sparks in explosive areas could cause explosion or fire and may result in property damage, severe injury, and/or death.

- Do not expose your device to any extreme environment where the temperature or humidity is high. Such exposure could result in damage to the device or fire. Refer to the device specifications regarding recommended operating temperature and humidity.

- Do not expose the device to water, rain, or spilled beverages. Unless the device is IP67 rated, it is not waterproof. Exposure to liquids could result in damage to the device.

- Do not place the device alongside computer discs, credit or travel cards, or other magnetic media. The information contained on discs or cards may be affected by the device.

- Using accessories, such as antennas, that MultiTech has not authorized or that are not compliant with MultiTech's accessory specifications may invalidate the warranty.

If the device is not working properly, contact MultiTech Technical Support.

User Responsibility

Respect all local regulations for operating your wireless device. Use the security features to block unauthorized use and theft.

Vehicle Safety

When using your device in a vehicle:

- Do not use this device while driving.

- Respect national regulations on the use of cellular devices in vehicles.

- If incorrectly installed in a vehicle, operating the wireless device could interfere with the vehicle's electronics. To avoid such problems, use qualified personnel to install the device. The installer should verify the vehicle electronics are protected from interference.

- Using an alert device to operate a vehicle's lights or horn is not permitted on public roads.

- UL evaluated this device for use in ordinary locations only. UL did NOT evaluate this device for installation in a vehicle or other outdoor locations. UL Certification does not apply or extend to use in vehicles or outdoor applications.

Chapter 3 – Getting Started

Getting Started Overview

To use the MTD, do the following:

1. Insert the SIM Card. Refer to *Installing a SIM Card*.
2. Power up the device. Refer to *Turning the Device On or Off.*
3. Install device drivers. Use the *Connection Manager* or follow instructions in the *USB Driver Installation Guide* for your model.
4. Activate the device on your carrier network. Use the *Connection Manager* or refer to *Account Activation for Cellular Devices*.
5. Make a data connection. Use the *Connection Manager* or refer to *Using Linux* and/or *Basic Operations*.

Installing a SIM Card

To install a SIM Card:

Warning: If the device is connected to a computer or power supply, disconnect it. Inserting or removing a SIM card with the device powered may harm the SIM card and the device.

1. Remove the SIM cover from the back of the device. If you have trouble sliding the SIM cover, use a flat-blade screwdriver in the slot on the SIM cover to slide it out.
2. Insert the SIM card into the card holder with the gold contact side facing down as shown.

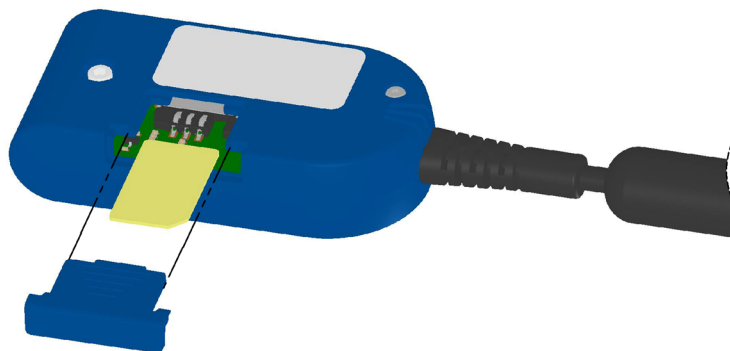3. Verify that the SIM card fits into the holder properly and replace the cover.
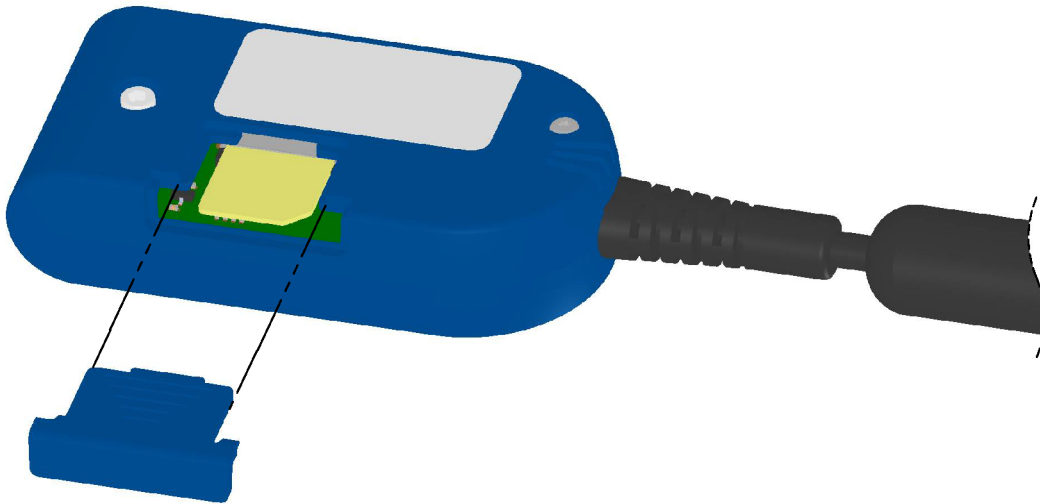
Removing a SIM Card

To remove a SIM card:

Warning: If the device is connected to a computer or power supply, disconnect it. Inserting or removing a SIM card with the device powered may harm the SIM card and the device.

1. Remove the SIM cover from the back of the device. If you have trouble sliding the SIM cover, use a flat-blade screwdriver in the slot on the SIM cover to slide it out.
2. Slide the SIM card out.
3. Replace the SIM cover.

Turning the Device On or Off

This USB-powered device does not have a power button. Connect the device to a computer's USB port to turn it on.

- After plugging in the device, allow 15 seconds to initialize before using.

Disconnecting it or shutting off the computer, turns it off. For best practices, follow the steps in *Powering Off or Rebooting a Device*.

Note: When reconnecting the device, use the same USB port that you used when installing drivers. Otherwise, you may need to re-install the driver.

Powering Off or Rebooting a Device

To power off your device:

1. Suspend dial-up network.
2. Suspend ModemQuery.
3. Wait for Steps 1-2 to complete.
4. Verify that the modem has disconnected.
5. Issue **AT#SHDN**.
6. Wait 30 seconds.
7. Power off or disconnect power.

Device Phone Number

Every device has a unique phone number. Your service provider supplies a phone number when you activate your account, or if your device has a SIM card, the phone number may be on it. Wireless service provider implementation may vary. Consult with your service provider to get the phone number for your device.

Installing Connection Manager

Connection Manager installs the appropriate drivers for USB devices along with the application. Serial devices do not require drivers.

> **Note:** Attempting to plug in the device before the appropriate drivers are installed can cause the connection to fail.

To install Connection Manager and the device drivers:

1. Go to https://www.multitech.com/support/connection-manager.
2. Click **Connection Manager**.
3. Open or unzip the **Connection Manager** file and run the installer (.msi file).
4. In the MultiTech Connection Manager Setup Wizard, read the end-user license agreement and check **I accept the terms in the License Agreement**.
5. Click **Next** to have the installer automatically disable the native WWAN AutoConfig service in Windows.

   The WWAN AutoConfig service manages mobile broadband connections. Connection Manager requires that this service be disabled.

   > **Note:** This page appears only on Windows 10.

6. If a MultiTech device is connected to the computer, disconnect it and click **Next**.
7. If you use a USB device, check **Install the modem driver**.

   CAUTION: Unless you are certain that the drivers for your USB device are already installed on the computer, make sure that you check **Install the modem driver**. Failure to do this will cause the application to incorrectly detect your device or not detect the device at all.

   > **Note:** Because serial devices do not require drivers, it does not matter if you check or uncheck **Install the modem driver** for a serial device.

8. To specify a folder for Connection Manager, use the default folder or click **Change** to browse to the folder you want to use.

9. Click **Install**.

A separate wizard opens for installing Telit drivers. Some MultiTech devices use embedded modules from Telit Wireless Solutions to provide cellular connectivity; these devices require Telit drivers.

10. Select **Complete** setup type.
11. When the drivers are installed, click **Finish**.
12. In the Setup Wizard, click **Finish**.

> **Note:**
> - To open Connection Manager after installation, check **Start the MultiTech Connection Manager when the installation is finished**.
> - After the drivers are installed, you need to restart your computer if prompted by Windows.

If using a USB device, you can connect the device to the carrier's network with Connection Manager. Refer to Connecting a Device.

If using a serial device, you need to set up the device in Windows Device Manager before connecting the device. Refer to Setting Up a Serial Device in Windows Device Manager.

Troubleshooting

Serial COM port is not available in the Serial Modem Settings

Close Connection Manager and reopen it.

Device is not detected ("No Device")

After following the steps to activate your device, the **Main** tab still indicates "No Device."

Try the following steps:

1. Click the **Settings** tab and make sure that the appropriate modem type is selected: USB or Serial.
2. If you are connecting a serial device, make sure that all serial modem settings correspond to the serial modem and serial port configuration.
3. Restart Connection Manager.
4. Disconnect and reconnect the device.

MultiConnect Cell USB Modem is not detected

1. Check the Power and LS LEDs on the device. If they are not continuously lit, then the problem is with the power supply. Check the cable and connections.
2. USB device: Make sure that the device is connected to the PC and that the correct USB cable is in use.

Connection Manager is not working, and a device connected to the computer is not detected

Connection Manager cannot detect a connected device because the required drivers are not installed. The most likely cause is that **Install the modem drivers** was not checked during the installation.

Uninstall and re-install Connection Manager. During the installation, make sure that you check **Install the modem driver**. Refer to Uninstalling Connection Manager and Installing Connection Manager.

Connection Manager displays "Device Error" status for a serial device

This error has the following causes and solutions.

Cause	Solution
Connection Manager cannot open the COM port that the device was installed on because the port is being used by another program.	If possible, free up the COM port for the device.
The wrong COM port is specified for the device on the **Settings** tab.	On the **Settings** tab, select the COM port that matches the port that the device is installed on and click **Apply**. You can look up the port in Device Manager in Windows. In Device Manager, expand **Modems**, right-click the name of your device, and select **Properties**. Note the port on the **Modem** tab.

Account Activation for Cellular Devices

Some MultiTech devices are pre-configured to operate on a specific cellular network. To use the device, you must set up a cellular data account with your service provider. Each service provider has its own process for adding devices to their network.

Chapter 4 – Using Linux

Shell Commands

Testing Serial Ports

To test the serial ports created by the driver, type in a shell:

```
# cat /dev/ttyACM0 &
# echo -en "ATE0\r" > /dev/ttyACM03
# echo -en "AT\r" > /dev/ttyACM0

cat /dev/ttyUSBx &
# echo -en "ATE0\r" > /dev/ttyUSBx
# echo -en "AT\r" > /dev/ttyUSBx
```

> **Note:** Sending ATE0 is required, to avoid issues in the terminal output. It prevents the sending/receiving spurious characters to/from the modem when used with the Linux commands "echo" and "cat"

You can perform the same test using the other interface (ttyACM1 ttyACM3).

Create a PPP Connection

Most recent Linux distributions have GUI tools for creating PPP connections; the following instructions are for creating a PPP connection through command line interface.

PPP support must be compiled into the kernel; pppd and chat programs are also required.

H5 Example

Step 1. Use a text editor to create a peer file containing the lines in the example below. (/dev/ttyACM0 may need to be something like /dev/ttyS0 for a serial build). Save the file as /etc/ppp/peers/H5-peer.

Example peer file:

```
/dev/ttyACM0
connect "/usr/sbin/chat -v -f /etc/chatscripts/H5-chat"
noipdefault
usepeerdns
defaultroute
noauth
```

Step 2. Use a text editor to create a chat script containing the lines in the example below. In this example [APN] should be replaced with the APN assigned by your cellular provider. Save the file as /etc/chatscripts/H5-chat.

Example chat script:

```
ABORT "ERROR"
ABORT "NO CARRIER"
ABORT "BUSY"
"" at+cgdcont=1,"IP","[APN]"
OK atd*99***1#
CONNECT ""
```

Step 3. Use the following command line to start pppd:

```
pppd debug call H5-peer
```

This command line enables logging of debug information and tells pppd to use the peer file referenced by the call option. After 20-30 seconds, type ifconfig and check whether a ppp interface is listed. If it is not, then check syslog for pppd and chat events. Normally pppd/chat logging is written to /var/log/syslog (could vary depending on syslog configuration).

EV3 Example

Step 1. Use a text editor to create a peer file containing the lines in the example below. (/dev/ttyUSB2 may need to be something like /dev/ttyS0 for a serial build). Save the file as /etc/ppp/peers/EV3-peer.

Example peer file:

```
/dev/ttyUSB2
connect "/usr/sbin/chat -v -f /etc/chatscripts/EV3-chat"
noipdefault
usepeerdns
defaultroute
noauth
```

Step 2. Use a text editor to create a chat script containing the lines in the example below. In this example [APN] should be replaced with the APN assigned by your cellular provider. Save the file as /etc/chatscripts/EV3-chat.

Example chat script:

```
ABORT "ERROR"
ABORT "NO CARRIER"
ABORT "BUSY"
"" at
OK atd#777
CONNECT ""
```

Step 3. Use the following command line to start pppd:

```
pppd debug call EV3-peer
```

This command line enables logging of debug information and tells pppd to use the peer file referenced by the call option.

After 20-30 seconds, type ifconfig and check whether a ppp interface is listed. If it is not, then check syslog for pppd and chat events. Normally pppd/chat logging is written to /var/log/syslog (could vary depending on syslog configuration).

MNA1 Example

Step 1. Use a text editor to create a peer file containing the lines in the example below. (/dev/ttyUSB0 may need to be something like /dev/ttyS0 for a serial build.) Save the file as /etc/ppp/peers/MNA1-peer.

Example peer file:

```
/dev/ttyUSB0
connect "/usr/sbin/chat -v -f /etc/chatscripts/MNA1-chat"
noipdefault
```

```
usepeerdns
defaultroute
noauth
```

Step 2. Use a text editor to create a chat script containing the lines in the example below. In this example [APN] should be replaced with the APN assigned by your cellular provider. Save the file as /etc/chatscripts/MNA1-chat.

Example chat script:

```
ABORT "ERROR"
ABORT "NO CARRIER"
ABORT "BUSY"
"" at+cgdcont=1,"IP","[APN]"
OK atd*99***1#
CONNECT ""
```

Step 3. Use the following command line to start pppd:

```
pppd debug call MNA1-peer
```

This command line enables logging of debug information and tells pppd to use the peer file referenced by the call option. After 20-30 seconds, type ifconfig and check whether a ppp interface is listed. If it is not, then check syslog for pppd and chat events. Normally pppd/chat logging is written to /var/log/syslog (could vary depending on syslog configuration).

Chapter 5 – Using Connection Manager

Use Connection Manager to:

- Install the latest device drivers.
- Activate and connect your device to your carrier's network.

   Note:
   - Connection Manager can install drivers and connect your device regardless of your cellular network; however, activation is only supported with Verizon, Aeris, Sprint, and some regional carriers. If you cannot activate your device with Connection Manager, refer to *Account Activation for Cellular Devices.*
      - MTD-H5 models use SIM-based activation. If you do not have a SIM card, contact your carrier.
- Switch the firmware in your device to a different carrier (if supported by your device).
- Manage cellular connection and automatically reconnect with the keep-alive feature.
- View device details.
- View line charts of signal level and data rates.
- Use a terminal window for communicating with and troubleshooting the device.

Installing Connection Manager

Connection Manager installs the appropriate drivers for USB devices along with the application. Serial devices do not require drivers.

   Note: Attempting to plug in the device before the appropriate drivers are installed can cause the connection to fail.

To install Connection Manager and the device drivers:

1. Go to https://www.multitech.com/support/connection-manager.
2. Click **Connection Manager**.
3. Open or unzip the **Connection Manager** file and run the installer (.msi file).
4. In the MultiTech Connection Manager Setup Wizard, read the end-user license agreement and check **I accept the terms in the License Agreement**.
5. Click **Next** to have the installer automatically disable the native WWAN AutoConfig service in Windows.

   The WWAN AutoConfig service manages mobile broadband connections. Connection Manager requires that this service be disabled.

   Note: This page appears only on Windows 10.

6. If a MultiTech device is connected to the computer, disconnect it and click **Next**.
7. If you use a USB device, check **Install the modem driver**.

   CAUTION: Unless you are certain that the drivers for your USB device are already installed on the computer, make sure that you check **Install the modem driver**. Failure to do this will cause the application to incorrectly detect your device or not detect the device at all.

   Note: Because serial devices do not require drivers, it does not matter if you check or uncheck **Install the modem driver** for a serial device.

8. To specify a folder for Connection Manager, use the default folder or click **Change** to browse to the folder you want to use.

9. Click **Install**.

   A separate wizard opens for installing Telit drivers. Some MultiTech devices use embedded modules from Telit Wireless Solutions to provide cellular connectivity; these devices require Telit drivers.

10. Select **Complete** setup type.

11. When the drivers are installed, click **Finish**.

12. In the Setup Wizard, click **Finish**.

    Note:
    - To open Connection Manager after installation, check **Start the MultiTech Connection Manager when the installation is finished**.
    - After the drivers are installed, you need to restart your computer if prompted by Windows.

If using a USB device, you can connect the device to the carrier's network with Connection Manager. Refer to Connecting a Device.

If using a serial device, you need to set up the device in Windows Device Manager before connecting the device. Refer to Setting Up a Serial Device in Windows Device Manager.

Setting Up a Serial Device in Windows Device Manager

To set up the device in Windows Device Manager:

1. Make sure that your desired COM port for the serial device is available.

2. Connect the serial device to the PC.

3. Go to **Control Panel** > **Device Manager**. Make a note of the COM port number for the connected device (in **COM Ports**).

   Example: The COM port is **COM31**.

4. Go to **Action** > **Add legacy hardware**.
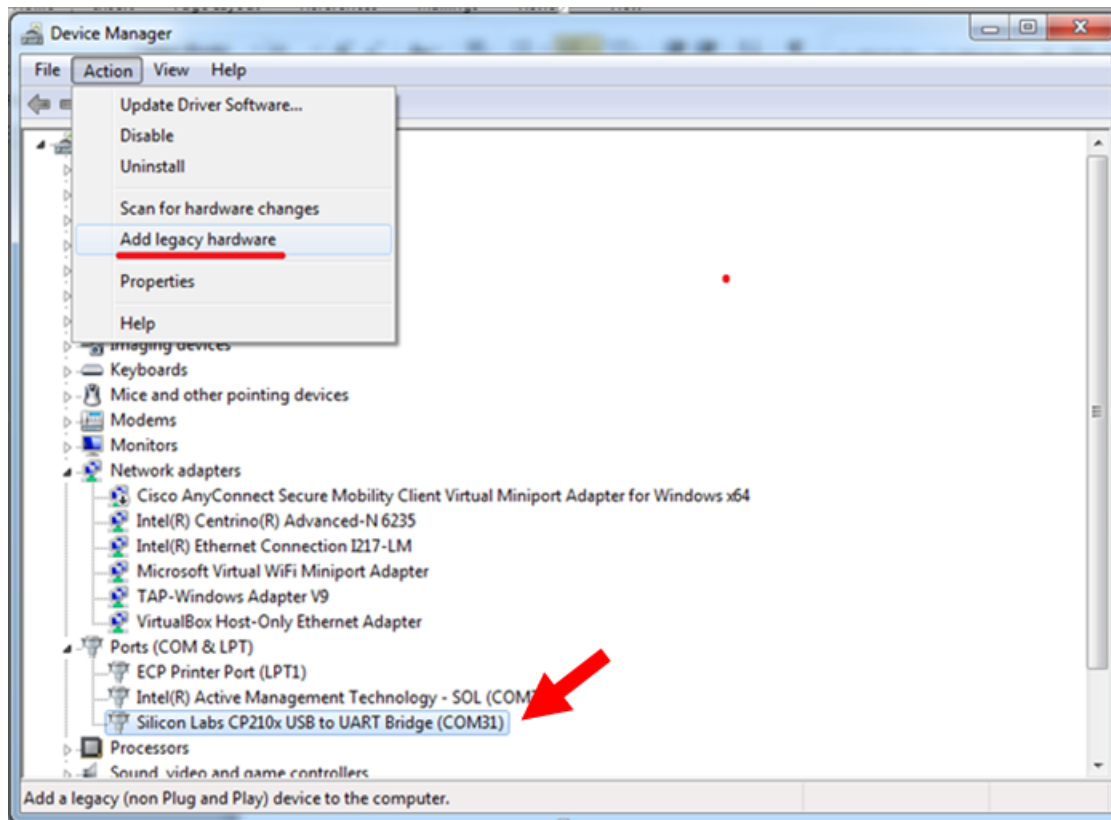
5. In the **Add Hardware Wizard**:

    a. Click **Next**.

    b. Select **Install the hardware that I manually select from a list**, then click **Next**.

    c. Select **Modems**, then click **Next**.

    d. Check **Don't detect my modem; I will select it from a list**, then click **Next**.

    e. Select **Standard Modem Types**, then select **Standard 33600 bps Modem** on the right.

        Important: Make sure that you select *only* **Standard 33600 bps Modem**. Selecting another model may cause your device to work incorrectly or fail.

    f. Select your COM port, then click **Next**.

    g. Click **Finish**.

    h. Go to **Device Manager** > **Modems** and confirm that the device is added.

6. To verify that the device is set up correctly, query the device:

    a. Go to **Device Manager** > **Modems**, right-click **Standard 33600 bps Modem**, and select **Properties**.

    b. On the **Diagnostics** tab, click **Query Modem**.

        Note: The device cannot be queried if the Connection Manager is running and using the device's port.

If the device is ready, diagnostic information from the device appears in the box above.

To connect the device to your carrier's network, refer to Connecting a Device.

Connecting a Device

Before You Begin

- Make sure that your device is connected to the computer where Connection Manager is installed.
- Set up the device in Device Manager. Refer to Setting Up a Serial Device in Windows Device Manager.

To connect your device to the carrier's network:

1. Open Connection Manager.

   Connection Manager automatically detects the connected device, and the **Detect** button on the **Main** tab changes to **Connect**. If the application cannot detect the device automatically, click **Detect** to initiate device detection manually.

2. If you are connecting the device to this computer for the first time, on the **Connection** dialog box, provide values for the connection settings, such as the dial number and access point name (APN).

   You may need to ask the carrier for these settings.

   a. To monitor Internet connectivity, have Connection Monitor send periodic pings to a host, check **Enable keep-alive** and enter the IP address or host name to ping in the **Host to ping** box. For example, you can enter the host name google.com or IP address **8.8.8.8**.

   If the keep-alive check fails, Connection Manager automatically reconnects. When the keep-alive feature is enabled, the Connection Manager's **Main** tab displays the keep-alive check status and when the last ping response was received.

   b. If your device supports dual carriers, switch the firmware to the desired carrier by selecting the carrier in the **MNO Firmware** list. For example, if your device can switch the firmware between AT&T and Verizon, select **Verizon** in the list.

      Note:
      - The **MNO Firmware** list doesn't appear if your device doesn't support carrier firmware switching.
      - When you change the carrier firmware, the modem automatically restarts to apply the selected firmware.

   c. To save the settings, click **Apply**.

      You can change the connection settings on the **Connection** tab. The **Dial number**, **APN**, **User name**, and **Password** cannot be changed after the device is connected.

3. On the **Settings** tab, select **USB Modem** or **Serial Modem** depending on whether you are connecting a USB or serial device.

4. If you are connecting a serial device, provide the serial settings on the **Settings** tab:

   a. In the **Modem type** list, select the appropriate modem type.

   b. For the other settings, provide the values that match the serial-port settings for the device in Device Manager.

      For **Port**, expand **Ports** and notice the COM port number next to the device name. Right-click the device name, select **Properties**, and find the values for the other settings on the **Port Settings** tab.

   c. To save the settings, click **Apply**.

   Note:

- Settings displayed for a USB device on the **Settings** tab are determined automatically and cannot be changed.
- To set the application to run during Windows startup, check **Run application at Windows startup**.
- To automatically connect to the Internet, check **Connect to the Internet automatically**.

Selecting **Run application at Windows startup** and **Connect to the Internet automatically** is useful in scenarios where Connection Manager is running on a remote computer. If a power failure occurs on the computer, these settings ensure the application will restart and reconnect to the Internet when power is restored.

5. On the **Main** tab, click **Connect**.

When a connection is established, the **Main** tab displays the download and upload speeds, the amount of traffic sent and received, **Connected** status, and the signal strength percentage and bars. The statistics on connection speeds and traffic are available only during a current connection session.

Note:

- For serial modems, the signal strength is available only when the device is *not* connected to the carrier's network. When connection to the network is established, the last signal strength value is displayed.
- View the details for the current connection on the **Details** tab.

6. To disconnect the device from the carrier's network, click **Disconnect**.

Uninstalling Connection Manager

Along with uninstalling Connection Manager, the installed device drivers are also removed.

Before You Begin

Make sure that Connection Manager is not running.

To uninstall Connection Manager:

1. In Windows, go to **Control Panel > Programs > Programs and Features**.
2. Right-click **MultiTech Connection Manager** and select **Uninstall**.
3. Click **Yes** to confirm that you want to uninstall Connection Manager.

   The native Windows WWAN AutoConfig service is automatically enabled.

4. When the message "Are you sure you want to uninstall this product?" appears, click **Yes**.

Connection Manager and the installed drivers are removed from the computer.

Note: The steps above describe how to uninstall Connection Manager using Control Panel. You can also uninstall the application by using the installer file (.msi). Double-click the file, in the MultiTech Connection Manager Setup Wizard, click **Next**, and then select **Remove** on the next two pages.

Connection Manager User Interface

Connection Manager consists of the following tabs:

- Main
- Settings

- Connection
- Details
- Terminal
- Charts
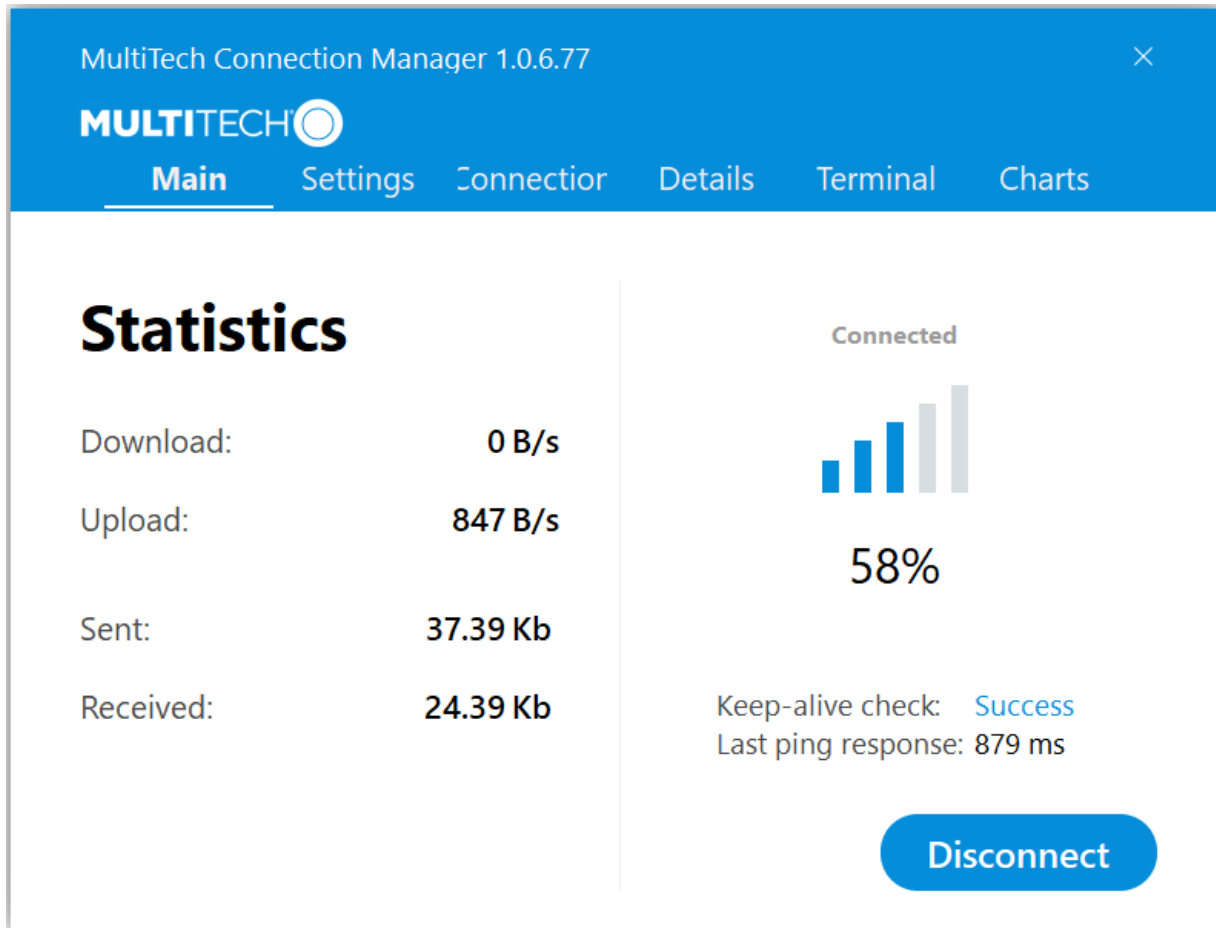
Main tab

The **Main** tab displays the following:

- Status of device connection: Searching, Connecting, Connected, Disconnecting, or Disconnected
- The action button, which changes according to the current device connection status: **Detect**, **Connect**, or **Disconnect**
- Signal strength bars and percentage indicator (only when connection to the carrier's network is established)

  Note: The signal strength is displayed for a serial device only when the device is not connected to the carrier's network.

- Connection statistics: download and upload speeds, amount of traffic sent and received (only when connection to the carrier's network is established)
- The keep-alive check status and when the last ping response was received if **Enable keep-alive check** is checked on the **Connection** tab.

Settings tab

Use the **Settings** tab to specify the type of device: **USB Modem** or **Serial Modem**.

- If **USB Modem** is selected, the tab displays USB settings. These settings cannot be edited.
- If **Serial Modem** is selected, the tab displays the serial settings that match the serial-port settings for the device. You can edit these settings.

The **Settings** tab also contains the **Run application at Windows startup** and **Connect to the Internet automatically** options.

- Check **Run application at Windows startup** to open Connection Manager when Windows starts.
- Check **Connect to the Internet automatically** to set Connection Manager to connect to the carrier's network automatically each time the application opens.

Connection tab

The **Connection** tab displays the following:

- The carrier-provided connection settings.
- The **Enable keep-alive check** box. Check this box to monitor connectivity to the Internet. Check **Enable keep-alive check** and enter the IP address or host name to ping in the **Host to ping** box. Connection Monitor will send periodic pings to the host. If the keep-alive feature fails, Connection Manager will automatically reconnect.
- The **MNO firmware** list. If your device supports dual carriers, you can switch the firmware to the other carrier by selecting the carrier in this list.

    Note: The **Connection** tab isn't available if Connection Manager doesn't detect a device.

Details tab

The **Details** tab displays the modem details when a device is detected and the connection details when a connection is established.

Terminal tab

The **Terminal** tab contains a terminal window to communicate with the connected device by entering AT commands. For details, refer to the AT Commands reference guide for your device.

    Note: When a serial device is connected to the carrier's network, the terminal window isn't available.

Charts tab

The **Charts** tab contains line charts that graphically represent signal strength and download and upload speeds for the 2-hour interval.

Troubleshooting

Serial COM port is not available in the Serial Modem Settings

Close Connection Manager and reopen it.

Device is not detected ("No Device")

After following the steps to activate your device, the **Main** tab still indicates "No Device."

Try the following steps:

1. Click the **Settings** tab and make sure that the appropriate modem type is selected: USB or Serial.
2. If you are connecting a serial device, make sure that all serial modem settings correspond to the serial modem and serial port configuration.
3. Restart Connection Manager.
4. Disconnect and reconnect the device.

MultiConnect Cell USB Modem is not detected

1. Check the Power and LS LEDs on the device. If they are not continuously lit, then the problem is with the power supply. Check the cable and connections.
2. USB device: Make sure that the device is connected to the PC and that the correct USB cable is in use.

Connection Manager is not working, and a device connected to the computer is not detected

Connection Manager cannot detect a connected device because the required drivers are not installed. The most likely cause is that **Install the modem drivers** was not checked during the installation.

Uninstall and re-install Connection Manager. During the installation, make sure that you check **Install the modem driver**. Refer to Uninstalling Connection Manager and Installing Connection Manager.

Connection Manager displays "Device Error" status for a serial device

This error has the following causes and solutions.

Cause	Solution
Connection Manager cannot open the COM port that the device was installed on because the port is being used by another program.	If possible, free up the COM port for the device.
The wrong COM port is specified for the device on the **Settings** tab.	On the **Settings** tab, select the COM port that matches the port that the device is installed on and click **Apply**. You can look up the port in Device Manager in Windows. In Device Manager, expand **Modems**, right-click the name of your device, and select **Properties**. Note the port on the **Modem** tab.

Chapter 6 – Basic Operations

Interacting with Your Device Overview

This section describes how to use AT commands to interact with your device. Using terminal software such as Kermit, you can issue AT commands to communicate with and configure your modem. The AT commands let you establish, read and modify device parameters and help you control how the device operates. This section documents basic interactions with your device, such as verifying signal strength and network registrations, sending and reading SMS text messages, and sending and receiving data.

Generally, USB modems are used as unintelligent bit pipes. In Windows, this means you create a dial-up network connection that uses the Windows IP stack to use the modem to create a PPP connection to the cellular network. The modem is assigned an IP address from the cellular carrier. This connection provides Internet access and is the basis for TCP/IP communication for sending and receiving email, creating TCP/UDP Sockets, or putting and getting files from an FTP server.

In Linux, PPPD is used to dial the modem and create the connection to the cellular TCP/IP network. This provides Internet access for sending and receiving email, creating TCP/UDP Sockets, or putting and getting files from an FTP server.

Related Documentation

Related documentation for using HSPA+ H5 devices:

- HSPA-H5 AT Commands Reference Guide (S000528) provides for additional information on AT commands available for your device. The Introduction chapter describes command formatting, syntax, and other basic information.
- Configuring Devices: Using AT RUN, Setting up Digital Voice Interface, and Configuring Ports Reference Guide (S000552).

Related documentation for using EV-DO EV3 devices:

- EV-DO EV3 AT Commands Reference Guide (S000546) provides for additional information on AT commands available for your device. The Introduction chapter describes command formatting, syntax, and other basic information.

Before Using the Device

Before using the device:

- Install any drivers. Refer to the separate driver installation guide for your device.
- Power up your device and ensure it is connected to your computer that issues AT commands.

  Note: Wait 10 seconds after power-up before issuing any AT commands.

- Install terminal software that can communicate with the device, such as HyperTerminal, Tera Term, Kermit, or Putty.

For additional information, refer to the AT command guide and any related documentation for your device. The AT command guide describes command formatting, syntax, and other basic information.

Preparing the Modem for a Data Connection

Set the APN by issuing the following command where <APN Name> is the APN assigned by the carrier.

- **AT+CGDCONT=1,"IPV4V6","<APN Name>**

Check for registration by issuing **AT+CREG?<cr>** and wait for the response. If the second value of the response (for example, +CREG:x,y) is 1, then the modem is registered on the home network. If y=5, then the modem is registered but roaming. See the AT Command reference guide for other possible responses. If the second value is not 1 or 5, then do not attempt to dial. Wait ~5 seconds for the modem to finish registration and check +CREG again.

Using the Radio IP Stack to Make a Data Connection

Connect by issuing the command: **AT#SGACT=1,1** (using PDP context #1).

Using the Host System IP Stack to Make a Data Connection

This device only supports packet data connections, such as dial-up networking. To make a data connection, you must use a PPP dialer. If your carrier requires a username and password for the Internet connection, be sure to enter that information into the PPP dialer. Dial up using **ATD*99***1#** (using PDP context #1).

Disconnecting a Data Connection Using an Internal IP Stack

Issue the following command to disconnect: **AT#SGACT=1,0**

Disconnecting a Data Connection Using Host IP Stack

Issue the following command to disconnect: **AT#SGACT-1,0**.

Using Command Mode and Online Data Mode

Modems have two operation modes, command and online data. After power up, the modem is in command mode and ready to accept AT commands.

Use AT commands to communicate with and configure your modem. These commands establish, read, and modify device parameters and control how the modem works. The device also generates responses to AT commands that help determine the modem's current state.

If the modem is in online data mode, it only accepts the Escape command (+++).

To send the modem AT Commands from terminal emulation software, set the software to match the modem's default data format, which is:

- Speed: 115,200 bps
- Data bits: 8
- Parity: none
- Stop bit: 1
- Flow control: hardware

To confirm communication with the device:

- Type **AT** and press **Enter**.

If the device responds with OK, it is properly communicating.

Verifying Signal Strength

To verify the device signal strength, enter:

`AT+CSQ`

The command indicates signal quality, in the form:

`+CSQ: <rssi>,<ber>`

Where:

<rssi>		Received signal strength indication.
	0	(-113) dBm or less
	1	(-111) dBm
	2-30	(-109) dBm - (-53) dBm / 2 dBm per step
	31	(-51) dBm or greater
	99	Not known or not detectable
<ber>		Bit error rate, in percent
	0	Less than 0.2%
	1	0.2% to 0.4%
	2	0.4% to 0.8%
	3	0.8% to 1.6%
	4	1.6% to 3.2%
	5	3.2% to 6.4%
	6	6.4% to 12.8%
	7	More than 12.8%
	99	Not known or not detectable

Note: Signal strength of 10 or higher is needed for successful packet data sessions.

Example

A example response to AT+CSQ:

`+CSQ: 15,1`

Checking Network Registration

Before establishing a packet data connection, verify the is device registered on the network. To do this enter the network registration report read command:

```
AT+CREG?
```

If the device returns:

```
+CREG: 0,1
```

or

```
+CREG: 0,5
```

The device is registered.

If the device returns:

```
+CREG: 0,2
```

The device is in a network searching state.

Verify that Device Detects a Valid SIM Card

If your device uses a SIM card, use the query SIM status command to verify if the device detects the SIM card. To do this, enter:

```
AT#QSS?
```

If the device detects that SIM card, it responds with one of the following:

Response	Description
#QSS: 2, 1	SIM inserted
#QSS: 2, 2	SIM inserted and PIN unlocked.
#QSS: 2, 3	SIM inserted and ready.

If your device does not reply with one of those responses, verify that the SIM card is properly inserted.

When your device fails to connect

Work through the steps below until your device connects.

1. Wait 30 seconds and try again.
2. Wait 1 minute and try again.
3. Wait 2 minutes and try again.
4. Wait 8 minutes and try again.
5. Make one attempt every 15 minutes for an hour.
6. Make one attempt every 90 minutes.

When a call drops

If a connected call drops for any reason:

- Wait 30 seconds and restart the sequence again.

Reading, Writing, and Deleting Messages

Reading Text Messages

To read a text message in text mode:

1. **Put the device in text mode.**

   Enter:

   ```
   AT+CMGF=1
   ```

2. **Read message.**

   Enter:

   ```
   AT+CMGR=1
   ```

Example response:

```
+CMGR: "REC UNREAD","+10001112222z`z","","13/09/05,13:39:40-20"
How are you?
OK
```

Where 0001112222 is the phone number.

Writing Text Messages

To send a text message in text mode:

1. **Put the device in text mode.**

   Enter:

   ```
   AT+CMGF=1
   ```

   The device responds.

   ```
   OK
   ```

2. **Enter the recipient's number and your message.**

   Enter:

   ```
   AT+CMGS="##########"
    >Your message here
   ```

   where ########## is the recipient's number.

3. **Send the message.**

   Enter CTRL+Z.

   The device responds:

   ```
   +CMGS: #
   OK
   ```

   where # is the reference number of the sent message.

For example:

```
AT+CMGF=1
OK
AT+CMGS="0001112222"
> How are you?  <CTRL+Z to send>
+CMGS: 255
OK
```

Where 0001112222 is the phone number.

Deleting Messages

To delete one text message, enter:

AT+CMGD=I,#

where I is the index in the select storage and # is the delflag option. Enter:

0	Deletes message in the specified index.
1	Deletes all read messages. Leaves unread messages and stored device-originated messages.
2	Deletes all read and sent device-originated messages. Leaves unread messages and unsent device-originated messages.
3	Deletes all read messages and sent and unsent device-orginated messages. Leaves unread messages.
4	Deletes all messages.

For example:

```
AT+CMGD=1 (delete message at index 1)
AT+CMGD=2 (delete message at index 2 )
AT+CMGD=1,0
AT+CMGD=1,1
AT+CMGD=1,2
AT+CMGD=1,3
AT+CMGD=1,4
```

Chapter 7 – Regulatory Statements

47 CFR Part 15 Regulation Class B Devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits 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.
- Connect 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.

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 Class B Notice

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.

This device complies with Industry Canada license-exempt RSS standard(s). The operation is permitted for the following two conditions:

1. the device may not cause interference, and
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

EMC, Safety, and Radio Equipment Directive (RED) Compliance

$C\!\in$

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

Council Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment;
and

Council Directive 2014/53/EU on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

MultiTech declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be requested at https://support.multitech.com.

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 regulatory 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.

Other Countries

The above country-specific information does not cover all countries with specific regulations; they are included to show you how each country may differ. If you have trouble determining your own country's requirements, check with MultiTech's Technical Support for assistance.

Chapter 8 – Environmental Notices

Waste Electrical and Electronic Equipment Statement

Note: This statement may be used in documentation for your final product applications.

WEEE Directive

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 MultiTech 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 where you purchased the product.

July, 2005

Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc.

Certificate of Compliance

2015/863

Multi-Tech Systems, Inc. confirms that its embedded products comply with the chemical concentration limitations set forth in the directive 2015/863 of the European Parliament (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment - RoHS).

These MultiTech products do not contain the following banned chemicals[1]:

- Lead, [Pb] < 1000 PPM
- Mercury, [Hg] < 100 PPM
- Cadmium, [Cd] < 100 PPM
- Hexavalent Chromium, [Cr+6] < 1000 PPM
- Polybrominated Biphenyl, [PBB] < 1000 PPM

- Polybrominated Diphenyl Ethers, [PBDE] < 1000 PPM
- Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm
- Benzyl butyl phthalate (BBP): < 1000 ppm
- Dibutyl phthalate (DBP): < 1000 ppm
- Diisobutyl phthalate (DIBP): < 1000 ppm

Environmental considerations:

- Moisture Sensitivity Level (MSL) =1
- Maximum Soldering temperature = 260C (in SMT reflow oven)

[1]Lead usage in some components is exempted by the following RoHS annex, therefore higher lead concentration would be found in some modules (>1000 PPM);

- Resistors containing lead in a glass or ceramic matrix compound.

REACH Statement

Registration of Substances

Multi-Tech Systems, Inc. confirms that none of its products or packaging contain any of the Substances of Very High Concern (SVHC) on the REACH Candidate List, in a concentration above the 0.1% by weight allowable limit

The latest **197** substances restricted per the REACH Regulation were **last updated January 2019**. Refer to the following for the most current candidate list of substances: http://echa.europa.eu/candidate-list-table.

Information on HS/TS Substances According to Chinese Standards

In accordance with China's Administrative Measures on the Control of Pollution Caused by Electronic Information Products (EIP) # 39, also known as China RoHS, the following information is provided regarding the names and concentration levels of Toxic Substances (TS) or Hazardous Substances (HS) which may be contained in Multi-Tech Systems Inc. products relative to the EIP standards set by China's Ministry of Information Industry (MII).

Hazardous/Toxic Substance/Elements

Name of the Component	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybromi nated Biphenyl (PBB)	Polybrominat ed Diphenyl Ether (PBDE)
Printed Circuit Boards	O	O	O	O	O	O
Resistors	X	O	O	O	O	O
Capacitors	X	O	O	O	O	O
Ferrite Beads	O	O	O	O	O	O
Relays/Opticals	O	O	O	O	O	O
ICs	O	O	O	O	O	O
Diodes/ Transistors	O	O	O	O	O	O
Oscillators and Crystals	X	O	O	O	O	O
Regulator	O	O	O	O	O	O
Voltage Sensor	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
Speaker	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
Screws, Nuts, and other Hardware	X	O	O	O	O	O
AC-DC Power Supplies	O	O	O	O	O	O
Software /Documentation CDs	O	O	O	O	O	O
Booklets and Paperwork	O	O	O	O	O	O
Chassis	O	O	O	O	O	O

X Represents that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/Txxx-2006 Requirements for Concentration Limits.
O Represents that no such substances are used or that the concentration is within the aforementioned limits.

Information on HS/TS Substances According to Chinese Standards (in Chinese)

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。

有害/有毒物质/元素

成分名称	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
ICs	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
LEDs	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之内。

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