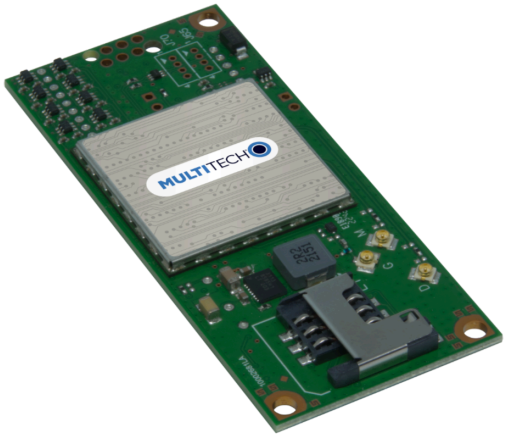

SocketModem® Cell

MTSMC-L1G2D Device Guide

SocketModem® Cell LTE Cat 1 Device Guide

Models: MTSMC-L1G2D, MTSMC-L1G2D-U

Part Number: S000817, Version 1.0

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Contacting MultiTech

Sales	Support
sales@multitech.com	support@multitech.com
+1 (763) 785-3500	+1 (763) 717-5863

Website

https://www.multitech.com

Knowledge Base

For immediate access to support information and resolutions for MultiTech products, visit https://www.multitech.com/kb.go.

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World Headquarters

Multi-Tech Systems, Inc.

2205 Woodale Drive, Mounds View, MN 55112

USA

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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 1 performance. 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.

Product Build Options

Product	Description	Carrier/Region
MTSMC-L1G2D	Embedded LTE Cat 1 Modem/Serial with fallback and GNSS	AT&T, Verizon, NA, EU, AU/NZ
MTSMC-L1G2D-U	Embedded LTE Cat 1 USB Modem with Fallback and GNSS	AT&T, Verizon, NA, EU, AU/NZ

Note:

- These units ship without network activation.
- To connect them to the cellular network, you need a cellular account. For more information, refer to Account Activation.
- The complete product code may end in .Rx. For example, MTSMC-L4G1.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.

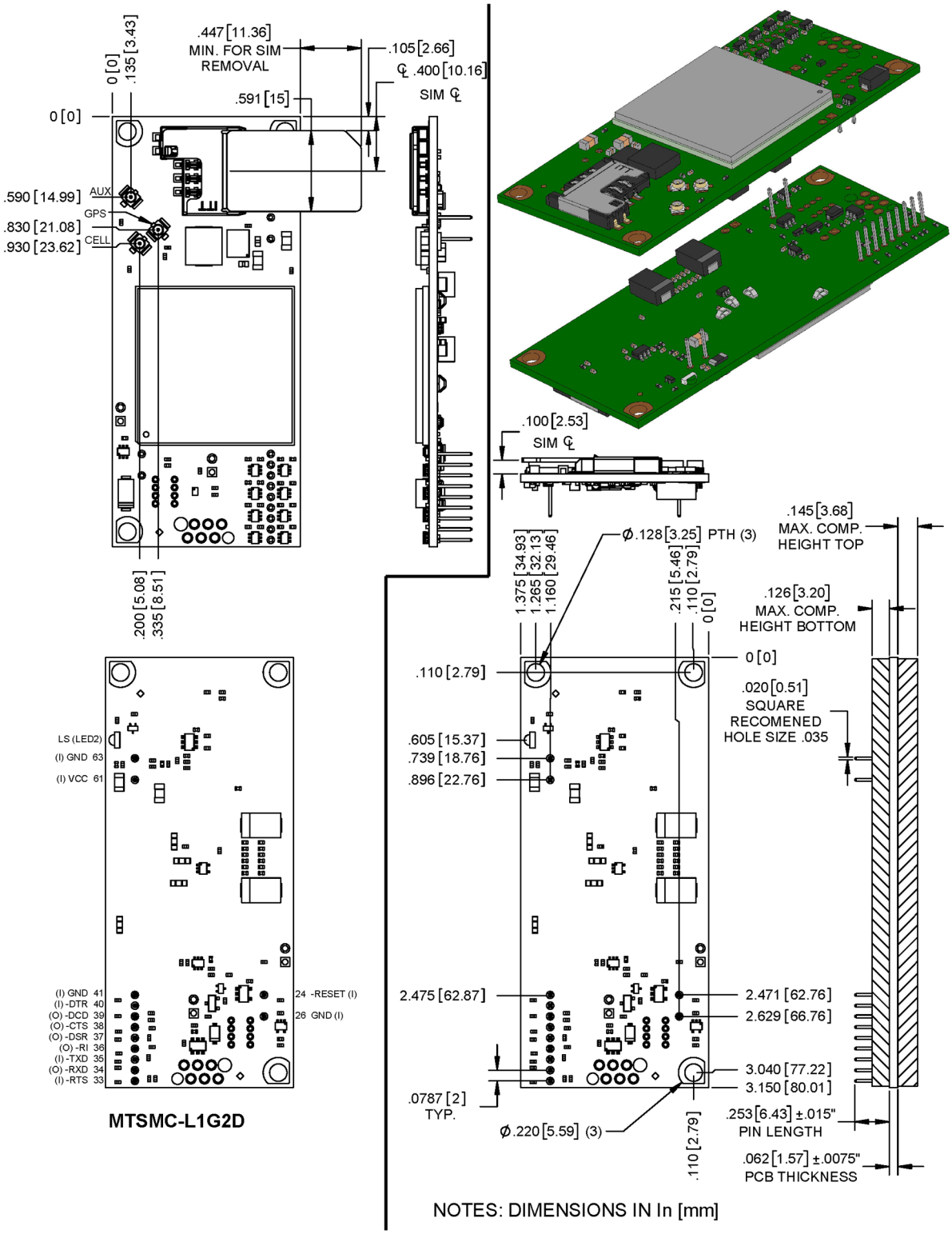
Documentation

The following documentation is available through www.multitech.com/resources/manuals.

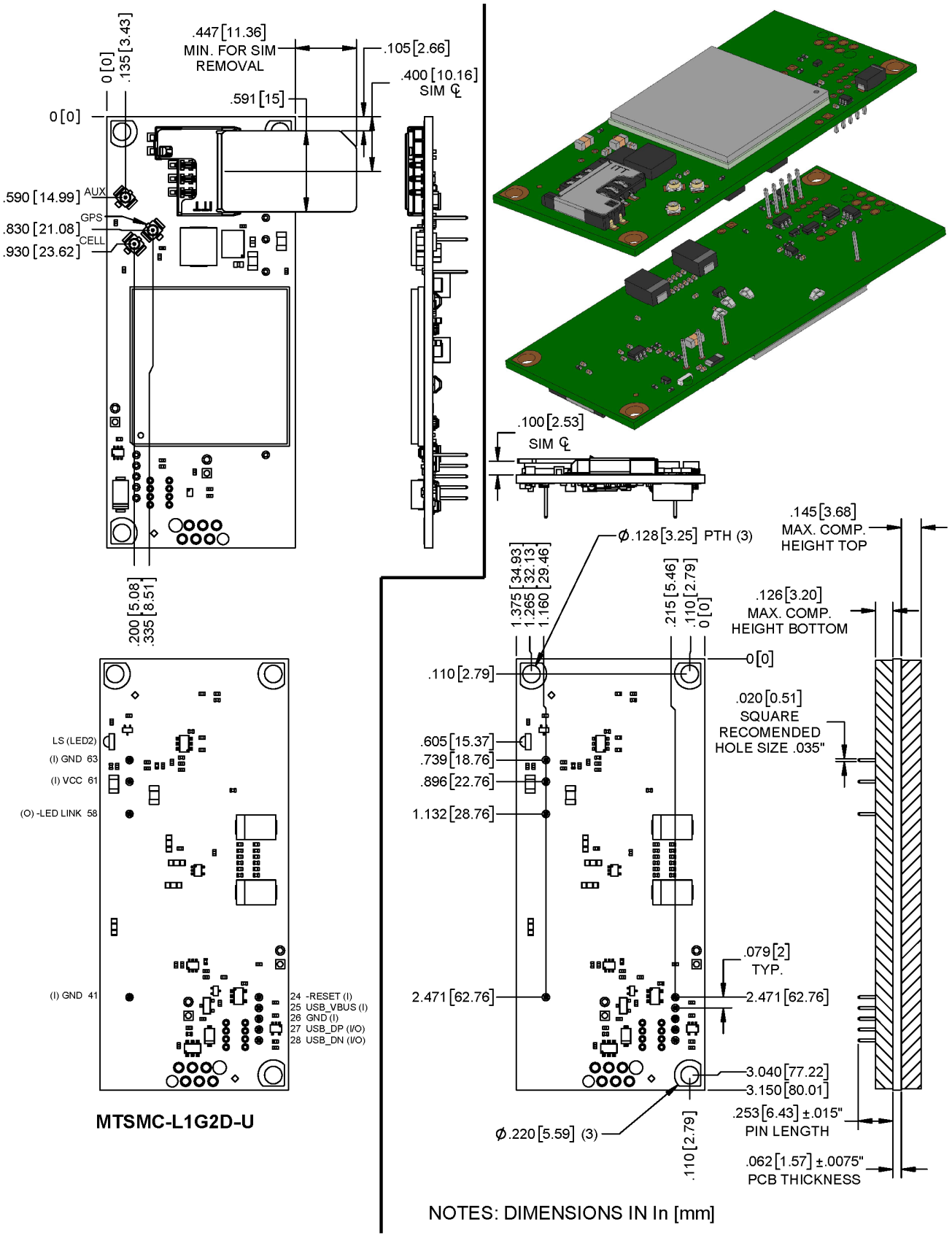
Document	Description	Part Number
SocketModem Cell LTE CAT 1 Device Guide	This document. Provides overview, safety and regulatory information, design considerations, schematics, and device information.	S000817
Universal Developer Kit 2 Developer Guide	Information for developing with the MTUDK2-ST-CELL.R1 Developer Kit. Includes an overview, design considerations, schematics, and installation and operation information.	S000799
Telit LE910 AT Commands Reference Guide	For L1G2D devices, lists AT Commands and parameters used to communicate with your device.	80502ST10950A
USB Installation Guide	Instruction for installing USB drivers.	S000616

Chapter 2 – Mechanical Drawings

MTSMC-L1G2D



MTSMC-L1G2D-U



Chapter 3 – Specifications

MTSMC-L1G2D and MTSMC-L1G2D-U Specifications

Category	Description
General	
Standards	LTE FDD CAT 1 3GPP Release 10
	HSPA+ 21/GPRS fallback
TCP/IP Functions	FTP, SMTP, TCP, UDP
Frequency Bands	4G: B1, B2, B3, B4, B5, B7, B8, B8_US, B9, B12, B13, B14, B18, B19, B20, B25, B26, B28
	3G: B1, B2, B4, B5, B6, B8, B19
	2G: B2, B3, B5, B8
Speed	
Data Speed	LTE: 10 Mbps downlink/5 Mbps uplink
Interface	
USB Interface	USB 2.0 High Speed
Serial Modem Interface	Up to 921.6 Kbps
Physical Description	
Weight	0.64 oz. (18 g)
Dimensions	Refer to Mechanical Drawing for Dimensions.
Connectors	
Antenna Connector	3 surface mount U.FL connectors for cellular, RX diversity/MIMO, and GPS/GNSS
SIM	1.8V/ 3V SIM holder for mini-SIM card (2FF)
Environment	
Operating Temperature[1]	-40° C to +85° C
Storage Temperature	-40° C to +85° C
Humidity	20%-90% RH, non-condensing
Power Requirements	
Input Voltage	3.3 - 5 VDC
SMS	
SMS	Point-to-Point messaging
	Mobile-Terminated SMS
	Mobile-Originated SMS

Category	Description
Certifications and Compliance	
EMC and Radio Compliance	FCC Part 15 Class B
	FCC Part 22H, 24E, 27, 90
	CE Mark, RED (EU)
	RCM
	UKCA
Safety Compliance	UL 62368-1
	cUL 62368-1
	IEC 62368-1
Network Compliance	PTCRB
Carrier	AT&T/Verizon

[1] The Link Status LED is only rated to -30°C operating temperature.

LED Interface

LED — Link Status— All Builds

The LED signal indicates the SocketModem working status. Refer to the mechanical drawing for LED location.

LED Signal	Link Status LED	
Off	No power to the device.	
On	Continuously lit	Powered and connected, but not transmitting or receiving.
	Slow blink (0.2Hz)	Powered and searching for a connection.
	Faster blink (3Hz)	Transmitting or receiving.

UART DC Electrical Characteristics

Symbol	Applicable Signals	VCC (V)	Minimum	Maximum	Unit
V_{IH} High-level input voltage	#RESET, #RTS, #TXD, #DTR	3.0 to 3.6	2	-	V
		4.5 to 5.3	VCC × 0.7	-	V
	USB_VBUS	3.0 to 5.3	VCC × 0.7	-	V
V_{IL} Low-level input voltage	#RESET, #RTS, #TXD, #DTR	3.0 to 3.6	-	0.8	V
		4.5 to 5.3	-	VCC × 0.3	V
	USB_VBUS	3.0 to 5.3	-	VCC × 0.3	V
I_{OH} High-level output current	#RXD, #RI, #DSR, #CTS, #DCD	3.0 to 3.6	-	-24	mA
		4.5 to 5.3	-	-32	mA
I_{OL} Low-level output current	#RXD, #RI, #DSR, #CTS, #DCD	3.0 to 3.6	-	24	mA
		4.5 to 5.3	-	32	mA

Absolute Maximum Rating

Parameter	Minimum	Maximum
VCC Voltage	-0.3V	5.3V
J65 Pin 1 Voltage		
#RESET, #RTS, #RXD, #TXD, #RI, #DSR, #CTS, #DCD, #DTR Voltage	GND - 0.3V	5.3V
#LED_LINK sink current	--	50mA
USB_VBUS Voltage	GND - 0.3V	5.3V
J70 Pin 1 Voltage		
USB_DP, USB_DN Voltage	GND - 0.3V	3.3V
J65 Pins 2 & 3, J70 Pins 2 & 3	GND - 0.3V	2.3V

Recommended Operating Conditions

Symbol	Applicable Signals	VCC (V)	Minimum	Maximum
VCC	Positive DC Supply Voltage		3.3V	5.0
t_r, t_f Input transition rise or fall rate	#RESET, #RTS, #TXD, #DTR, USB_VBUS	3.0 to 3.6	--	10V
		4.5 to 5.5	--	5V

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	--	--	--	--
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[1]	In/Out	Description
J24	–RESET	3.3 – 5.0	Input with 47KΩ pull-up	Device reset (active low)
J25	USB VBUS	3.3 – 5.0	Input with 47KΩ pull-down	USB power supply input
J26	GND	GND	N/A	Ground
J27	USB DP	3.3	3.3V I/O	USB data
J28	USB DN	3.3	3.3V I/O	USB data
J33	–RTS	5.0	Input with 47KΩ pull-down	Request to send (active low)
J34	–RXD	5.0	Output with 47KΩ pull-up	Received data (active low)

Pin	Signal Name	Logic Level Voltage[1]	In/Out	Description
J35	–TXD	5.0	Input with 47KΩ pull-down	Transmitted data (active low)
J36	–RI	5.0	Output with 47KΩ pull-up	Ring indicator (active low)
J37	–DSR	5.0	Output with 47KΩ pull-up	Data set ready (active low)
J38	–CTS	5.0	Output with 47KΩ pull-up	Clear to send (active low)
J39	–DCD	5.0	Output with 47KΩ pull-up	Data carrier detect (active low)
J40	–DTR	5.0	Input with 47KΩ pull-down	Data terminal ready (active low)
J41	GND	GND	N/A	Ground
J58	–LED LINK	3.3	Open Drain	Link status (active low, can sink up to 150mA)
J61	VCC	5.0	Power	DC input power
J63	GND	GND	N/A	Ground

[1] A hyphen (-) indicates a range of acceptable logic levels.

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	
J37	–DSR	X	
J38	–CTS	X	
J39	–DCD	X	
J40	–DTR	X	
J41	GND	X	X

Pin	Signal Name	Serial Only	USB Only
J58	–LED LINK		X
J61	VCC	X	X
J63	GND	X	X

DSR Signal

The contained cellular module does not provide a signal output for Data Set Ready (DSR). To support legacy applications, the SocketModem provides a controllable output signal on that pin. Refer to the commands below to control the output.

Set the pin to output, with no pull, with 2mA drive strength:

```
AT+QGPIOS=4,0,1,0,0
```

Set the signal level high:

```
AT+QGPIOW=4,1
```

Set the signal level low:

```
AT+QGPIOW=4,0
```

Power Measurements

Multi-Tech Systems, Inc. recommends 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 a GSM850 transmission burst period or 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 input current at power on.

MTSMC-L1G2D Power Draw

Radio Protocol	Sleep Mode Current	Callbox Connection Idle (No Data)	(AVG) Measured Current at Max Power	TX Pulse (AVG) Amplitude Current for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge measured	Total Inrush Charge DURATION during Powerup (INRUSH Duration)
3.3 Volts						
GSM 850	24 mA	36 mA	278 mA	2.16 A	0.215 mC	2.28 mS
WCDMA (WS46=22)	24 mA	37 mA	690 mA	772 mA	0.215 mC	2.28 mS
LTE (WS46=28) Band 7	24 mA	37 mA	910 mA	1.02 A	0.215 mC	2.28 mS
5 Volts						
GSM 850	22 mA	32 mA	264 mA	1.08 A	0.260 mC	2.40 mS
WCDMA (WS46=22)	22 mA	31 mA	443 mA	520 mA	0.260 mC	2.40 mS
LTE (WS46=28) Band 7	22 mA	31 mA	570 mA	648 mA	0.260 mC	2.40 mS

MTSMC-L1G2D-U Power Draw

Radio Protocol	Sleep Mode Current if Applicable	Callbox Connection Idle (No Data)	(AVG) Measured Current at Max Power	TX Pulse (AVG) Amplitude Current for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge measured	Total Inrush Charge DURATION during Powerup (INRUSH Duration)
3.3 Volts						
GSM 850	N/A	58 mA	285 mA	2.19 A	0.231 mC	2.23 mS
WCDMA (WS46=22)	N/A	53 mA	980 mA	1.09 A	0.231 mC	2.23 mS
LTE (WS46=28) Band 7	N/A	60mA	907 mA	988 mA	0.231 mC	2.23 mS
5 Volts						
GSM 850	N/A	45 mA	239 mA	1.18 A	0.251 mC	2.34 mS
WCDMA (WS46=22)	N/A	45 mA	595 mA	680 mA	0.251 mC	2.34 mS
LTE (WS46=28) Band 7	N/A	45 mA	560 mA	640 mA	0.251 mC	2.34 mS

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.

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

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.

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

FCC Requirements

There cannot be any alteration to the authorized antenna system. The antenna system must be the same type with similar in-band and out-of-band radiation patterns and should not exceed the maximum gain information detailed in the FCC Grant.

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

LTE Antenna MISO

LTE devices use Multiple Input and Single output (MISO) to improve the downlink connection (cell tower to mobile). It has no effect on the uplink (mobile to cell tower).

Important: Always connect all included antennas for increased downlink bandwidth and better signal handling in diverse locations. 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.

Antenna Approvals and Safety Considerations

Note the following:

- Carriers conduct antenna diversity tests.
- 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.

Power Draw

There are no significant power draw differences.

OEM Integration

FCC & IC Information to Consumers

The user manual for the consumer must contain the statements required by the following FCC and IC regulations: 47 C.F.R. 15.19(a)(3), 15.21, 15.105 and RSS-Gen Issue 4 Sections 8.3 and 8.4.

FCC Grant Notes

The OEM should follow all the grant notes listed below. Otherwise, further testing and device approvals may be necessary.

FCC Definitions

Portable: (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

Mobile: (§2.1091) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

Actual content pending Grant: *This device is a mobile device with respect to RF exposure compliance. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons, and must not be collocated or operate in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product guidelines. Installers and end-users must be provided with specific information required to satisfy RF exposure compliance for installations and final host devices. (See note under Grant Limitations.) Compliance of this device in all final host configurations is the responsibility of the Grantee.*

> **Note:** Host design configurations constituting a device for portable use (<20 cm from human body) require separate FCC/IC approval.

Host Labeling

The following statements are required to be on the host label:

- This device contains FCC ID: RI7LE910CXWWX
- This device contains equipment certified under IC ID: 5131A-LE910CXWWX

For labeling examples, see *Approvals and Certification*

Chapter 5 – Safety Information

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.
- Switch OFF your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and is illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.
- Switch OFF your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your wireless device in hospitals and any other place where medical equipment may be in use.

Sécurité relative aux appareils à radiofréquence (RF)

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

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

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).

Vehicle Safety

When using your device in a vehicle:

- Do not use this device while driving.
- Respect national regulations on the use of cellular devices in vehicles.
- If incorrectly installed in a vehicle, operating the wireless device could interfere with the vehicle’s electronics. To avoid such problems, use qualified personnel to install the device. The installer should verify the vehicle electronics are protected from interference.
- Using an alert device to operate a vehicle’s lights or horn is not permitted on public roads.
- UL evaluated this device for use in ordinary locations only. UL did NOT evaluate this device for installation in a vehicle or other outdoor locations. UL Certification does not apply or extend to use in vehicles or outdoor applications.

User Responsibility

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

End user must operate product per country laws and rules

Device Maintenance

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

When maintaining your device:

- Do not misuse the device. Follow instructions on proper operation and only use as intended. Misuse could make the device inoperable, damage the device and/or other equipment, or harm users.
- Do not apply excessive pressure or place unnecessary weight on the device. This could result in damage to the device or harm to users.
- Do not use this device in explosive or hazardous environments unless the model is specifically approved for such use. The device may cause sparks. Sparks in explosive areas could cause explosion or fire and may result in property damage, severe injury, and/or death.
- Do not expose your device to any extreme environment where the temperature or humidity is high. Such exposure could result in damage to the device or fire. Refer to the device specifications regarding recommended operating temperature and humidity.
- Do not expose the device to water, rain, or spilled beverages. 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's accessory specifications may invalidate the warranty.

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

Chapter 6 – Regulatory Information

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

CE

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://www.multitech.com/red

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.

FCC Grant Information

FCC Identifier:	RI7LE910CXWWX
Equipment Class:	Part 15 Class B Computing Device Peripheral
Notes:	4G/3G/2G Module
Modular Type:	Single Modular
FCC Rule Parts:	15B

FCC Identifier:	RI7LE910CXWWX
Equipment Class:	PCS Licensed Transmitter
Notes:	4G/3G/2G Module
Modular Type:	Single Modular
FCC Rule Parts:	9, 22H, 24E, 27,

Rule Parts	Frequency Range	Power Output	Frequency Tolerance	Emission Designator
27	699-716 MHz	157 mW	2.5 ppm	9M04G7D
27	699-716 MHz	124 mW	2.5 ppm	9M04W7D
27	777-787 MHz	167 mW	2.5 ppm	9M01G7D
27	777-787 MHz	133 mW	2.5 ppm	9M04W7D
9	788-798 MHz	174 mW	2.5 ppm	9M01G7D
9	788-798 MHz	142 mW	2.5 ppm	9M03W7D
9	814-824 MHz	207 mW	2.5 ppm	8M99G7D
9	814-824 MHz	162 mW	2.5 ppm	8M97W7D
22H, 9	821.5 MHz	206 mW	2.5 ppm	13M5G7D
22H, 9	821.5 MHz	158 mW	2.5 ppm	13M5W7D
22H	824-849 MHz1	193 mW	2.5 ppm	13M5G7D
22H	824-849 MHz	168 mW	2.5 ppm	13M5W7D
22H	826.4-846.6 MHz	214 mW	2.5 ppm	4M14F9W
27	897.5-900.5 MHz	143 mW	2.5 ppm	2M73G7D
27	897.5-900.5 MHz	117 mW	2.5 ppm	2M73W7D
27	1.71-1.755 GHz	387 mW	2.5 ppm	17M9G7D
27	1.71-1.755 GHz	308 mW	2.5 ppm	17M9W7D
27	1.7124-1.7526 GHz	412 mW	2.5 ppm	4M14F9W
24E	1.85-1.915 GHz	361 mW	2.5 ppm	18M0G7D
24E	1.85-1.915 GHz	284 mW	2.5 ppm	18M0W7D
24E	1.8502-1.9098 GHz	1.394 W	2.5 ppm	246KGXW

Rule Parts	Frequency Range	Power Output	Frequency Tolerance	Emission Designator
24E	1.8502-1.9098 GHz	580 mW	2.5 ppm	243KG7W
24E	1.8524-1.9076 GHz	398 mW	2.5 ppm	4M14F9W
27	2.5-2.57 GHz	365 mW	2.5 ppm	18M0G7D
27	2.5-2.57 GHz	291 mW	2.5 ppm	18M0W7D

Single Modular Approval. Output power listed is conducted. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter evaluation procedures as documented in this filing. This device is to be used only for mobile and fixed application. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM integrators. OEM integrators must ensure that end-users are not provided with the module installation instructions. OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance. The highest antenna gain including cable loss, must not exceed 8.51 dBi for Band 2 and Band 25, 5.5 dBi for Band 4, 6.91 dBi for Band 5 and Band 26, 9.91 dBi for Band 8, 9.7 dBi for Band 12, 9.91 dBi for Band 13 and 14, and 9.01 dBi for Band 7. This device supports 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15MHz and 20 MHz bandwidth modes for LTE Bands 2/4/25; 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15MHz bandwidth modes for LTE Band 26; 1.4 MHz, 3 MHz, 5 MHz and 10 MHz bandwidth modes for LTE Bands 5/12; 5 MHz, 10 MHz, 15MHz and 20 MHz bandwidth modes for LTE Bands 7; 1.4 MHz and 3 MHz for LTE Band 8; 5 MHz and 10 MHz bandwidth modes for LTE Bands 14/13. This device contains functions that are not operational in U.S. Territories. This filing is only applicable for U.S. operations.

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.

Canadian Limitations

Notice: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

Notice: The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed five.

Limitations canadiennes

Avis: Cet équipement respecte les spécifications techniques des équipements terminaux d'Industrie Canada. Cette conformité est confirmée par le numéro d'enregistrement. L'abréviation IC précédant le numéro d'enregistrement signifie que l'enregistrement a été effectué conformément à une Déclaration de Conformité indiquant que les spécifications techniques d'Industrie Canada ont été respectées. Ceci n'indique pas que cet équipement a été approuvé par Industrie Canada.

Avis: L'IES (indice d'équivalence de la sonnerie) attribué à chaque terminal fournit une indication du nombre maximal de terminaux pouvant être connectés à une interface téléphonique. La terminaison d'une interface peut être constituée de n'importe quelle combinaison d'appareils à la seule condition que la somme des indices d'équivalence de sonnerie de l'ensemble des appareils ne dépasse pas cinq.

Industry Canada Grant Information

Company Number/Numéro de compagnie:	5131A
Company Name/Nom de compagnie::	Telit Communications S.p.A.
Certification Number/Numéro d'homologation:	5131A-LE910CXWWX
Approval Date/Date d'approbation:	Mon Nov 22 16:45:45 EST 2021
Hardware Version Identification Number (HVIN)/Numéro d'identification de la version du matériel (NIVM):	LE910C1-WWXD
Product Marketing Name (PMN)/Nom de marque du produit (NMP):	LE910C1-WWXD
Equipment Description/Description de l'équipement:	Data Terminal Module
Type of Radio Equipment/Genre d'équipement radio:	Cellular Network - Other Mobile Device

RF Exposure Results/Résultats d'exposition humaine aux RF

Type	Value/Valeur	Compliance Distance/Distance de conformité
RF	1.59 W/m2	200 mm

Emissions

Specification	Issue Number	Frequency Range		Emission Designator	Power	
		From	To		Min.	Max.
RSS130	2	699.7 MHz	715.3 MHz	1M11W7D	123.0 mW	123.0 mW
RSS130	2	699.7 MHz	715.3 MHz	1M11G7D	154.0 mW	154.0 mW
RSS130	2	700.5 MHz	714.5 MHz	2M72W7D	122.0 mW	122.0 mW
RSS130	2	700.5 MHz	714.5 MHz	2M72G7D	150.0 mW	150.0 mW
RSS130	2	701.5 MHz	713.5 MHz	4M53W7D	116.0 mW	116.0 mW
RSS130	2	701.5 MHz	713.5 MHz	4M57G7D	152.0 mW	152.0 mW
RSS130	2	704.0 MHz	711.0 MHz	9M04W7D	124.0 mW	124.0 mW
RSS130	2	704.0 MHz	711.0 MHz	9M04G7D	157.0 mW	157.0 mW
RSS130	2	779.5 MHz	784.5 MHz	4M54W7D	133.0 mW	133.0 mW
RSS130	2	779.5 MHz	784.5 MHz	4M55G7D	166.0 mW	166.0 mW
RSS130	2	782.0 MHz	782.0 MHz	9M04W7D	131.0 mW	131.0 mW
RSS130	2	782.0 MHz	782.0 MHz	9M01G7D	167.0 mW	167.0 mW
RSS132	3*	824.2 MHz	848.8 MHz	242KG7W	711.0 mW	711.0 mW
RSS132	3*	824.2 MHz	848.8 MHz	247KGXW	2352.0 mW	2352.0 mW

Specification	Issue Number	Frequency Range		Emission Designator	Power	
		From	To		Min.	Max.
RSS132	3*	824.7 MHz	848.3 MHz	1M11W7D	245.0 mW	245.0 mW
RSS132	3*	824.7 MHz	848.3 MHz	1M11G7D	299.0 mW	299.0 mW
RSS132	3*	825.5 MHz	847.5 MHz	2M71W7D	257.0 mW	257.0 mW
RSS132	3*	825.5 MHz	847.5 MHz	2M71G7D	317.0 mW	317.0 mW
RSS132	3*	826.4 MHz	846.6 MHz	4M14F9W	352.0 mW	352.0 mW
RSS132	3*	826.5 MHz	846.5 MHz	4M52W7D	251.0 mW	251.0 mW
RSS132	3*	826.5 MHz	846.5 MHz	4M56G7D	308.0 mW	308.0 mW
RSS132	3*	829.0 MHz	844.0 MHz	9M01W7D	261.0 mW	261.0 mW
RSS132	3*	829.0 MHz	844.0 MHz	9M01G7D	317.0 mW	317.0 mW
RSS133	6	1850.2 MHz	1909.8 MHz	243KG7W	580.0 mW	580.0 mW
RSS133	6	1850.2 MHz	1909.8 MHz	246KGXW	1394.0 mW	1394.0 mW
RSS133	6	1850.7 MHz	1909.3 MHz	1M11W7D	269.0 mW	269.0 mW
RSS133	6	1850.7 MHz	1909.3 MHz	1M10G7D	345.0 mW	345.0 mW
RSS133	6	1850.7 MHz	1914.3 MHz	1M11W7D	269.0 mW	269.0 mW
RSS133	6	1850.7 MHz	1914.3 MHz	1M10G7D	345.0 mW	345.0 mW
RSS133	6	1851.5 MHz	1908.5 MHz	2M72W7D	275.0 mW	275.0 mW
RSS133	6	1851.5 MHz	1908.5 MHz	2M72G7D	351.0 mW	351.0 mW
RSS133	6	1851.5 MHz	1913.5 MHz	2M72W7D	275.0 mW	275.0 mW
RSS133	6	1851.5 MHz	1913.5 MHz	2M72G7D	351.0 mW	351.0 mW
RSS133	6	1852.4 MHz	1907.6 MHz	4M14F9W	398.0 mW	398.0 mW
RSS133	6	1852.5 MHz	1907.5 MHz	4M54W7D	284.0 mW	284.0 mW
RSS133	6	1852.5 MHz	1907.5 MHz	4M59G7D	353.0 mW	353.0 mW
RSS133	6	1852.5 MHz	1912.5 MHz	4M54W7D	284.0 mW	284.0 mW
RSS133	6	1852.5 MHz	1912.5 MHz	4M59G7D	353.0 mW	353.0 mW
RSS133	6	1855.0 MHz	1905.0 MHz	9M00W7D	277.0 mW	277.0 mW
RSS133	6	1855.0 MHz	1905.0 MHz	9M01G7D	361.0 mW	361.0 mW
RSS133	6	1855.0 MHz	1910.0 MHz	9M00W7D	277.0 mW	277.0 mW
RSS133	6	1855.0 MHz	1910.0 MHz	9M01G7D	361.0 mW	361.0 mW
RSS133	6	1857.5 MHz	1902.5 MHz	13M5W7D	282.0 mW	282.0 mW
RSS133	6	1857.5 MHz	1902.5 MHz	13M5G7D	355.0 mW	355.0 mW
RSS133	6	1857.5 MHz	1907.5 MHz	13M5W7D	282.0 mW	282.0 mW

Specification	Issue Number	Frequency Range		Emission Designator	Power	
		From	To		Min.	Max.
RSS133	6	1857.5 MHz	1907.5 MHz	13M5G7D	355.0 mW	355.0 mW
RSS133	6	1860.0 MHz	1900.0 MHz	18M0W7D	265.0 mW	265.0 mW
RSS133	6	1860.0 MHz	1900.0 MHz	18M0G7D	323.0 mW	323.0 mW
RSS133	6	1860.0 MHz	1905.0 MHz	18M0W7D	265.0 mW	265.0 mW
RSS133	6	1860.0 MHz	1905.0 MHz	18M0G7D	323.0 mW	323.0 mW
RSS139	3*	1711.5 MHz	1753.5 MHz	2M72W7D	293.0 mW	293.0 mW
RSS139	3*	1711.5 MHz	1753.5 MHz	2M72G7D	367.0 mW	367.0 mW
RSS139	3*	1712.4 MHz	1752.6 MHz	4M14F9W	412.0 mW	412.0 mW
RSS139	3*	1712.5 MHz	1752.5 MHz	4M53W7D	282.0 mW	282.0 mW
RSS139	3*	1712.5 MHz	1752.5 MHz	4M58G7D	348.0 mW	348.0 mW
RSS139	3*	1715.0 MHz	1750.0 MHz	9M01W7D	293.0 mW	293.0 mW
RSS139	3*	1715.0 MHz	1750.0 MHz	9M01G7D	370.0 mW	370.0 mW
RSS139	3*	1717.5 MHz	1747.5 MHz	13M5W7D	308.0 mW	308.0 mW
RSS139	3*	1717.5 MHz	1747.5 MHz	13M4G7D	387.0 mW	387.0 mW
RSS139	3*	1720.0 MHz	1745.0 MHz	17M9W7D	306.0 mW	306.0 mW
RSS139	3*	1720.0 MHz	1745.0 MHz	17M9G7D	372.0 mW	372.0 mW
RSS140	1	790.5 MHz	795.5 MHz	4M54W7D	132.0 mW	132.0 mW
RSS140	1	790.5 MHz	795.5 MHz	4M58G7D	174.0 mW	174.0 mW
RSS140	1	793.0 MHz	793.0 MHz	9M03W7D	142.0 mW	142.0 mW
RSS140	1	793.0 MHz	793.0 MHz	9M01G7D	174.0 mW	174.0 mW
RSS199	3	2502.5 MHz	2567.5 MHz	4M51W7D	256.0 mW	256.0 mW
RSS199	3	2502.5 MHz	2567.5 MHz	4M52G7D	353.0 mW	353.0 mW
RSS199	3	2505.0 MHz	2565.0 MHz	9M02W7D	286.0 mW	286.0 mW
RSS199	3	2505.0 MHz	2565.0 MHz	8M99G7D	365.0 mW	365.0 mW
RSS199	3	2507.5 MHz	2562.0 MHz	13M5W7D	291.0 mW	291.0 mW
RSS199	3	2507.5 MHz	2562.5 MHz	13M5G7D	357.0 mW	357.0 mW
RSS199	3	2510.0 MHz	2560.0 MHz	18M0W7D	272.0 mW	272.0 mW
RSS199	3	2510.0 MHz	2560.0 MHz	18M0G7D	351.0 mW	351.0 mW

Chapter 7 – Environmental Notices

Waste Electrical and Electronic Equipment Statement

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

WEEE Directive

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

Instructions for Disposal of WEEE by Users in the European Union

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

July, 2005

Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc.

Certificate of Compliance

2015/863

Multi-Tech Systems, Inc. confirms that its embedded products comply with the chemical concentration limitations set forth in the directive 2015/863 of the European Parliament (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment - RoHS 3).

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

REACH-SVHC Statement

Registration of Substances

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

For the current REACH-SVHC statement, refer to additional regulatory documents at:
https://www.multitech.com/support/support

Chapter 8 – Labels

Example Labels

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

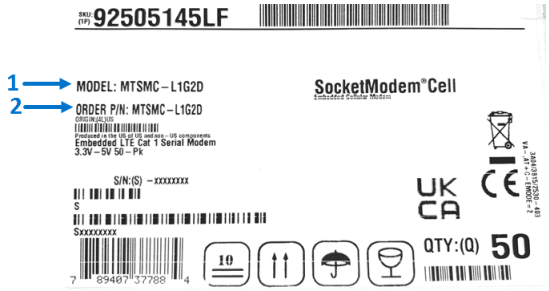
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label shown is not than actual size.

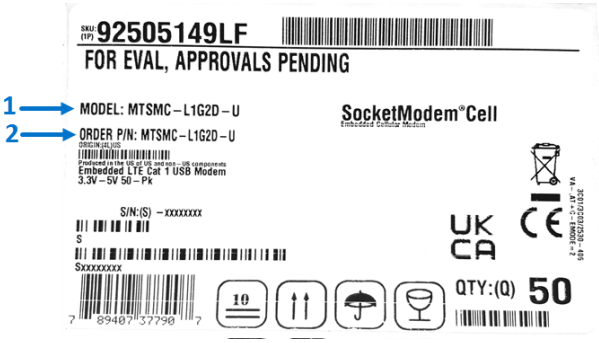
1 - MultiTech Model Identification.
2 - MultiTech Ordering Part Number.
3 - IMEI (International Mobile Equipment Identity).

MTSMC-L1G2D

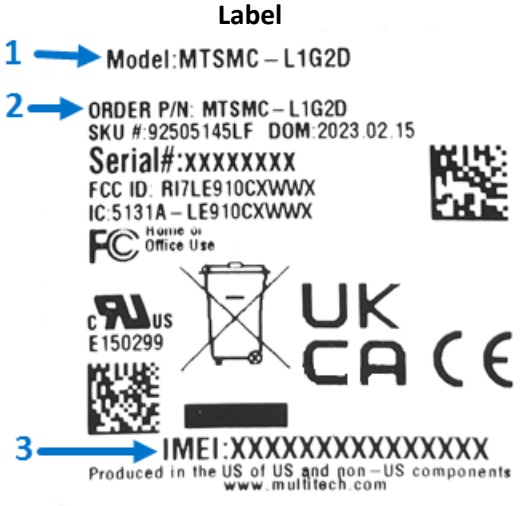
MTSMC-L1G2D Package Label



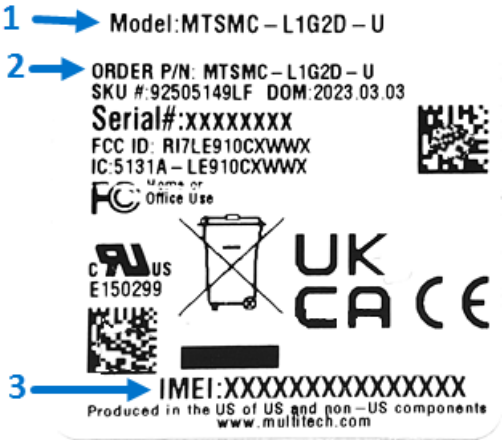
MTSMC-L1G2D-U Package Label



MTSMC-L1G2D Device Label



MTSMC-L1G2D-U Device Label



Chapter 9 – Basic Operations

Introduction

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

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

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

Before Using the Device

Before using the device:

- Install and cable the hardware. If using with the developer board, refer to the *Universal Developer Kit Developer Guide*
- 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, 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.

Switching Carrier Network for Cellular Radio

This device uses a cellular radio with global carrier firmware meaning that it can be used on different carrier networks (not simultaneously).

Verifying that your device is configured for your carrier network:

```
AT#FWSWITCH?
```

If response is:
`#FWSWITCH: 0`
The device is configured for AT&T/other networks.

If response is:
`#FWSWITCH: 1`
The device is configured for Verizon.

If response is:
`#FWSWITCH: 3`
The device is configured for Bell.

If response is:
`#FWSWITCH: 4`
The device is configured for Telus.

If response is:
`#FWSWITCH: 40`
The device is configured for Global.

If response is:
`#FWSWITCH: 102`
The device is configured for AT&T Mexico.

Switching carrier networks:

Note: This AT Command reboots the system.

:

Switch to Verizon:

```
AT#FWSWITCH=1,1
```

Switch to AT&T:

```
AT#FWSWITCH=0,1
```

Switch to Bell:

```
AT#FWSWITCH=3,1
```

Switch to Telus:

```
AT#FWSWITCH=4,1
```

Switch to Global:

```
AT#FWSWITCH=40,1
```

Switch to AT&T Mexico:

```
AT#FWSWITCH=102,1
```

Note: For the Link status (LS) LED to function, you must issue the command AT#GPIO=1,0,2 any time you use the firmware switch command (AT#FWSWITCH=0 or AT#FWSWITCH=1).

Configure APN Value

After properly setting up your account with your carrier and activating and installing your SIM card, you need to add your carrier's APN (Access Point Name) into the device before the cellular modem is ready for use.

Important: For Verizon, DO NOT complete Step 2. APN will establish OTA (Over The Air) and must not be manually entered.

To add your APN value:

1. Establish a terminal session with the device
2. If you are not on the Verizon network, program your network provider's Access Point Name (APN) into the device. To do this, issue:

   ```
   AT+CGDCONT=1,"IPV4V6","APN_Name"
   ```

   (where APN_Name is the APN provided by your wireless carrier).
   - Your wireless carrier assigns the APN. If you don't know the APN, contact your wireless carrier.

Your device should now be activated on the carrier's network and ready for use. To check operation issue the command: AT+CEREG? The modem should respond with +CEREG: 0,1 showing registration.

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:

```
+CEREG: 0,1
```

or

```
+CEREG: 0,5
```

The device is registered.

If the device returns:

```
+CEREG: 0,2
```

The device is in a network searching state.

If the device returns:

```
+CEREG: 0,3
```

The registration is denied.

If the device returns:

```
+CEREG: 0,0
```

The device is not currently attempting to register to a network.

Sending and Receiving Data

Connecting Device to TCP Server as TCP Client

To send data through a connect socket:

1. **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
```

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:
   `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. **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=100`
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=100`
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

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.

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.

Deleting Messages

To delete one text message, enter:

`AT+CMGD=1,#`

where 1 is the index in the selected storage and # is the delflag option. Enter:

0	Deletes message in the specified index.
1	Deletes all read messages from selected storage. 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-originated messages. Leaves unread messages.
4	Deletes all messages from selected storage.

For example:

Delete message at index 1:

```
AT+CMGD=1
```

Delete message at index 2:

```
AT+CMGD=2
```

Deletes messages at index 1:

```
AT+CMGD=1,0
```

Deletes read messages at index 2, leaves unread and stored device-originated messages:

```
AT+CMGD=2,1
```

Deletes read messages at index 2 and sent device-originated messages:

```
AT+CMGD=2,2
```

Check valid memory locations <index> and supported values of <deflag>:

```
AT+CMGD=?
+CMGD: (1,2,3,6,7,17,18,19,20,37,38,39,47),(0-4)
OK
```

Chapter 10 – Using Connection Manager

Use Connection Manager to:

- Install the latest device drivers.
- Connect your device to your carrier's network.
- 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://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. 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 1.

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. 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.

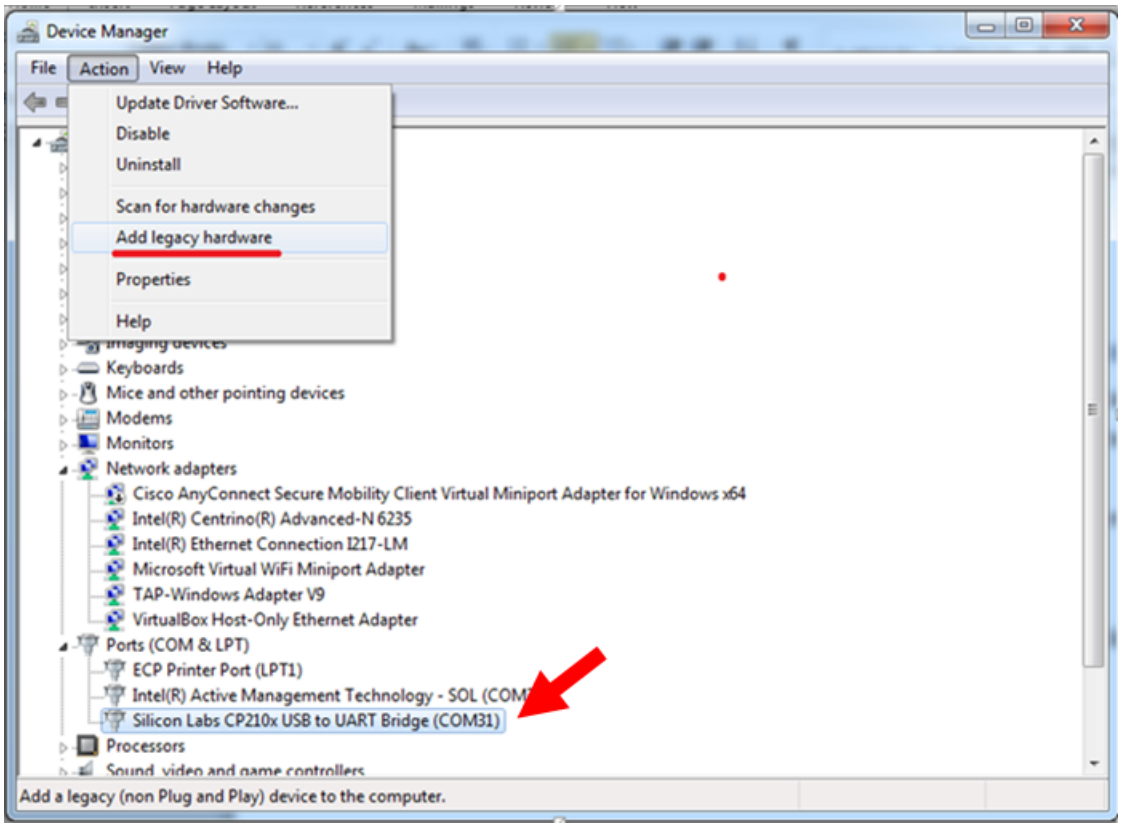
Setting Up a Serial Device in Windows Device Manager

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.
- If you have a serial device, 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.

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

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**.

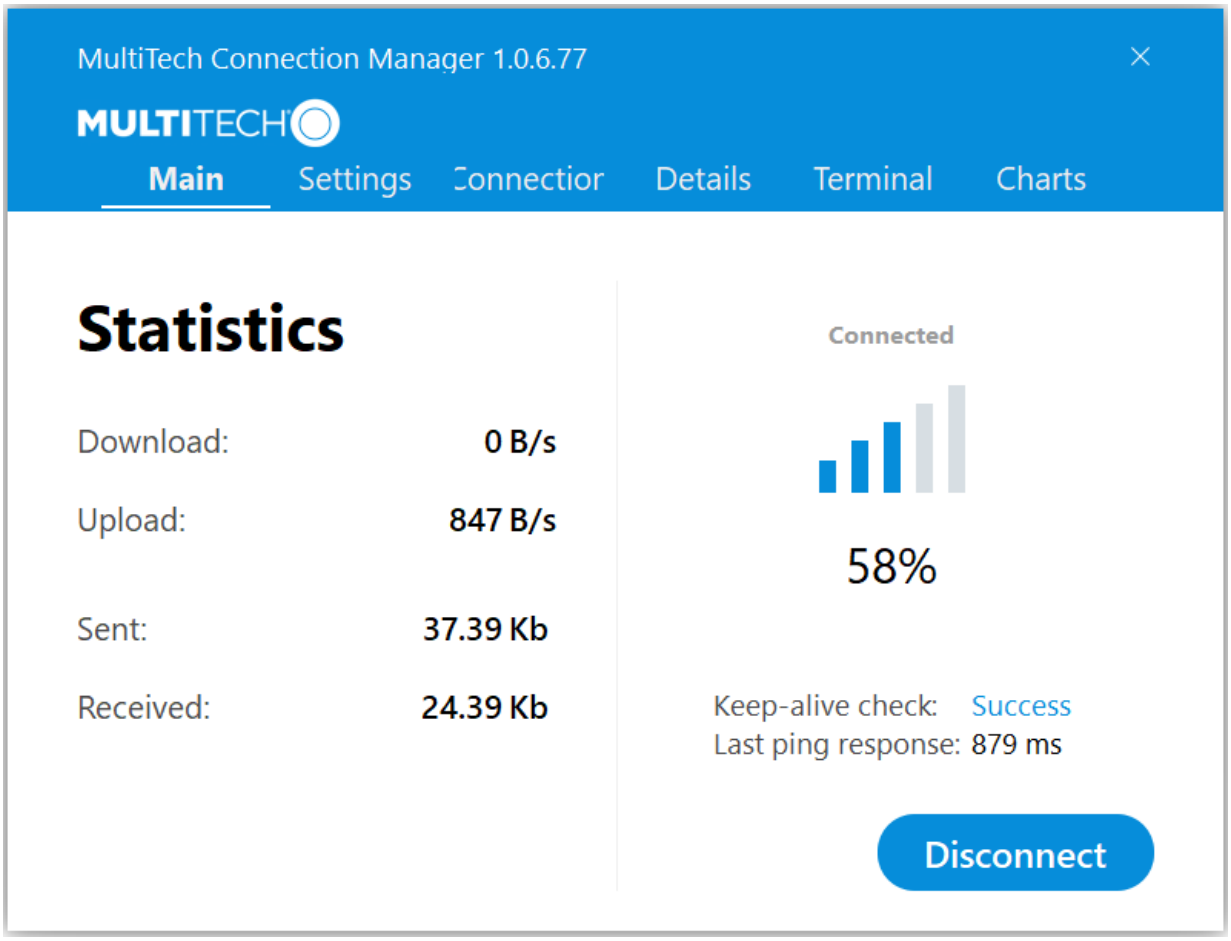
Connection Manager and the installed drivers are removed from the computer.

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.

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 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

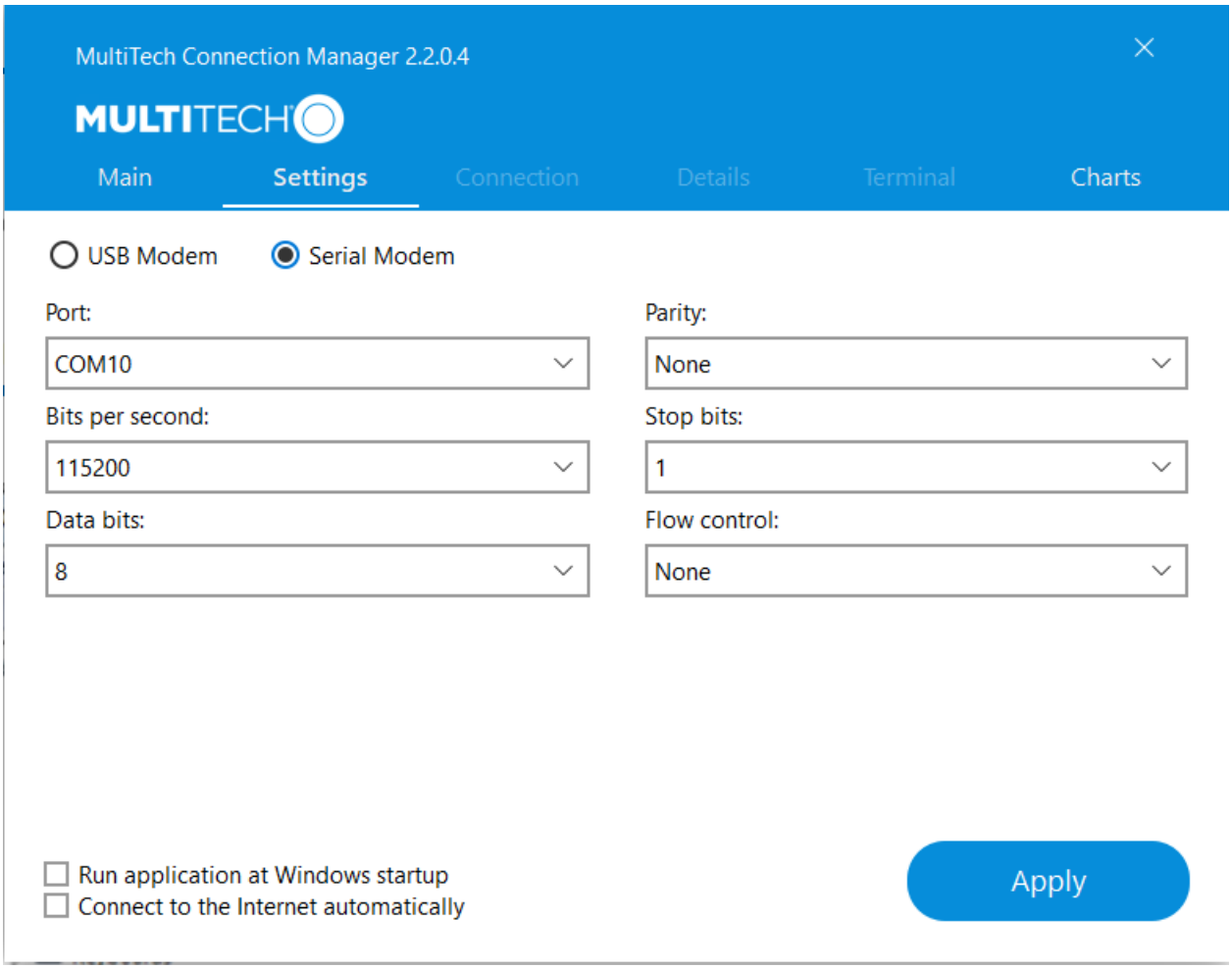
This error has the following causes and solutions.

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.

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.

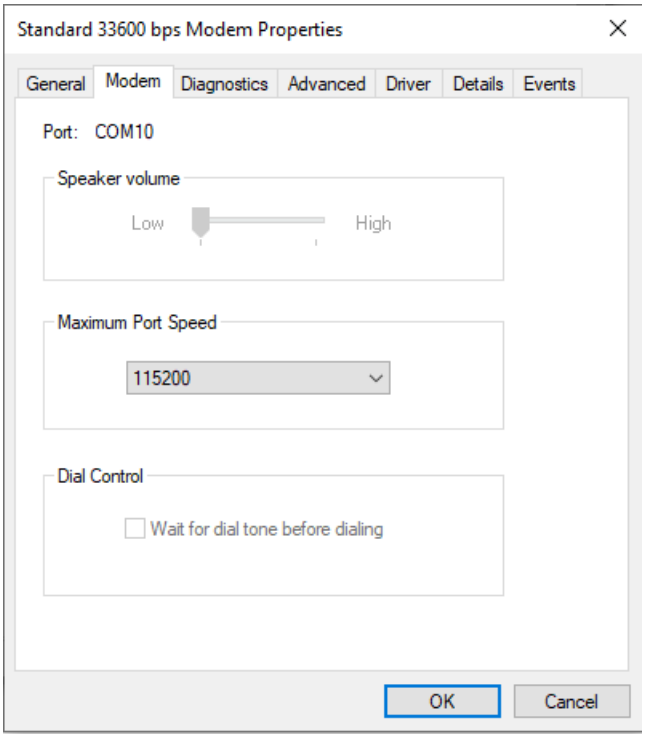
In **Connection Manager**, click on the **Settings** tab.



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

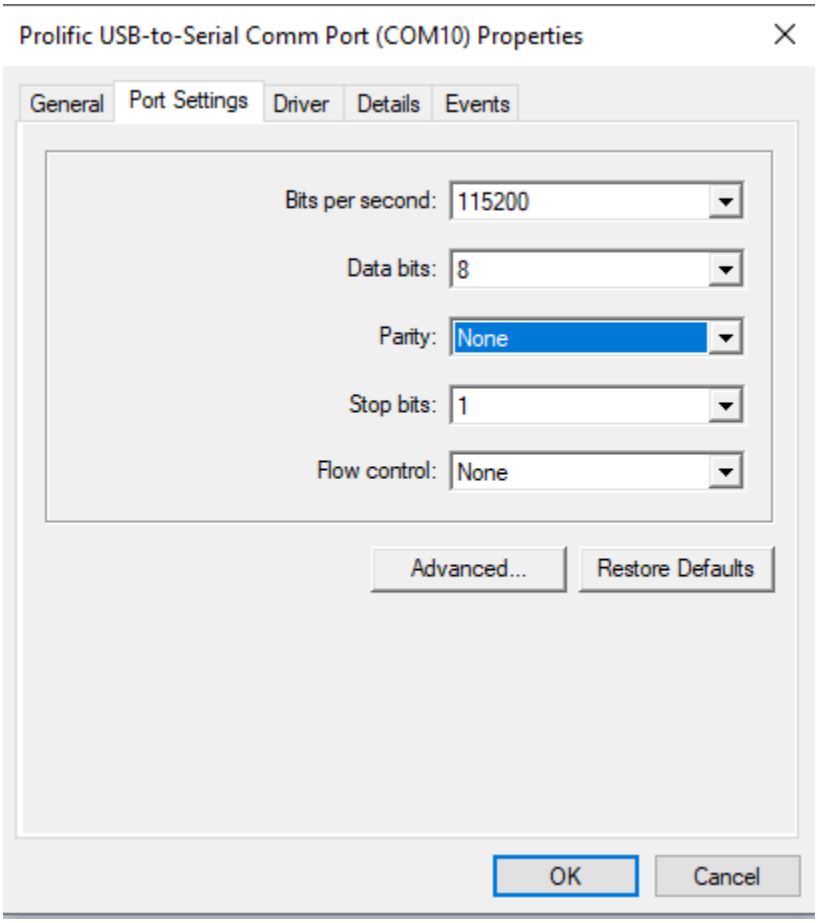
> **Note:** If Modems and Ports don't appear in Device Manager, open the **View** Menu and select **Show hidden devices**.

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


Prolific USB-to-Serial Comm Port (COM10) Properties
General
Port Settings
Driver
Details
Events
Bits per second:
115200
Data bits:
8
Parity:
None
Stop bits:
1
Flow control:
None
Advanced...
Restore Defaults
OK
Cancel

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