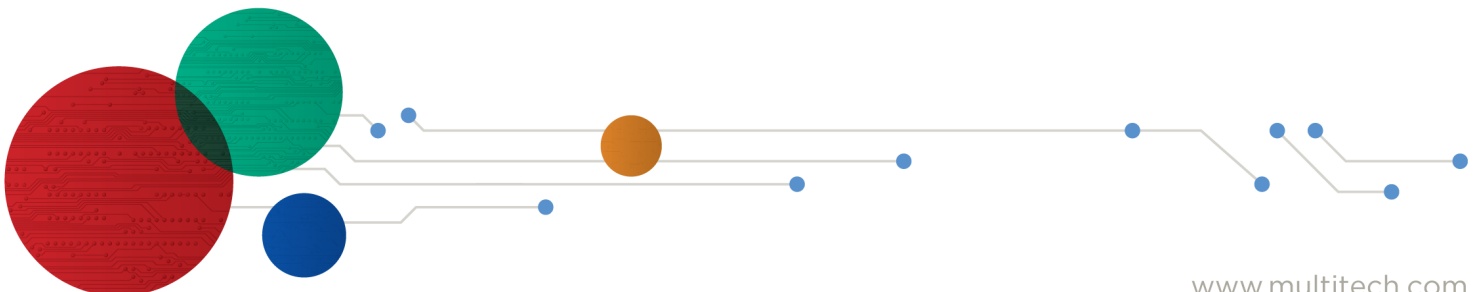# MultiConnect® Cell

MTC-LNA4 User Guide

MultiConnect® Cell Series 100 User Guide

Model: MTC-LNA4

Part Number: S000699 1.1

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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

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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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Contents

Chapter 1 – Product Overview

About the MultiConnect Cell Modem

MultiConnect® Cell 100 Series MTC-LNA4 cellular modems are ready-to-deploy, standalone LTE Category 4 modems that provide wireless communication. The MTC-LNA4 is a compact communications platform that provides cellular capabilities for fixed and mobile applications. It is intended for use in energy, utility, or industrial settings. The MTC-LNA4 is available with RS-232 or as a USB to Cellular device.

Documentation

The following documentation is available at https://www.multitech.com/brands/multiconnect-cell-100-series Select your model to get the documentation for that device.

Document	Description
MultiConnect Cell User Guide	This document provides an overview, safety and regulatory information, schematics, and general device information.
Telit LE9x0 AT Commands Reference Guide	You can configure the device using the LTE AT Commands. These commands are documented in the Telit AT Command Reference Guide P/N: 80407ST10116a.
USB Driver Installation Guide for LTE Devices	The document provides instructions on USB driver installation for LTE devices P/N: S000616.

Dimensions

Serial

USB

.800 [20.32]
.800 [20.32]
.517 [13.13]
.425 [10.80]
CELL
AUX
SIM

.300 [7.62]
.170 [4.32]
.260 [6.60]
4.925 [125.10]
5.415 [137.54]
.400 [10.16]
3.171 [80.53]

MULTITECH
MultiConnect® Cell
PROG. SIGNAL
LS
POWER

1.163 [29.54]
USB
2.450 [62.23]
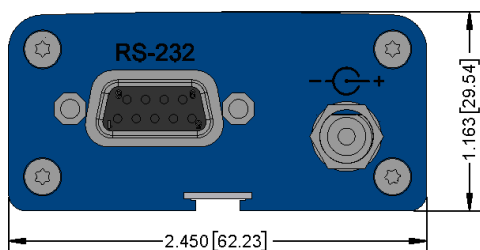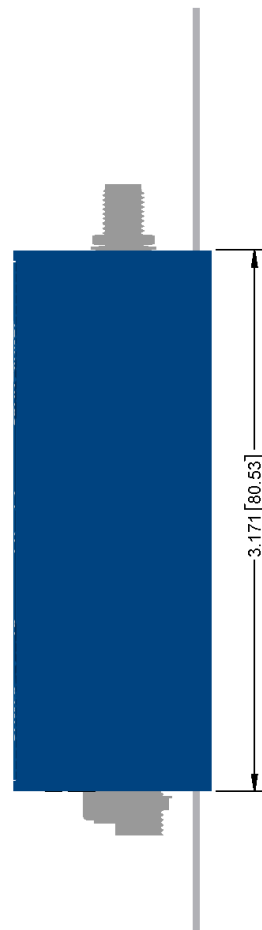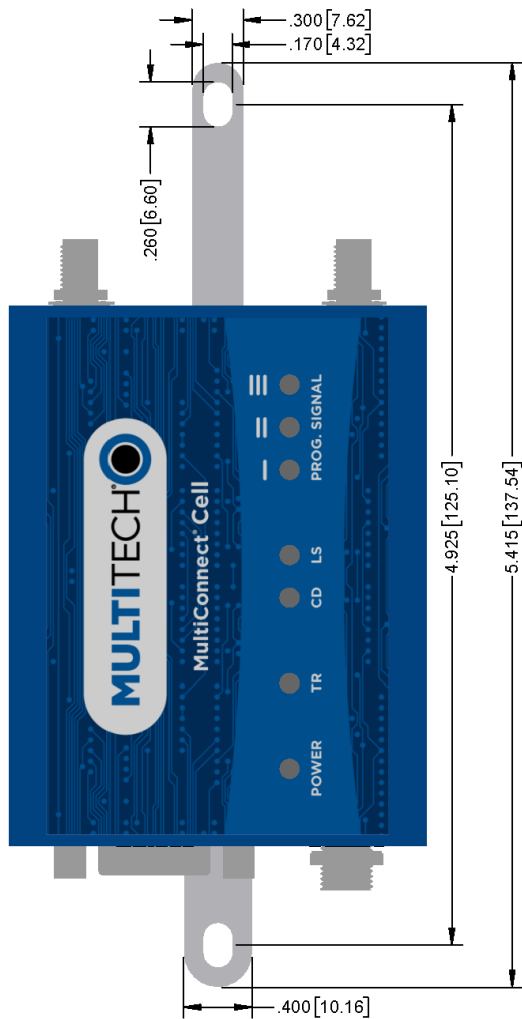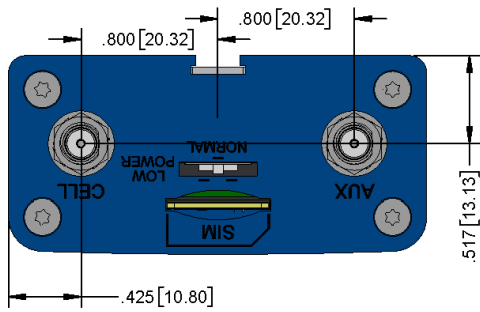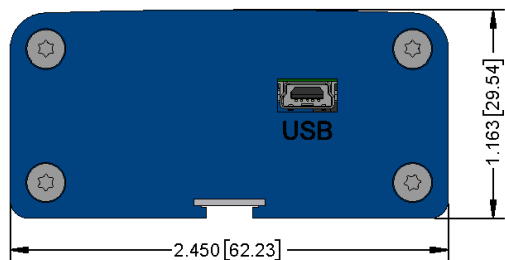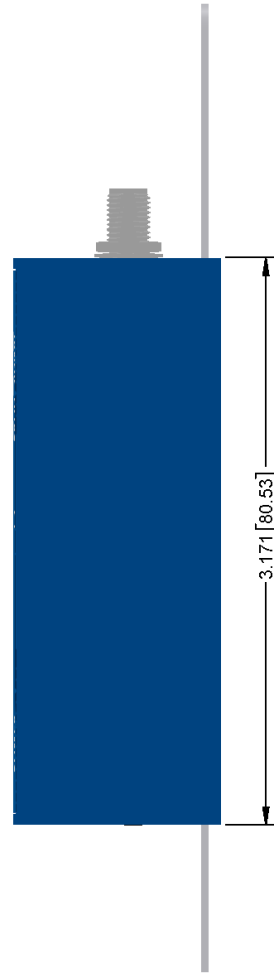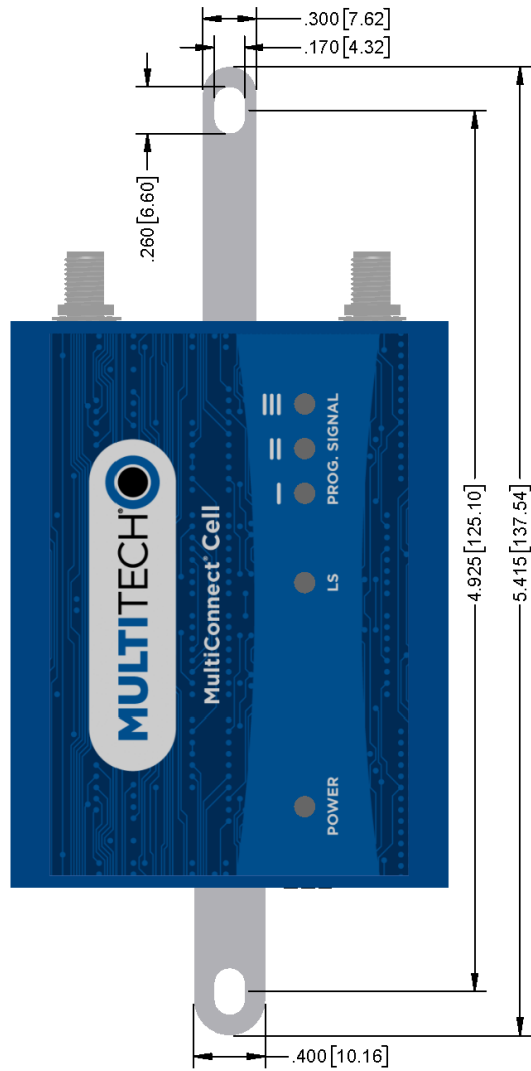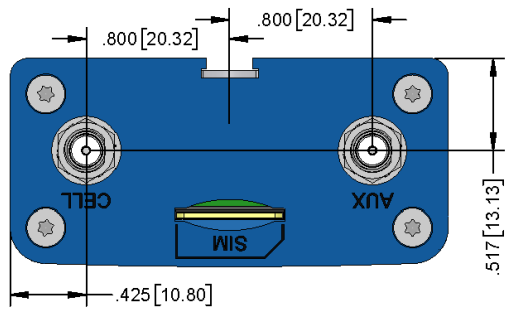
Descriptions of LEDs

The top panel contains the following LEDs:

- Power and Terminal Ready LEDs—The Power LED indicates that DC power is present and the TR LED indicates when the unit is ready to receive data.
- Modem LEDs—Two modem LEDs indicate carrier detection and link status.
- Signal LEDs—Three signal LEDs display the signal strength level of the wireless connection.

LED Indicators	
POWER	Indicates presence of DC power when lit.
TR	Terminal Ready. When lit, indicates connection to terminal emulation. When not lit, indicates no terminal is present. (for serial only)
CD	Carrier Detect. Indicates established data connection when lit. (for serial only)
LS	Link Status. - OFF — No power to the cellular radio - Continuously lit — SIM is not installed, or no signal is present - Slow blink — Registered
PROG. SIGNAL	To use these LEDS, you can control them through the Appzone program which is loaded on the device at the factory.

Side Panels

The device has connectors on either side. The figures that follow show the side panels.

Serial
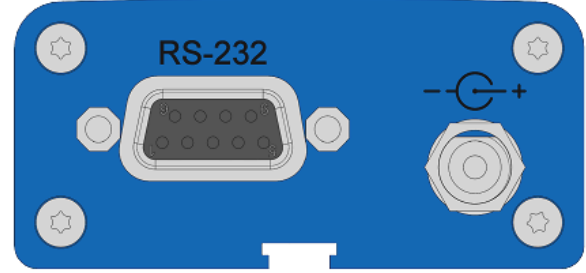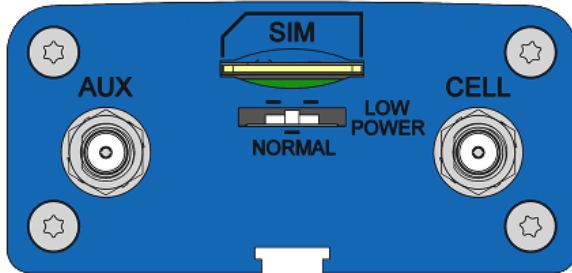
USB
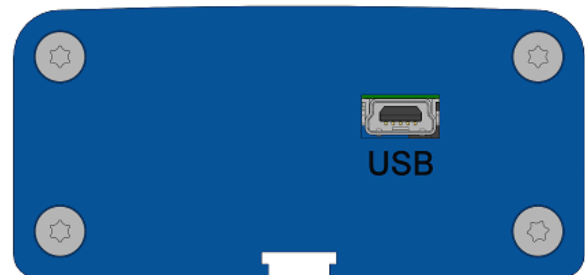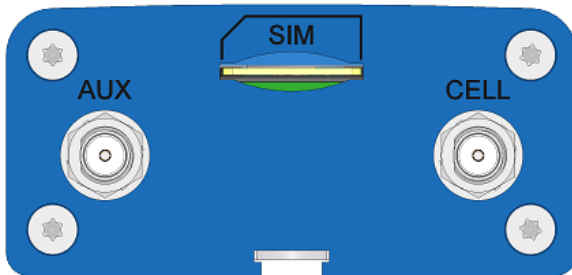
Note: The power-saving switch—which appears with the NORMAL and LOW POWER labels—is included only on models that have a serial connector.

MTC-LNA4 Specifications

Category	Description
General	
Standards	LTE 3GPP Release 9
	HSPA+ 21/GPRS fallback
	USB interface is CDC-ACM compliant
TCP/IP Functions	FTP, SMTP, SSL, TCP, UDP
Frequency Bands	4G: 700 (B12, B13)/850 (B5)/AWS 1700 (B4)/1900 (B2)
	3G: 850 (B5)/1900 (B2)
Speed	
Data Speed	LTE: 150 Mbps downlink/50 Mbps uplink
	HSPA+: 21 Mbps downlink/5.76 Mbps uplink
Interface	
USB Interface	USB 2.0 high speed compatible
UART Interface	RS-232 levels
Physical Description	
Weight	0.4 oz. (10 g)
Dimensions	Refer to mechanical drawing for dimensions.
Connectors	
Antenna Connectors	2 SMA connectors for cellular, Rx diversity/MIMO
	1 SMA connector for GPS (Available on the MTC-LAT1-B02 only)
SIM	1.8V and 3V SIM holder for mini-SIM card
Environment	
Operating Temperature	-40° C to +85° C
Storage Temperature	-40° C to +85° C
Humidity	20%-90% RH, non-condensing
Power Requirements	
Operating Voltage	Serial Models: 5-32 VDC
	USB Models: 5 VDC

Category	Description
SMS	

Category	Description
SMS	Point-to-Point messaging
	Mobile-Terminated SMS
	Mobile-Originated SMS
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
Radio Compliance	FCC Part 22, 24, 27
Safety Compliance	UL 60950-1 2nd ED
	cUL 60950-1 2nd ED
	IEC 60950-1 2nd ED
Network Compliance	PTCRB
	GCF
Carrier	AT&T
	Verizon

RS-232 9-Pin Female Connector
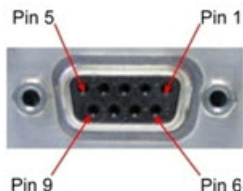
Pin	Abbreviation	Description	In/Out
1	CD	Carrier Detect	O
2	RX	Receive	O
3	TX	Transmit	I
4	DTR	Data Terminal Ready	I
5	GND	Ground	--
6	DSR	Data Set Ready	O
7	RTS	Request to Send	I
8	CTS	Clear to Send	O
9	RI	Ring Indicator	O

Power Measurements

Multi-Tech Systems, Inc. recommends incorporating a 10% buffer into your power source when determining product load.

Serial Model: MTC-LNA4-B01 Power Draw

Radio Protocol	Sleep mode current, connected to wireless (milliamps)	Sleep mode current, connected to live network, active SIM installed (milliamps)	Cellular call box connection, no data (milliamps)	Average measured current (milliamps) at maximum power	Average TX pulse amplitude current (milliamps)	Total inrush charge, in millicoulombs (mC)	Total inrush charge duration during power-up (ms)
9 Volts							
LTE 836 MHz	13	26	26	245	320	0.658	9.0
WCDMA	12	34	30	309	380	0.658	9.0
12 Volts							
LTE 836 MHz	9	24	28	195	196	0.618	7.4
WCDMA	8	26	28	239	239	0.618	7.4
24 Volts							

Radio Protocol	Sleep mode current, connected to wireless (milliamps)	Sleep mode current, connected to live network, active SIM installed (milliamps)	Cellular call box connection, no data (milliamps)	Average measured current (milliamps) at maximum power	Average TX pulse amplitude current (milliamps)	Total inrush charge, in millicoulombs (mC)	Total inrush charge duration during power-up (ms)
LTE 836 MHz	5	15	15	114	180	1.03	9.2
WCDMA	5	16	16	137	204	1.03	9.2

USB Model: MTC-LNA4-B03 Power Draw

Radio Protocol	Sleep mode current (milliamps)	Cellular connection idle, no data (milliamps)	Live Connection idle current (milliamps)	Average current at Max Power (milliamps)	Average TX pulse amplitude current (milliamps)	Total inrush charge in millicoulombs (mC)
5 Volts						
LTE	N/A	36	38	460	528	1.43
WCDMA	N/A	36	36	616	684	1.43

Chapter 2 – Safety Warnings

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.

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).

Antenna

The antenna intended for use with this unit meets the requirements for mobile operating configurations and for fixed mounted operations, as defined in 2.1091 and 1.1307 of the FCC rules for satisfying RF exposure compliance. If an alternate antenna is used, consult user documentation for required antenna specifications.

Chapter 3 – Installing and Using the Device

Installing the Device

1. Connect suitable antenna(s) to the antenna connector(s).
2. If your device is the serial version:

    Connect the DE9 male connector (9-pin) of the RS-232 cable to the RS-232 connector on the device, then connect the other end to the serial port on the other desired device.

    Screw-on the power lead from the power supply module into the power connection on the device.

    Plug the power supply into your power source.
3. If your device is the USB version:

    For information about the USB cable that helps power your device, see the section "USB Cable Recommendations."

    The USB cable uses power from the USB power line. Connect one end of the USB cable to your computer or other USB high power device, such as a hub.

    Connect the other end to the device's USB connector.
4. The POWER LED lights after the device powers up.

Placing Serial Devices in Power Save Mode

The serial devices offer a low power mode (sleep or power save mode) using the power save switch (below the SIM card slot) on the device to change from normal or low power mode. The low power mode is intended for battery or solar-powered, IoT applications such as outdoor remote sensors.

There are other techniques to place the device into low power mode. This example uses data terminal ready (DTR) and the AT command +CFUN=5. For other techniques, review the AT command guide for your device, as described in the Documentation section of this guide.

The device also wakes up from sleep mode by using the wake-on-ring feature. See the following example using the ring indicator line to wake the host processor when the radio receives an incoming call or SMS message. Your application then needs to act on the ring indication and wake up the device by asserting DTR.

Using Low Power Mode

Here are some different configuration options for low power mode:

- To turn on low power mode, set the power-save switch to LOW.
- On the RS-232 interface, ensure your application controls DTR and makes it active (on). To configure the device for DTR control, issue either AT&D1 or AT&D2 for DTR control. The &D0 command does not allow low power to operate.
- To configure the device to enter low power (sleep) mode, issue AT+CFUN=5 to the radio.
- To configure the device to wake from low power mode by using the wake-on-ring feature, issue AT#E2SMSRI=1000. This configures the ring indicator to go active for 1000 ms when an SMS message is received.
- To have the device enter sleep mode, set DTR to inactive (off) on the RS-232 interface. The clear to send (CTS) signal is off when the device is in sleep mode.

USB Cable Recommendations

If your device has a USB connector, to avoid enumeration or power issues:

- Use a high-speed USB cable that is as short as possible.
- Use a well-shielded cable with at least 24 AWG wire pair for power/ground and 28 AWG wire pair for data lines.
- If possible, use a USB port that connects directly to the motherboard rather than a USB port with added cabling inside the computer chassis.
- Use USB 3.0 ports if available. These ports are typically rated for more current.
- You can order the USB cable through MultiTech. The part number is CA-USB-A-MINI-B-3

Powering Down Your Device

CAUTION: Failing to properly power down the device before removing power may corrupt your device's file system.

To properly power down your device, use the following sequence :

1. Issue the AT#SHDN command.
2. Wait 30 seconds.
3. Power off or disconnect power.

Note: If you send AT#SHDN and do not remove power, the radio restarts after 60 seconds.

Installing a SIM Card

This model requires a SIM card, which is supplied by your service provider. To install the SIM card:

1. Locate the SIM card slot on the side of the modem. The slot is labeled SIM.
2. Slide the SIM card into the SIM card slot with the contact side facing down as shown. When the SIM card is installed, it locks into place.

INSTALLING AND USING THE DEVICE
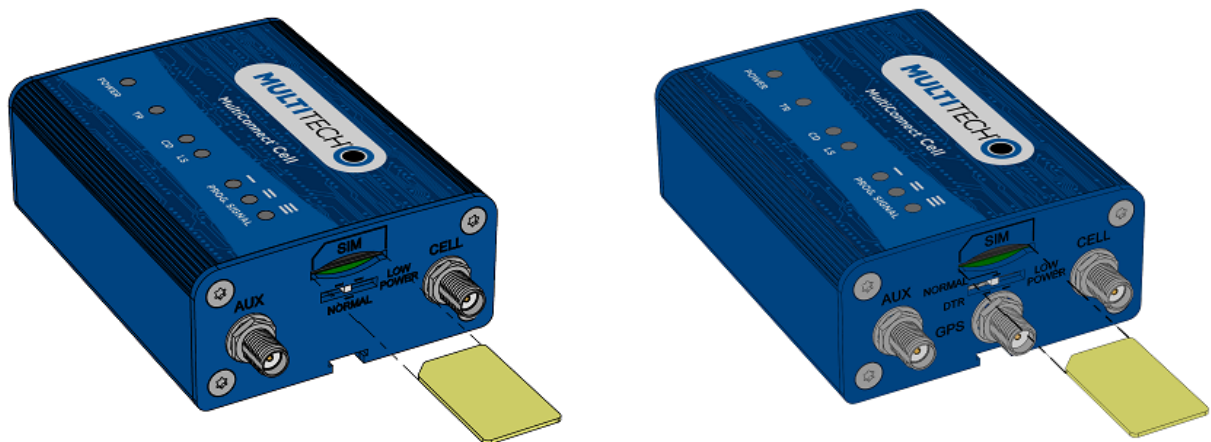
Removing a SIM Card

To remove the SIM card, push the SIM card in. The device ejects the SIM card.

Mounting Device to Flat Surface

1. Locate the groove on the bottom of the device.
2. Slide the mounting bracket through the groove.
3. To secure the bracket to the desired surface, place and tighten two screws in the holes on either end of the mounting bracket. The dimensions illustration in this guide shows the mounting bracket, as well as the dimensions for placement of the screws.

LTE Antenna Diversity

Antenna diversity uses two receive antennas to improve the downlink connection (cell tower to mobile). It has no effect on the uplink (mobile to cell tower).

Antenna diversity is useful in environments where the signal arrives at the device after bouncing off or around buildings or other objects. The bounced signal may be attenuated by going through semi-transparent (to the signal) objects. Each signal alteration can change its magnitude, phase, orientation, or polarization. This complex environment can exist in cities, inside buildings or in traffic. In this environment, signal paths from the cell tower form an interference pattern of peaks and nulls. These peaks and nulls can be very close together.

Antenna diversity provides an advantage in complex environments because if one receive antenna has a poor signal due to an interference null pattern, the other antenna is likely not in the null and has better reception. The radio compares the reception from both receive antennas and uses the one with the strongest signal.

Important: You must deploy with two antennas, unless your carrier has authorized you to deploy with one antenna.

Selecting Antennas

Select an antenna based on your product and application. Typically, both antennas are the same and either can be the main receive antenna.

Placing External Antennas

Antennas are usually a quarter wavelength apart from each other. With multiband radios where the quarter wavelengths in each band are diverse from each other, this rule may not be practical. Choose spacing based on the band used most often or the band with connection difficulty. Some environments are harsher on particular bands. MultiTech products have antenna connectors at the best spacing for the product size.

Placing antennas in close proximity to each other is not optimal, but you can do it if necessary. It depends on the signal strength to and from each antenna.

If the antennas are too close together for your application, use a similar antenna on a short cable for the second receive only antenna.

Antenna Approvals and Safety Considerations

Note the following:

- Carriers conduct antenna diversity tests.

MultiConnect® Cell MTC-LNA4 User Guide

- There are no EMC concerns about antenna diversity.

- All antennas need to have a minimum flammability rating.

- Safety requirements depend on your final product.

- Unless otherwise noted, antennas certified by MultiTech are not approved for outdoor use. Do not extend these antennas outside of any building.

Diversity and Power Draw

There are no significant power draw differences.

Chapter 4 – Antenna and Activation Information

Antenna

The antenna intended for use with this unit meets the requirements for mobile operating configurations and for fixed mounted operations, as defined in 2.1091 and 1.1307 of the FCC rules for satisfying RF exposure compliance. If an alternate antenna is used, consult user documentation for required antenna specifications.

Antenna System Cellular Devices

The cellular/wireless performance depends 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. Devices were approved with the following antenna(s) and for alternate antennas meeting the given specifications.

Antenna

Devices were approved with the following antenna or for alternate antennas meeting the given specifications:

Manufacturer:	Wieson
Description:	LTE Antenna with SMA-Male Connector
Model Number	GY115IE002-001

MultiTech ordering information:

Model	Quantity
ANLTE4-1HRA	1
ANLTE4-2HRA	2
ANLTE4-10HRA	10
ANLTE4-50HRA	50

Antenna Specifications

Category	Description
Frequency Range	0.698 - 0.96 GHz 1.710 - 2.170 GHz 2.30 - 2.69 GHz
VSWR	3:1 maximum
Gain	2.06 dBi
Impedance	50Ω nominal
Radiation	Omni-directional
Polarization	Linear, vertical

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.

Device Phone Number

Every device has a unique phone number. Your service provider supplies a phone number when you activate your account. Wireless service provider implementation may vary. Consult with your service provider to get the phone number for your device.

Chapter 5 – Configuring and Communicating with Your Device

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.

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.

Verizon FOTA (Firmware Over the Air)

At times, your device may require a critical update to radio firmware for devices connecting to the network. To stay compliant to Verizon's LTE requirements, you must implement FOTA. Failure to perform a critical update could result in losing access to the Verizon network.

MultiTech has developed a script for customers to use in order to initiate a FOTA update from the (the customer's) local host processor (pull FOTA). The script is available at: https://www.multitech.com/vzw-catm1

Verifying Signal Strength

To verify the device signal strength, enter:

AT+CSQ

The command indicates signal quality, in the form:

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

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
<sq>	LTE - RSRQ (in dBm):
0	-4 to -3
1	-6 to -5
2	-8 to -7
3	-10 to -9
4	-13 to -11
5	-15 to -14
6	-17 to -16
7	-19 to -18
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+CEREG?`

If the device returns:

`AT+CEREG?: 0,1`

or

`AT+CEREG?: 0,5`

The device is registered.

If the device returns:

`AT+CEREG?: 0,2`

The device is in a network searching state.

Sending and Receiving Data

Connecting Device to TCP Server as TCP Client

1. `AT+CGDCONT=1,"IPV4V6","apnname"`
    where apnname is the APN your cellular provider assigned to your SIM card.
2. **Bring up Data Connection Using Internal IP stack**
    Enter:
    Verizon:
    `AT#SGACT=3,1`
    Other Networks:
    `AT#SGACT=1,1`
    The device responds with the IP Address the cellular provider assigned to the device on connection, followed by OK. For example:
    `#SGACT: 25.194.185.116`
    `OK`
3. **Create Client Connection to TCP Server on Port 500**
    Enter:
    `AT#SD=1,0,500,"###.##.###.##"`
    where ###.##.###.## is the TCP server IP Address.

    The device responds with OK. The device can send or receive data now without entering additional commands.

Closing the Socket and the Connection

To close the socket:

1. Enter the escape sequence:
    `+++`

2. To close Socket 1, enter:
   ```
   AT#SH=1
   ```

To close the data connection:

■ Enter:

Verizon:
```
AT#SGACT=3,0
```

Other Networks:
```
AT#SGACT=1,0
```

The device responds with OK.

Configuring Device as UDP Listener to Accept UDP Client Connections

To configure the device as a UDP client:

1. **Check signal strength.**

   Enter:
   ```
   AT+CSQ
   ```
2. **Verify device is registered on the cellular network.**

   Enter:

   Should return:
   ```
   +CEREG: 0,1 or +CEREG: 0,5
   OK
   ```
3. **Configure socket parameters**

   Enter:
   ```
   AT#SCFG=1,3,300,240,600,50
   ```
4. **Activate context one**

   Enter:

   Verizon:
   ```
   AT#SGACT=3,1
   ```
   Other Networks:
   ```
   AT#SGACT=1,1
   ```
5. **Set firewall rule to accept connections:**
   ```
   AT#FRWL=1,"###.##.###.#","###.##.###.#"
   ```
   where ###.##.###.# represents the IP range. For example:
   ```
   AT#FRWL=1,"204.26.122.1","204.26.122.255"
   ```
6. **Set connection ID 1 for UDP listening mode on port 7000.**

   Enter:

   AT#SLUDP=1,1,7000

   The device responds with and unsolicited indication that a host is trying to connect to connection ID 1 on port 7000.
   ```
   SRING: 1
   ```
7. **Accept incoming connection ID 1**

   Enter:

AT#SA=1

The device indicates a client successfully established a listener connection.

`CONNECT`

The device can send and receive data now.

Exit Data Mode and Close Connection

To exit data mode and close the socket:

1. Enter the escape sequence:

   `+++`

2. To close Socket 1, enter:

   `AT#SH=1`

3. To close the data connection, enter:

   Verizon:

   `AT#SGACT=3,0`

   Other Networks:

   `AT#SGACT=1,0`

   The device responds with OK.

Configuring Device as UDP Client to Connect to UDP Server

Configure and Connect the Device

To configure the device as a UDP client:

1. **Check signal strength.**

   Enter:

   `AT+CSQ`

2. **Verify device is registered on the cellular network.**

   Enter:

   `AT+CEREG?`

   Should return:

   `+CEREG: 0,1 or +CEREG: 0,5`

   `OK`

3. **Configure socket parameters**

   Enter:

   `AT#SCFG=1,3,300,240,600,50`

4. **Activate context one**

   Enter:

   Verizon:

   `AT#SGACT=3,1`

   Other Networks:

   `AT#SGACT=1,1`

5. **Create UDP connection to Server port**

   Enter:

   `AT#SD=1,1,####,"###.##.###.##"`

where #### is the server port and ###.##.###.## is the IP number.

The device responds with OK, which indicates a successful connection for sending and receiving data through the socket connection.

Exit Data Mode and Close Connection

To exit data mode and close the socket:

1. Enter the escape sequence:

   +++

2. To close Socket 1, enter:

   AT#SH=1

3. To close the data connection,enter:

   Verizon:

   AT#SGACT=3,0

   Other Networks:

   AT#SGACT=1,0

   The device responds with OK.

Transferring FTP File to FTP Server

To connect to FTP server and upload files:

1. **Check signal strength.**

   Enter:

   AT+CSQ

2. **Verify device is registered on the cellular network.**

   Enter:

   AT+CEREG?

   Should return:

   +CEREG: 0,1 or +CEREG: 0,5

   OK

3. **Activate context**

   Enter:

   Verizon:

   AT#SGACT=3,1

   Other Networks:

   AT#SGACT=1,1

4. **Set FTP operations timeout to 10 seconds**

   Enter:

   AT#FTPTO=1000

5. **Configure FTP server IP address with username and password.**

   Enter:

   AT#FTPOPEN="###.##.###.#","username","password",0
   where ###.##.###.# is the IP address and the username and password for the FTP server.

6. **Configure file transfer type.**

Enter:

```
AT#FTPTYPE=#
```
where # is 0 for binary or 1 for ASCII.

7. **Enter the file name to be sent to the FTP server and initiate connection.**

   Enter:

   ```
   AT#FTPPUT="file.txt"
   ```
   The device responds with:

   ```
   CONNECT
   ```

8. Send the file through the device.

Closing the FTP Data Connection

After the file is sent:

1. **Enter the escape sequence.**

   Enter:

   ```
   +++
   ```
   The device responds with:

   ```
   NO CARRIER
   ```

2. **Close the FTP connection.**

   Enter:

   ```
   AT#FTPCLOSE
   ```

3. **Close the PPP data connection.**

   Enter:

   Verizon:
   ```
   AT#SGACT=3,0
   ```
   Other Networks:
   ```
   AT#SGACT=1,0
   ```
   The device responds with OK.

Downloading File from FTP Server

To connect to an FTP server and download files:

1. **Check signal strength.**

   Enter:

   ```
   AT+CSQ
   ```

2. **Verify device is registered on the cellular network.**

   Enter:

   ```
   AT+CEREG?
   ```
   Should return:

   ```
   +CEREG: 0,1 or +CEREG: 0,5
   OK
   ```

3. **Activate context one**

   Enter:

   Verizon:

```
AT#SGACT=3,1
```
Other Networks:
```
AT#SGACT=1,1
```

4. **Set FTP operations timeout to 10 seconds**

   Enter:

   ```
   AT#FTPTO=1000
   ```

5. **Configure FTP server IP address with username and password.**

   Enter:

   ```
   AT#FTPOPEN="###.##.###.#","username","password",0
   ```
   where ###.##.###.# is the IP address and the username and password for the FTP server.

6. **Configure file transfer type.**

   Enter:

   ```
   AT#FTPTYPE=#
   ```
   where # is 0 for binary or 1 for ASCII.

7. **If required, change the working directory to "folder1".**

   Enter:

   ```
   AT#FTPCWD="folder1"
   ```

8. **Enter the file name.**

   Enter:

   ```
   AT#FTPGET="filename.txt"
   ```
   where filename.txt is the file to download.

   The device responds with:

   ```
   CONNECT
   ```
   The file is received through the device. The device responds with:

   ```
   NO CARRIER
   ```
   The data connection closes automatically when the file sending ends.

Closing the FTP Data Connection

After the file is sent:

1. **Close the FTP connection.**

   Enter:

   ```
   AT#FTPCLOSE
   ```

2. **Close the PPP data connection.**

   Enter:

   Verizon:
   ```
   AT#SGACT=3,0
   ```
   Other Networks:
   ```
   AT#SGACT=1,0
   ```
   The device responds with OK.

Reading, Writing and Deleting Messages

Reading Text Messages

NOTE: For CAT M1 devices, you can only send/receive SMS messages from other CAT M1 devices on the same network.

To read a text message in text mode:

1. **Send a message to the phone number of the currently installed SIM.**
2. **Put the device in text mode.**

   Enter:

   ```
   AT+CMGF=1
   ```
3. **Read message.**

   Enter:

   ```
   AT+CMGR=1
   ```

Example response:

```
+CMGR: "REC UNREAD","0001112222","","20161006135126"
How are you?
OK
```

Where 0001112222 is the recipient phone number and 20161006135126 is received data in the format YYYYMMDDHHMMSS.

Sending Text Messages

To send a text message in text mode:

1. **Check signal strength.**

   Enter:

   ```
   AT+CSQ
   ```
2. **Verify device is registered on the cellular network.**

   Enter:

   ```
   AT+CEREG?
   ```
   Should return:

   ```
   +CEREG: 0,1 or +CEREG: 0,5
   OK
   ```
3. **Put the device in text mode.**

   Enter:

   ```
   AT+CMGF=1
   ```
   The device responds.

   ```
   OK
   ```
4. **Enter the recipient's number and your message.**

   Enter:

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

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

5. **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=1 , #

where 1 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 6 – Regulatory Information

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.

Industry Canada and FCC

This device complies with Industry Canada licence-exempt RSS standard(s) and part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada RSS exemptes de licence standard (s) et la partie 15 des règles de la FCC. Son fonctionnement est soumis aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et

2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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.

FCC Interference Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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.

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+)	Polybrominated Biphenyl (PBB)	Polybrominated 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。

Chapter 7 – 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.*

- 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**.
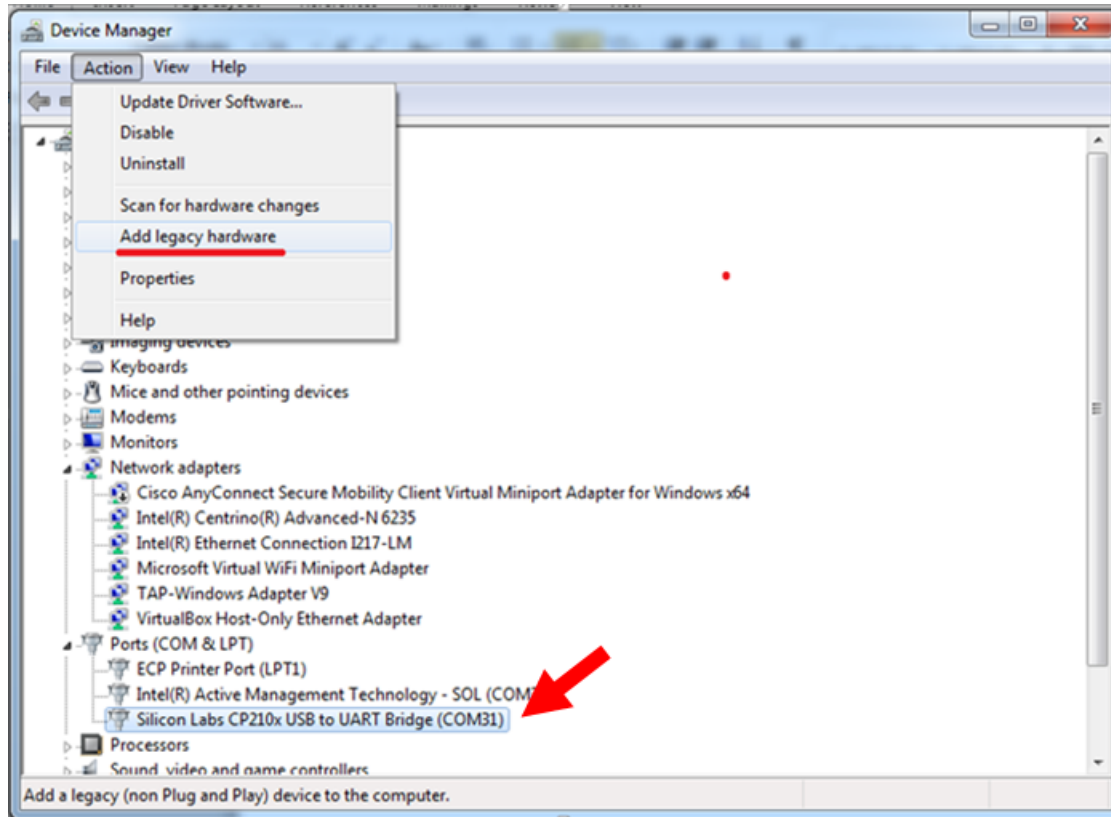
5. In the **Add Hardware Wizard**:

    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.