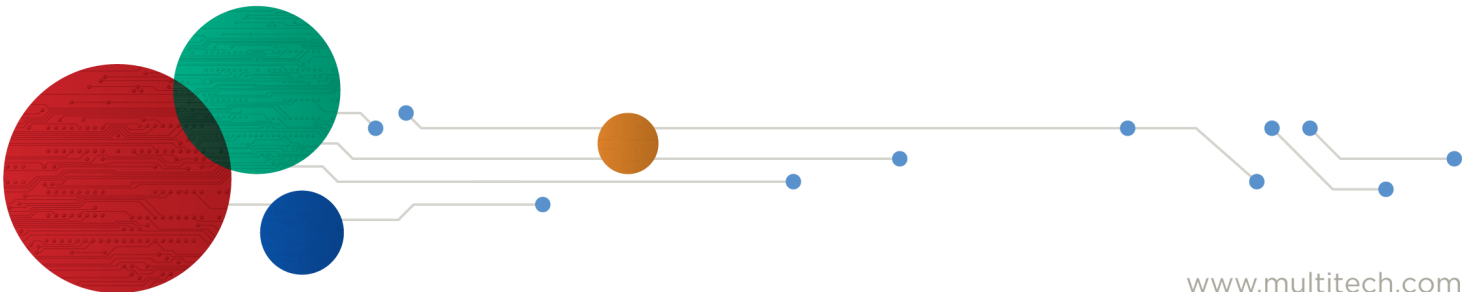


# SocketModem® Cell

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## MTSMC-MNG2 Device Guide



## SocketModem® Cell Device Guide

Models: MTSMC-MNG2, MTSMC-MNG2-U

Document Part Number: S000751 Rev. 1.2

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# Chapter 1 Product Overview

## Product Overview

SocketModem Cell models are complete, ready-to-integrate communications devices that offer standards-based LTE Cat M1 performance. Designed for IoT applications, these models offer enhanced coverage and optimized power consumption. These quick-to-market communications devices allow developers to add wireless communication to products with a minimum of development time and expense. SocketModem Cell models are based on industry-standard open interfaces and use MultiTech's Universal Socket design.

**Important:** The MTSMC-MNG6 must be configured for Cat M1 use only. Use AT#WS46=0 to ensure the device is in Cat M1 mode.

## Documentation

The following documentation is available at [multitech.com/support](http://multitech.com/support).

Document	Description	Part Number
SocketModem Cell Cat-M1 MTSMC-MNG2 Device Guide	This document. Provides overview, safety and regulatory information, design considerations, schematics, and device information.	S000751
Universal Developer Kit 2.0 Developer Guide	Information for developing with the MTUDK2 Developer Kit. Includes an overview, design considerations, schematics, and installation and operation information.	S000610
USB Driver Installation Guide for LTE Devices	Instructions for installing USB drivers on Linux and Windows Systems.	S000616
Telit ME910C1 AT Commands Reference Guide	Lists AT Commands and parameters used to configure your device.	80529ST10815A

## Product Build Options

Product	Description	Carrier/Region
MTSMC-MNG2	Embedded LTE Cat M1/NB/2G Modem/Serial w/GNSS	All
MTSMC-MNG2-U	Embedded LTE Cat M1/NB/2G Modem/USB w/GNSS	All

**Note:**

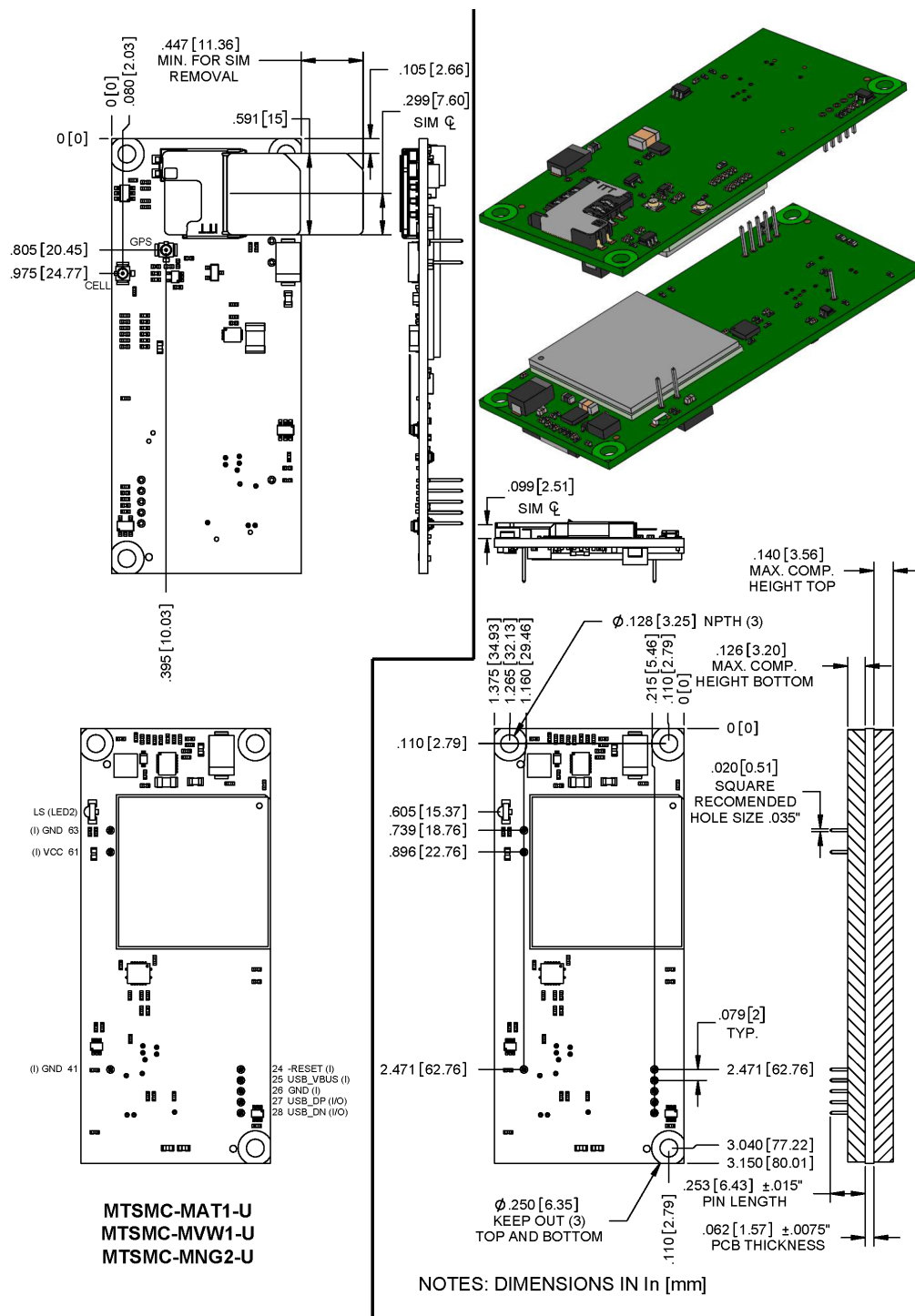
- These units ship without network activation.
- To connect them to the cellular network, you need a cellular account. For more information, refer to *SIM Card and Account Activation*.
- The complete product code may end in .Rx. For example, MTSMC-MNG2.Rx, where R is revision and x is the revision number.
- All builds can be ordered individually or in 50-packs. Add SP to the model number for a single pack.

# MTSMC-MNG2





# MTSMC-MNG2-U



## Chapter 3 Specifications

### MTSMC-MNG2 and MTSMC-MNG2-U Specifications

Category	Description	
General		
Standards	LTE UE Category M1/NB1	
	3GPP release 13 compliant	
	USB Interface is CDC-ACM compliant	
TCP/IP Functions	SSL, IPv4/IPv6 stack with TCP and UDP protocol	
Frequency Bands	Europe 4G:	B3 (1800), B8 (900), B20 (800) 2G: B2 (1900), B3 (1800), B5 (850), B8 (900)
	Europe 2G Fallback:	B2 (1900), B3 (1800), B5 (850), B8 (900)
	North America, Verizon 4G:	B4 (AWS1700), B13 (700)
	North America, AT&T 4G:	B2 (1900), B4 (AWS1700), B12 (700), B13 (700)
Speed		
Data Speed	Cat M1: Up to 375 Kbps uplink / Up to 300 Kbps downlink	
	Cat NB1:Up to 62.5 Kbps uplink / Up to 21 Kbps downlink	
Interface		
USB Interface	USB 2.0 high speed 480 Mbps	
Serial Modem Interface	Up to 921.6 Kbps	
Physical Description		
Weight	0.4 oz. (10 g)	
Dimensions	Refer to <i>Dimensions</i> for dimensions.	
Connectors		
Antenna Connector	2 UFL antenna connectors: Cell and GPS.	
SIM	1.8V and 3V SIM holder for mini-SIM (2FF) card	
Environment		
Operating Temperature	-40° C to +85° C	
Storage Temperature	-40° C to +85° C	
Humidity	20%-90% RH, non-condensing	

Category	Description
<b>Power Requirements</b>	
Input Voltage (USB Models)	5.0 VDC
Input Voltage (Serial Models)	3.3 VDC or 5.0 VDC
<b>Certifications and Compliance</b>	
EMC and Radio Compliance	RED
	RCM
Safety Compliance	IEC 60950-1 2nd ED
Approvals	PTCRB, AT&T, Verizon, RED

## Power Down the 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 or hold the reset line (pin J24) LOW.
2. Wait for 30 seconds.
3. Remove power to the MTSMC.

## Device RESET (Pin J24)

**Note:** Take note of how your software controls this pin to avoid unnecessary power cycling.

The RESET pin takes care of properly powering up and powering down the cellular radio module.

Holding the RESET pin LOW for >50ms initiates a power up or power down sequence, depending on its previous state.

### RESET Function on Initial Power Up

Regardless of the RESET pin's state, the cell radio initiates a power up sequence on the first power up. At the end of the power up cycle, the state of the RESET pin is sampled again.

- The full power up cycle may take up to 30 seconds before all AT commands are available.
- If the RESET pin is LOW when the radio completes the power up sequence, the radio initiates a power down sequence.

### RESET Function when the Radio Module is Powered

If the RESET pin is LOW, the radio initiates a power down sequence.

- The full power down cycle may take up to 65 seconds, during which time the radio is properly deregistered.

- If the RESET pin is in a continuous LOW state, the radio will stay off.
- If the RESET pin is set to HIGH, it will initiate a power up sequence.

## UART DC Electrical Characteristics

**Units:** Volts

Applies to the following pins:

Pin	Signal Name	Pin	Signal Name
J33	-RTS	J37	-DSR
J34	-RXD	J38	-CTS
J35	-TXD	J39	-DCD
J36	-RI	J40	-DTR

Parameter	Minimum	Maximum
<b>3.3 Volt Powered</b>		
Input Low Level	0	0.55
Input High Level	1.5	3.3
Output Low Level	0	0.55
Output High Level	2.35	3.3
<b>5 Volt Powered</b>		
Input Low Level	0	0.8
Input High Level	2.3	5
Output Low Level	0	0.55
Output High Level	3.7	5

## Absolute Maximum Rating

All models can run with an input voltage of either 3.3V or 5V. The maximum voltage on any signal pin equals the input voltage.

## Electrical Characteristics Other Pins

Pin	Signal Name	VIL Min	VIL Max	VIH Min	VIH Max	VOL Min	VOL Max	VOH Min	VOH Max
J24	-RESET	--	0.8	2.0	--	--	--	--	--
J25	USB VBUS	-0.3	0.8	2.0	8.7	--	--	--	--

Pin	Signal Name	VIL Min	VIL Max	VIH Min	VIH Max	VOL Min	VOL Max	VOH Min	VOH Max
J26	GND	--	--	--	--	--	--	--	--
J27	USB DP	--	0.8	2	--	--	0.3	2.8	--
J28	USB DN	--	0.8	2	--	--	0.3	2.8	--
J41	GND	--	--	--	--	--	--	--	--
J58	-LED LINK	--	--	--	--	0	0.45	2.85	3.3
J61	VCC	--	--	--	--	--	--	--	--
J63	GND	--	--	--	--	--	--	--	--

## Pinout Specifications

Pin	Signal Name	Logic Level Voltage <sup>1</sup>	In/Out	Description
J24	–RESET	3.3 – 5.0	I	Device reset (active low)
J25	USB VBUS	3.3 – 5.0	I	USB power supply input
J26	GND	GND	GND	Ground
J27	USB DP	3.3	I/O	USB data
J28	USB DN	3.3	I/O	USB data
J33	–RTS	5.0	I	Request to send (active low)
J34	–RXD	5.0	O	Received data (active low)
J35	–TXD	5.0	I	Transmitted data (active low)
J36	–RI	5.0	O	Ring indicator (active low)
J37	–DSR	5.0	O	Data set ready (active low)
J38	–CTS	5.0	O	Clear to send (active low)
J39	–DCD	5.0	O	Data carrier detect (active low)
J40	–DTR	5.0	I	Data terminal ready (active low)
J41	GND	GND	GND	Ground
J58	–LED LINK	3.3	O	Link status (active low, can sink up to 150mA)
J61	VCC	5.0	PWR	DC input power
J63	GND	GND	GND	Ground

<sup>1</sup> A hyphen (-) indicates a range of acceptable logic levels.

**Note:** Except for RESET, connect unused I/O pins to GND. If RESET is unused, connect it to VCC

## Pin Availability by Build

Pin	Signal Name	Serial Only	USB Only
J24	–RESET	X	X
J25	USB VBUS		X
J26	GND	X	X
J27	USB DP		X
J28	USB DN		X
J33	–RTS	X	
J34	–RXD	X	
J35	–TXD	X	
J36	–RI	X	

Pin	Signal Name	Serial Only	USB Only
J37	–DSR	X	
J38	–CTS	X	
J39	–DCD	X	
J40	–DTR	X	
J41	GND	X	X
J58	–LED LINK		X
J61	VCC	X	X
J63	GND	X	X

## Power Measurements

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

### Note:

The following notes apply to the following tables.

- **Tx Pulse:** The average peak current during an LTE connection.
- **Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power.
- **Inrush Charge:** The input current during power up, or a reset.

## MTSMC-MNG2 Power Draw

**Note:** This table has been split for readability.

Radio Protocol	Sleep Mode Current CFUN=0 (If Applicable) (Amps)	PSM Mode (CPSMS)	eDRX Mode	eDRX Mode w/CFUN=5	Cellular Connection Idle (No Data) (Amps)
<b>3.3 Volts</b>					
<b>GSM850</b>	10 mA	N/A	N/A	N/A	20 mA
<b>LTE Band 5 836.5Mhz</b>	10 mA	2.62 mA	21 mA	4.7 mA	22 mA
<b>5.0 Volts</b>					
<b>GSM850</b>	6 mA	N/A	N/A	N/A	13 mA
<b>LTE Band 5 836.5Mhz</b>	6 mA	2.48 mA	13 mA	3 mA	14 mA

Radio Protocol	(AVG) Measured Current (Amps) at Max Power	TX Pulse (Avg) Amplitude Current (Amps) Peak Current for LTE	Total Inrush Charge Measured in Millicoulombs	Total Inrush Charge Duration during Power Up (Inrush duration)
<b>3.3 Volts</b>				
<b>GSM850</b>	347 mA	1.84 A	1.48 mC	980 uS
<b>LTE Band 5 836.5Mhz</b>	263 mA	536 mA	1.48 mC	980 uS
<b>5.0 Volts</b>				
<b>GSM850</b>	209 mA	1.01A	1.46 mC	944 uS



Radio Protocol	(AVG) Measured Current (Amps) at Max Power	TX Pulse (Avg) Amplitude Current (Amps) Peak Current for LTE	Total Inrush Charge Measured in Millicoulombs	Total Inrush Charge Duration during Power Up (Inrush duration)
<b>LTE Band 5 836.5Mhz</b>	191 mA	352 mA	1.46 mC	944 uS

**Note:**

- Multi-Tech Systems, Inc. recommends that you incorporate a 10% buffer into the power source when determining product load.
- **Tx Pulse:** The average peak current during a GSM850 transmission burst period or HSDPA/LTE connection. The transmission burst duration for GSM850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).
- **Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power
- **Inrush Charge:** The total inrush charge at power on.
- **eDRX Mode Used:** Average current will be lower if a longer eDRX Period time is used. An eDRX Period time of 81.9 seconds was used , with a 20 second paging time (AT#CEDRXS=2,4,"0101","0111"). Issue AT#CEDRXS? command to view network supplied parameters.

## MTSMC-MNG2-U Power Draw

**Note:** This table has been split for readability.

Radio Protocol	Sleep Mode Current CFUN=0 (If Applicable) (Amps)	PSM Mode (CPSMS)	eDRX Mode	eDRX Mode w/CFUN=5	Cellular Connection Idle (No Data) (Amps)
<b>3.3 Volts</b>					
<b>GSM850</b>	N/A	N/A	N/A	N/A	41 mA
<b>LTE Band 5 836.5Mhz</b>	N/A	1.47 mA	41 mA	40 mA	44 mA
<b>5.0 Volts</b>					
<b>GSM850</b>	N/A	N/A	N/A	N/A	25 mA
<b>LTE Band 5 836.5Mhz</b>	N/A	1.49 mA	26 mA	24 mA	27 mA

Radio Protocol	(AVG) Measured Current (Amps) at Max Power	TX Pulse (Avg) Amplitude Current (Amps) Peak Current for LTE	Total Inrush Charge Measured in Millicoulombs	Total Inrush Charge Duration during Power Up (Inrush duration)
<b>3.3 Volts</b>				
<b>GSM850</b>	331 mA	1.75 A	1.64 mC	1.06 mS
<b>LTE Band 5 836.5Mhz</b>	311 mA	588 mA	1.64 mC	1.06 mS
<b>5.0 Volts</b>				
<b>GSM850</b>	219 mA	1.01A	1.54 mC	932 uS
<b>LTE Band 5 836.5Mhz</b>	205 mA	324 mA	1.54 mC	932 uS

**Note:**

- **Tx Pulse:** The average peak current during a GSM850 transmission burst period or HSDPA/LTE connection. The transmission burst duration for GSM850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).
- **Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power.
- **Inrush Charge:** The total inrush charge at power on.
- **eDRX Mode Used:** Average current will be lower if a longer eDRX Period time is used. An eDRX Period time of 81.9 seconds was used , with a 20 second paging time (AT#CEDRXS=2,4,"0101","0111"). Issue AT#CEDRXS? command to view network supplied parameters.

## Mounting Hardware

The board has three mounting holes at corners. Use #4 or M3 hardware for mounting the SocketModem to the board. Refer to *Dimensions* for more information.

### Recommended Parts

Manufacturer	Part	Part Number
PEM (Penn Engineering & Manufacturing)	Surface Mount Standoff	SMTSO-M3-4ET
RAF Electronic Hardware	3/16" Hex Female Standoff	2051T-440-S-12-Zinc
RAF Electronic Hardware	4.5mm Hex Female Standoff	1251-3005-S-12-Zinc

## Chapter 4 Antennas

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### 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 that the performance is not compromised. Devices were approved with the antenna(s) described below and for alternate antennas meeting the given specifications.

The antenna system is defined as the U.FL connection point from the device to the specified cable specifications and specified antenna specifications.

The antenna system is defined as the SMA connection point from the device to the specified cable specifications and specified antenna specifications.

### Requirements for Cellular Antennas with regard to FCC/IC Compliance

This device has been designed to operate with the antennas listed below and having a maximum antenna gain of 6.18 dBi for the 700 MHz band, 6.00 dBi for 1700 MHz band, and 9.01 dBi for the 1900 MHz frequency band. Antennas not included in this list or that have a gain greater than specified are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

### Antenna

Devices were approved with the following antenna:

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

## Chapter 5 Carrier Specific Notice

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### Firmware Over the Air (FOTA) for Verizon

Also known as Firmware Update Over the Air (FUOTA). At times, your device may require a critical update to radio firmware for devices connecting to the network. To stay compliant to Verizon's requirements you must implement FOTA. Failure to perform a critical update could result in losing access to the Verizon network. For information and examples go to <https://multitech.com/verizon-firmware-over-the-air-fota>.

# Chapter 6 SIM Card and Account Activation

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## SIM Card and Account Activation

To use the device, set up a wireless account with your network provider:

1. Contact your network provider to obtain an account and a SIM card for their network. This device requires a micro mini SIM (3FF) (2FF).
2. Give the provider the following:
  - a. The device's unique 15-character IMEI number located on the device label.
  - b. The device model number, also located on the device label. This number allows the carrier to verify that the device is approved for operation on their network.

**Important:** Check your product's label for the correct information to provide your wireless carrier. Provide the model number (not the ordering part number) listed on the label.

3. Follow your provider's instructions for activating their SIM card on their network.

## 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 7 Safety Information

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## Handling Precautions

To avoid damage due to the accumulation of static charge use proper precautions, such as an ESD strap, when handling any cellular device to avoid exposure to electronic discharge during handling and mounting the device.

## 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.
- Turn off your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and may be illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.
- Turn off your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Turn 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.
- 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 cellulaires. 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

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 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).

## Vehicle Safety

When using your device in a vehicle:

- Do not use this device while driving.
- Respect local 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 that 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.

## Operation Safety

**CAUTION:** Read all instructions and safety information before installing or using this device.

**Attention:** Lisez toutes les instructions et consignes de sécurité avant d'installer ou d'utiliser cet appareil.

- Follow all local laws, regulations, and rules for operating a wireless device.
- Use the device security features to block unauthorized use and theft.
- Unless otherwise noted, antennas are not approved for outdoor use. Do not extend any antenna outside of any building, dwelling, or campus.
- Do not attempt to disassemble the device. There are no user-serviceable parts inside.
- Do not misuse the device. Follow instructions on proper operation and only use as intended. Misuse could make the device inoperable, damage the device 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 an explosion or fire that may result in property damage, severe injury, or death.
- Do not expose the device to any extreme environment where the temperature or humidity is high. Such exposure could result in damage to the device or cause a fire. See the device specifications for recommended operating temperature and humidity.
- Do not expose the device to water, rain, or other liquids. It is not waterproof. Exposure to liquids could result in damage to the device.
- Using accessories, such as antennas, that MultiTech has not authorized or that are not compliant with the device accessory specifications may invalidate the warranty.

If the device is not working properly, contact MultiTech technical support.

## Chapter 8 Regulatory Information

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### FCC 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 Grant Information

<b>FCC Identifier:</b>	RI7ME910C1WW
<b>Equipment Class:</b>	Part 15 Class B Digital Device
<b>Notes:</b>	ME910C1-WW 2G & LTE CatM1/NB-IoT wireless
<b>Approval:</b>	Single Modular

FCC Rule Part	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
22H	824.0 - 849.0	2.53513	1.0 PM	244KGXW
22H	824.0 - 849.0	2.57632	1.0 PM	244KF9W
24E	1850.0 - 1910.0	1.18577	1.0 PM	246KGXW
24E	1850.0 - 1910.0	1.18304	1.0 PM	244KF9W
24E	1850.0 - 1910.0	0.23659	1.0 PM	1M28G7W
24E	1850.0 - 1910.0	0.23174	1.0 PM	1M29D7W
27	1710.0 - 1755.0	0.19999	1.0 PM	1M29G7W
27	1710.0 - 1755.0	0.18793	1.0 PM	1M28D7W
22H	824.0 - 849.0	0.23878	1.0 PM	1M28G7W
22H	824.0 - 849.0	0.23496	1.0 PM	1M28D7W
22H	824.0 - 849.0	0.22646	1.0 PM	1M29G7W
22H	824.0 - 849.0	0.22439	1.0 PM	1M28D7W
24E	1850.0 - 1910.0	0.21677	1.0 PM	172KG7W
24E	1850.0 - 1910.0	0.17219	1.0 PM	172KG7W
24E	1850.0 - 1910.0	0.18281	1.0 PM	208KG7W
24E	1850.0 - 1910.0	0.25351	1.0 PM	208KG7W
27	1710.0 - 1755.0	0.17378	1.0 PM	172KG7W
27	1710.0 - 1755.0	0.12972	1.0 PM	171KG7W
27	1710.0 - 1755.0	0.13305	1.0 PM	207KG7W
27	1710.0 - 1755.0	0.18113	1.0 PM	207KG7W
22H	824.0 - 849.0	0.23014	1.0 PM	172KG7W
22H	824.0 - 849.0	0.17865	1.0 PM	172KG7W
22H	824.0 - 849.0	0.18493	1.0 PM	208KG7W
22H	824.0 - 849.0	0.24889	1.0 PM	208KG7W
22H	824.0 - 849.0	0.23335	1.0 PM	170KG7W
22H	824.0 - 849.0	0.23227	1.0 PM	208KG7W
22H	824.0 - 849.0	0.24378	1.0 PM	209KG7W

FCC Rule Part	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
22H	824.0 - 849.0	0.230144	1.0 PM	172KG7W

Output power is conducted.

This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators.

The antenna of this transmitter must provide a separation distance of at least 20 cm from all persons. Installers and end users must be provided with antenna installation instructions and transmitter operating conditions and instructions for satisfying RF exposure compliance.

The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements.

The maximum antenna gain including cable loss for compliance with radiated power limits, RF exposure requirements and the categorical exclusion requirements of 2.1091 is 0.6 for GPRS/EGPRS 850 and LTE FDD 5 and 26 frequency bands, 6.0dBi for LTE FDD 2 frequency band and 8.7 dBi for LTE FDD 4 frequency band.

Multi-transmitter, supporting simultaneous transmission configurations, have not been evaluated and shall be evaluated according to KDB Publication 447498 and §2.947(f) composite system and §2.1 end product terms and concepts.

Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, emissions and host/module authentication, or new application if appropriate.

This device contains functions that are not operational in U.S. Territories. This filing is only applicable for U.S. operations.

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



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 downloaded at <https://multitech.com/product-support/>.

## Chapter 9 Environmental Notices

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### EU WEEE Directive

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

The Waste from Electrical and Electronic Equipment (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, contact your local city office, your household waste disposal service or where you purchased the product.

July, 2005



### EU REACH-SVHC Statement

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.

For the current REACH-SVHC statement and additional regulatory documents, go to <https://multitech.com/approvals-and-certifications/>.

## EU RoHS 3 Directive

Multi-Tech Systems, Inc. confirms that all products comply with the chemical concentration limitations set forth in the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS 3) regulations for CE and UKCA, following the standard EN IEC 63000:2018.

For the current Certificate of Compliance for Hazardous Substances and additional regulatory documents, go to <https://multitech.com/approvals-and-certifications/>.

## Chapter 10 Labels

### Approvals and Certifications

This device is an industry and/or carrier approved modem. In most cases, when integrated and used with an antenna system that was part of the MultiTech modem certification, additional approvals or certifications are not required for the device that you develop as long as the following requirements are met:

- **PTCRB Requirements:** The antenna system cannot be altered. The antenna system must be the same type with similar in-band and out-of-band radiation patterns and maintain the same specifications. Refer to the FCC grant information for details.
- **Model Identification:** The MultiTech model identification allows the carrier to verify the modem as one of its approved models. This information is located on the modem's label below the bar code.

### Example Labels

**Note:** Actual labels vary depending on the regulatory approval markings and content.

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.

The label shown is not than actual size.

- 1 - Multi-Tech Model Identification.
- 2 - IMEI (International Mobile Equipment Identity).

**MTSMC-MNG2 Device Label**



**MTSMC-MNG2-U Device Label**





# Chapter 11 Using Connection Manager

Use Connection Manager to:

- Install the latest device drivers.
- 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, and some regional carriers.
- 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.

**Note:** If you have an older version of Connection Manager, uninstall it before installing a new version. For details, refer to [Uninstalling Connection Manager](#).

## 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://multitech.com/all-products/software-management/connection-manager/>.
2. Click **Connection Manager**.
3. Open or unzip the **Connection Manager** file and run the installer (.msi file).
4. On the MultiTech Connection Manager Setup Wizard Welcome Panel, click **Next**.
5. Read the end-user license agreement and check **I accept the terms in the License Agreement**. Click **Next**.
6. 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 in Windows 10 and Windows 11.
7. If any Multichannel device is connected to the computer, disconnect it and click **Next**.
8. 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.

9. To specify a folder for Connection Manager, use the default folder or click **Change** to browse to the folder you want to use. Click **Next**.
10. Click **Install**. Windows may prompt you to allow the installer to make changes to your computer. Click **Yes**.
11. In the Setup Wizard, click **Finish**.

**Note:** To open Connection Manager automatically after installation, check **Start the MultiTech Connection Manager when the installation is finished**.

If using a USB device, you can connect the device to the carrier's network with Connection Manager. See [Connecting a Device](#).

If using a serial device, you need to set up the device in Windows Device Manager before connecting the device. See [Setting Up a Serial Device in Windows Device Manager](#).

**Note:** The –L6G1 radio establishes a connection automatically as soon as the device is plugged into a PC with Windows OS. No configuration or connection steps are required with this device.

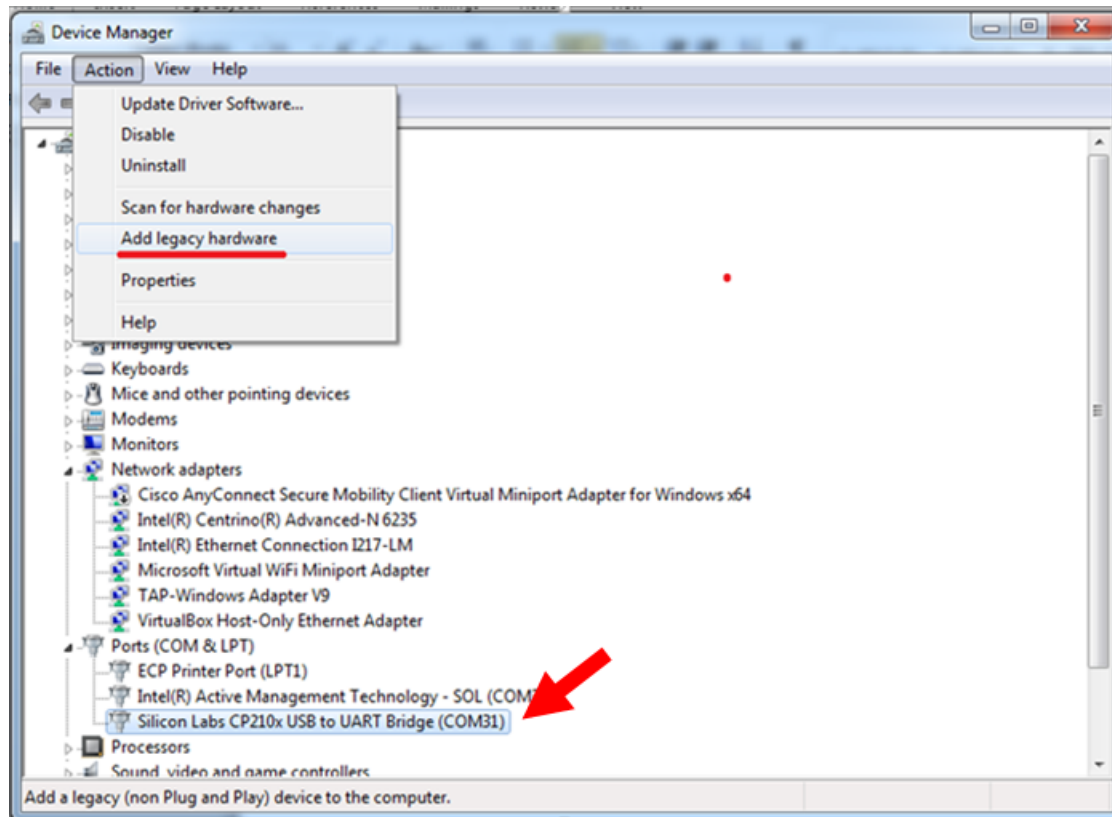
## Setting Up a Serial Device in Windows Device Manager

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, see [Connecting a Device](#).

## Connecting a Device

### Prerequisite:

- Make sure that your device is connected to the computer where Connection Manager is installed.
- If you have a serial device, set up the device in Device Manager. See [Setting Up a Serial Device in Windows Device Manager](#).

**Note:** The –L6G1 radio establishes a connection automatically as soon as the device is plugged into a PC with Windows OS. No configuration or connection steps are required with this device.

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.

**Note:** For –L6G1 radios, dial number is disabled.

- 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](http://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.

**Note:** For –L6G1 radios, dial number is disabled.

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.

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

**Important:** Disconnect the device in Connection Manager before disconnecting a device from the computer.

## Uninstalling Connection Manager

**Prerequisite:**

Make sure that Connection Manager is not running.

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

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**.

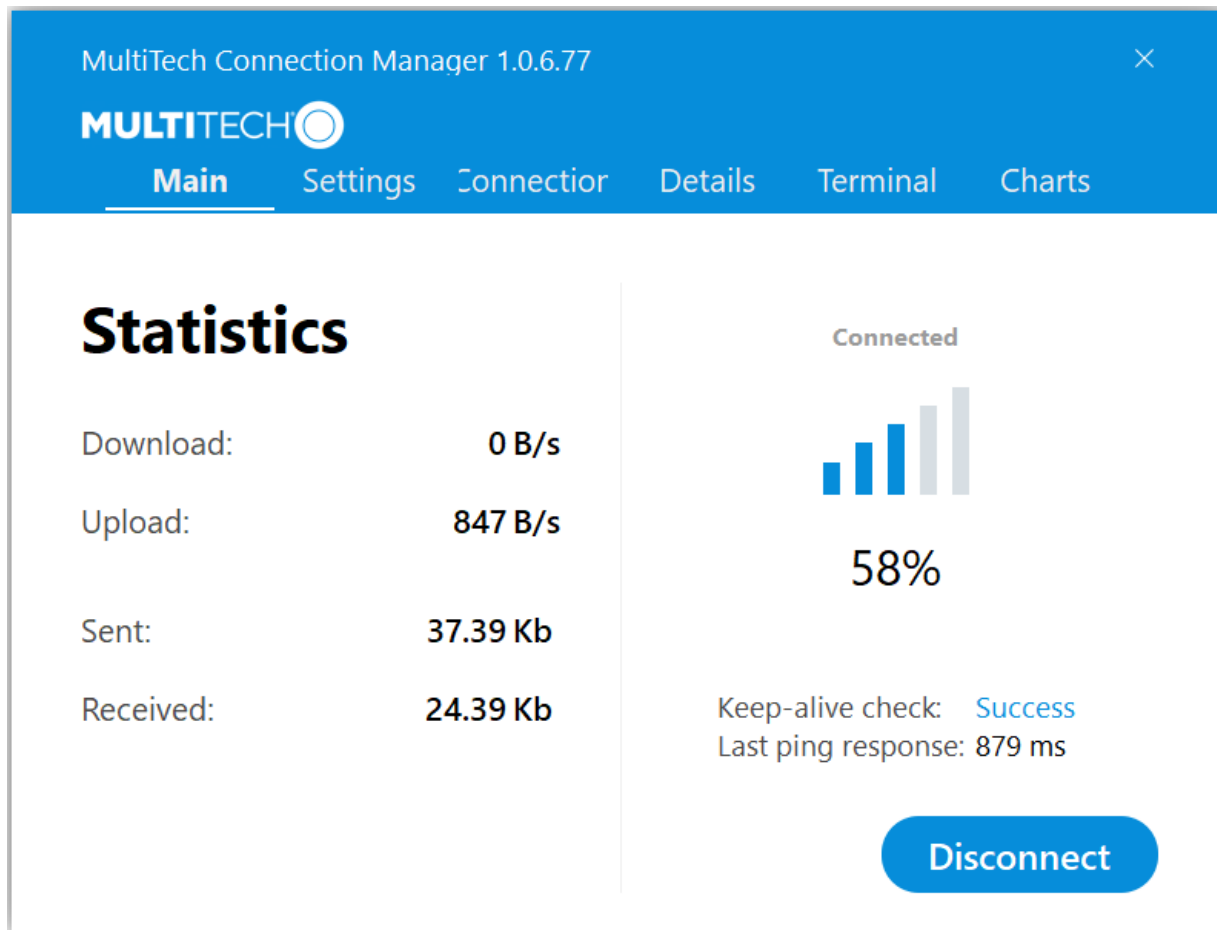
Connection Manager and the installed drivers are removed from the computer.

**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, see 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 two-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.

## USB Modem is not detected

1. Check the LS LED and Power LED (if available) on the device.  
If they are not continuously lit, then the problem is with the power supply. Check the cable and connections.  
If the LS LED is not blinking, 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 reinstall Connection Manager. During the installation, make sure that you check **Install the modem driver**. See [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 <b>Settings</b> tab.	On the <b>Settings</b> tab, select the COM port that matches the port that the device is installed on and click <b>Apply</b> . You can look up the port in Device Manager in Windows. In Device Manager, expand <b>Modems</b> , right-click the name of your device, and select <b>Properties</b> . Note the port on the <b>Modem</b> tab.

## System Cannot Connect to Serial Device

If your system cannot establish a connection with a serial device, verify Connection Manager settings match modem and serial port settings on the computer.

In **Connection Manager**, click the **Settings** tab.

MultiTech Connection Manager 2.2.0.4

**MULTITECH**

Main Settings Connection Details Terminal Charts

☐ USB Modem ☒ Serial Modem

Port: COM10

Parity: None

Bits per second: 115200

Stop bits: 1

Data bits: 8

Flow control: None

☐ Run application at Windows startup

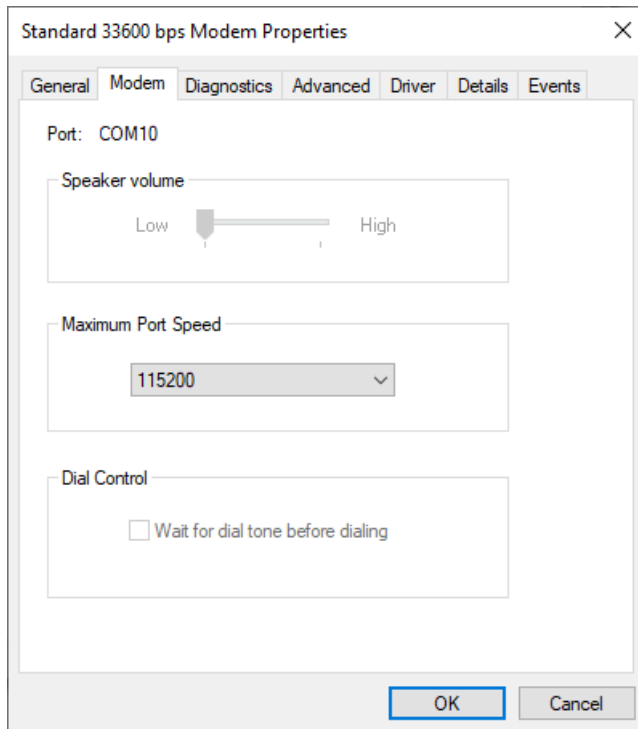
☐ Connect to the Internet automatically

Apply

In **Device Manager**, open **Modems** and then right-click on your device and select open the **Properties**.

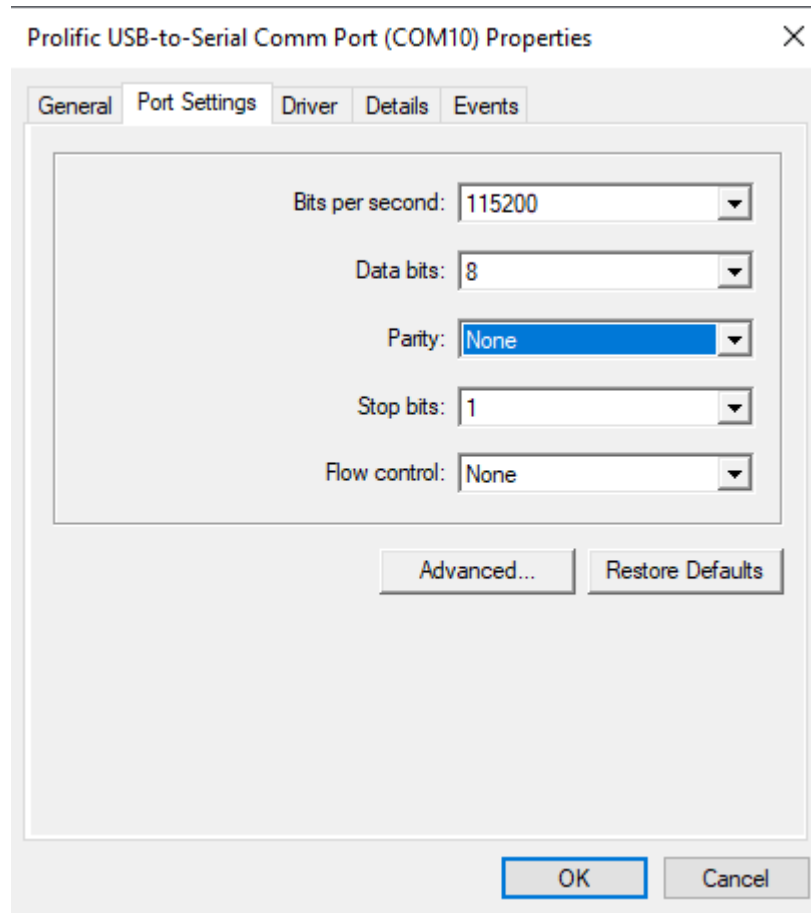
**Note:** If Modems and Ports don't appear in Device Manager, open the **View** Menu and select **Show hidden devices**.

Click the **Modem** tab to confirm the **Maximum Port Speed** matches Bits per second setting in Connection Manager.



In **Device Manager**, open **Ports (COM & LPT)** and then right-click on the Com Port used by your device and select **Properties**.

Click the Port Settings tab to confirm the **Bits per second**, **Data bits**, **Parity**, **Stop bits** and **Flow control** match those settings in Connection Manager.



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## Warranty

To read the warranty statement for your product, go to <https://www.multitech.com/warranty>.

## Contact Information

General Information	<a href="mailto:info@multitech.com">info@multitech.com</a> <a href="https://multitech.com/contact-us/">https://multitech.com/contact-us/</a>
Sales	+1 (763) 785-3500 <a href="mailto:sales@multitech.com">sales@multitech.com</a>
Technical Support Portal	+1 (763) 717-5863 <a href="https://support.multitech.com">https://support.multitech.com</a>
Website	<a href="http://www.multitech.com">www.multitech.com</a>
World Headquarters	2205 Woodale Drive Mounds View, MN 55112 USA

## Revision History

Revision Number	Description	Revision Date
1.2	Updated information on how to power down the device and functions of the device reset pin.	March 2025
1.1	Updated power requirements.	November 2024
1.0	Original publication.	August 2020