MULTITECH®





SocketModem® MTQN

MTQN-MNG1-B01 Device Guide

SocketModem® MTQN Device Guide

Models: MTQN-MNG1-B01

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Chapter 1 Product Overview

Overview

The SocketModem® MTQN cellular System-on-Module (SoM) is a small version of the SocketModem MTQ System-on-Module (SoM). Both embedded devices offer developers the functionality of an on-board cellular radio all-in-one compact design. The SocketModem MTQN provides a practical solution to the market's demand for a smaller, low-power module.

The SocketModem MTQN functions similarly to the SocketModem MTQ and maintains interoperability with legacy systems that use a 40-pin connector and forward mounting hole. All SocketModem software is open source.

Product Build Options

The available SocketModem MTQN modules are:

Model	Description	Region
MTQN-MNG1-B01	Embedded LTE Cat M1 Cellular SoM (Verizon/AT&T)	North America
Developer Kit		
MTUDK2-ST-CELL	SocketModem® & SocketModem MTQN Developer Kit	Global

Note: These units ship without network activation. To connect them to the cellular network, you need SIM cards from your service provider. The complete product code may end in .Rx. For example, MTQN-MNG1-B01.Rx, where R is revision and x is the revision number. All builds can be ordered individually or in 50-packs.

Documentation

This documentation is on the product page at https://multitech.com/all-products/cellular/embedded-modems/multitech-socketmodem-mtqn.

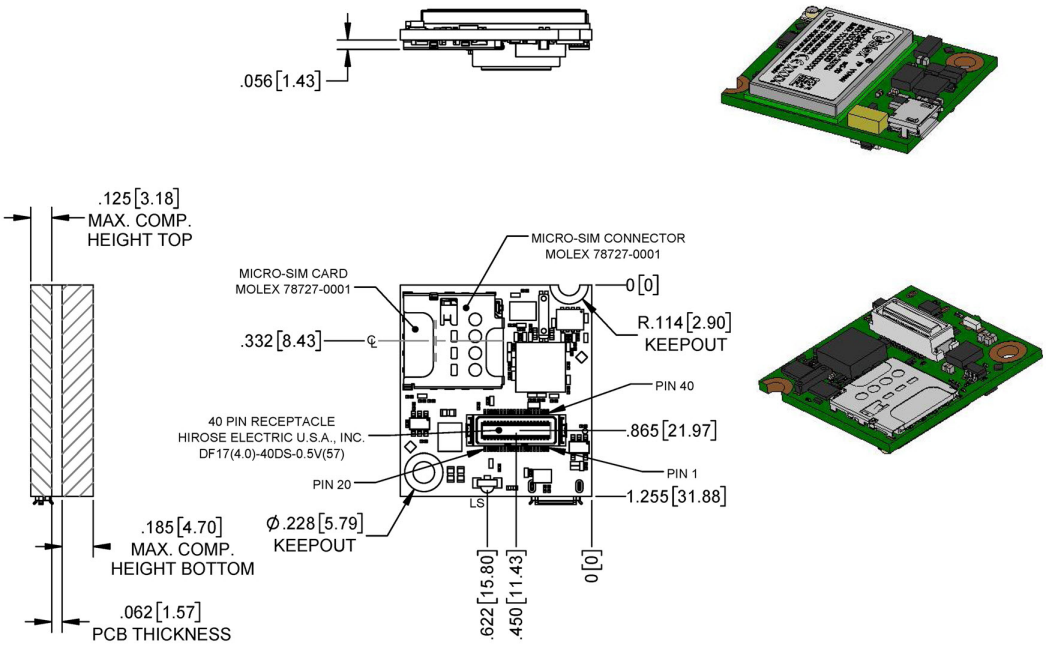
Document	Description	Part Number
MTQN-MNG1-B01 Device Guide	Provides model specifications and developer information regarding the B01 version of MTQN.	S000671
Universal Developer Kit 2.0 Developer Guide.	Provides information for using the developer board with the MTQN.	S000610
ST Microcontroller Data Sheet	Data sheet for processor STM32L471QG: https://www.st.com/en/microcontrollers/stm32l471qg.html	027226 Rev 1
Sara-R4 USB Driver Installation Guide	Provides instructions on how to install Windows USB driver.	N/A

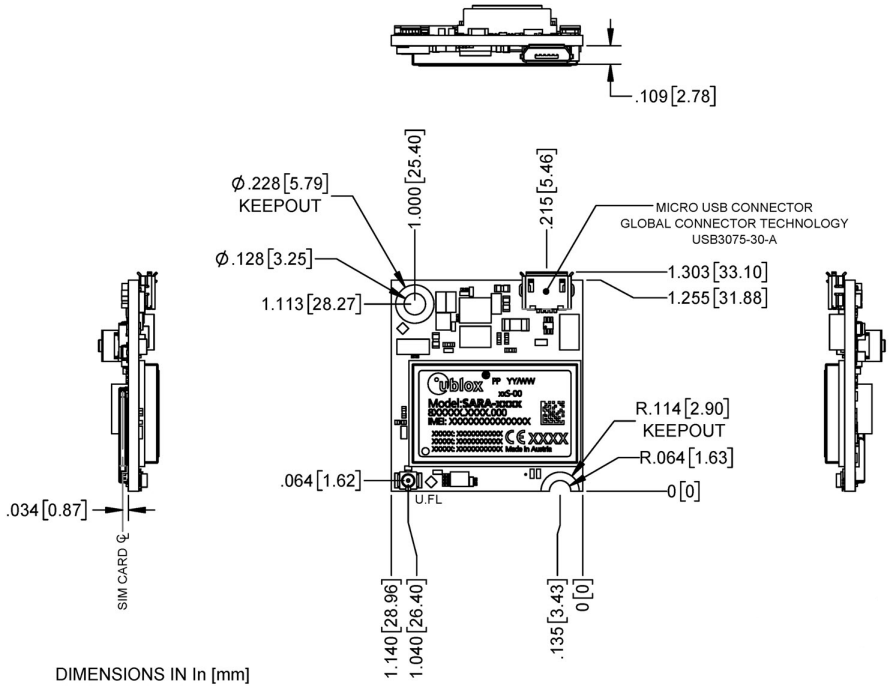
Document	Description	Part Number
Sara-R4/N4 series, AT Commands Manual	Provides AT commands and parameters used to configure your device.	UBX-17003787

Note: Additional documentation is available at www.multitech.net. See *Chapter 6, Getting Started* for details.

Chapter 2 Mechanical Drawings

MTQN-MNG1-B01





Chapter 3 Hardware and Specifications

Specifications

Category	Description	
Performance[1]	3GPP Release 13 Cat M1 Half Duplex (Up to 375K bps downlink and uplink)	
Frequency Band (MHz)	AT&T	Verizon
	700 MHz (B12), 850 MHz (B5), AWS1700 MHz (B4) and 1900 MHz (B2)	700 MHz (B13)
Interface		
Connectors	1 UFL (Cellular), 1x Micro USB, 1x 40-Pin Board-to-Board	
Host Processor	Cortex-M4 (STM32L471QG) 1 Mbyte Flash and 128 Kbyte SRAM (B01)	
I/O	1 x UART, 1 x HS USB, 2 x SPI, 2 x I2C, up to 9 analog inputs and up to 29 digital input/output	
SMS	Mobile Terminate/Mobile Originate PDU / Text mode	
Physical Description		
Weight	less than 0.3 oz (8.5g)	
Dimensions	28.96mm x 32.51mm (1.14 x 1.28 inches). Refer to Mechanical Drawings for details.	
Connectors		
Antenna	1 surface mount U.FL: cellular	
SIM Holder	1.8 V and 3 V Micro SIM (3FF) card. SIM denotes: Subscriber Identity Module.	
Pin header	40-pin female for USB or UART	
Environment		
Operating Temperature[2]	-40° C to +85° C (-40° F to +185° F)	
Storage Temperature	-40° C to +85° C (-40° F to +185° F)	
Humidity[3]	15%-93% RH, non-condensing	
Power Requirements		
Input Voltage (using micro-USB connector)	5.0 VDC	
Input Voltage (using 40-pin connector)	3.3 VDC or 5.0 VDC	
Certifications and Compliance		

Category	Description	
EMC Compliance	FCC Part 15 Class B	
Radio Compliance	FCC Part 22, 24, 27	
Safety Compliance	UL/cUL 60950-1 2nd ED, IEC 60950-1 2nd ED +Am.2	
Network	PTCRB	N/A
Carrier	AT&T	Verizon

[1]Actual performance speeds may be affected by a variety of attributes such as cell tower distance, data loads, packet sizes, etc.

[2]Device has been tested up to +85° C. UL Recognized @ 85° C.

[3]Radio performance may be affected by temperature extremes. This is normal.

Mounting Hardware

The board has two mounting holes at the corners. Use #4 or M3 hardware for mounting the SocketModem MTQN to the board. Refer to the Mechanical Drawings for more information.

Here are some standoffs that can be used with this product.

Recommended Parts

Manufacturer	Part	Part Number
PEM (Penn Engineering & Manufacturing)	Surface Mount Standoff	SMTSO-M3-6
RAF Electronic Hardware	6mm Hex Female Standoff	1251-3005-S-12-Zinc

Note 1: We recommend grounding the standoffs to the main PCB for better performance.

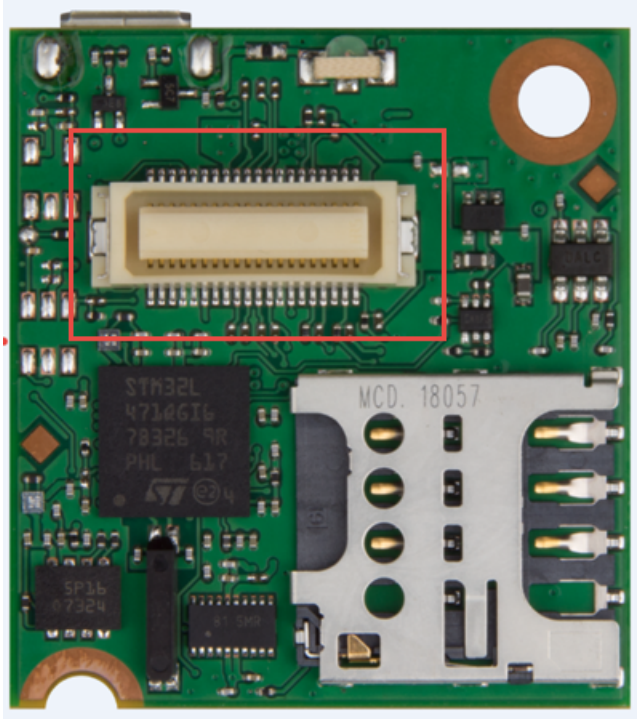
Note 2: For other stacking heights, refer to the Hirose DF17 Series 0.5mm Pitch Board to Board Connector Data Sheet to select the appropriate spacers.

40-Pin Connector Definitions

The SocketModem MTQN offers developers an FCC and carrier certified solution that makes connecting sensors and other edge-of-network devices quick and easy.

40-Pin Connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21



MTQN-MNG1-B01 Pin Definitions

Note: To program and use the SocketModem MTQN, you will need a UDK2 Developer Kit.

For more pinout information and other details, refer to the STM32L471QG processor manual. In addition to their stated functions, all GPIO pins (PA_*, PB_*, PC_*, PG_*) can also be used as Digital-In and Digital-Out interfaces.

Hardware Pinout Information

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
B5	PB6	FT_fa	DBG_TX	1		Programming , Output from MTQN
A10	PA14_SWCLK	FT	J_TCK/SWCLK	2		Programming
A9	PA15	FT	J_TDI/C_MON	3		Programming
A7	PB4	FT_a	J_RST	4		Programming
J1	GND		GND	5		GND
F2	VSS1		GND	13		GND
E3	VSS2		GND	28		GND
F6	VSS3		GND	36		GND
F12	VSS4		GND	37		GND

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
F11	VSS5		GND	5		GND
F7	VSS6		GND	5		GND
D3	VSS7		GND	5		GND
	USB_DP		USB_DP	6		USB_DP
	USB_DM		USB_DM	7		USB_DM
	VCC-IN		VCC-IN	8		VCC-IN
	VCC-IN		VCC-IN	33		VCC-IN
K3	PA2	FT_a	IO_00/RXD	9	D1	Serial Comm output from MTQN
J5	PA7	FT_a	IO_01/DCD	10	D4	Serial Comm output from MTQN
M5	PB0	TT_a	IO_02/RI	11	D8	Serial Comm output from MTQN
M2	PA1	FT_a	IO_03/RTS	12	D6	Serial Comm input to MTQN
C5	PB5	FT_a	IO_04/MOSI1	14	D11	GPIO / MOSI output from MTQN
G10	PG2	FT_s	IO_05/SCK1	15	D13	GPIO & PA5 as well
A3	PB8	FT_f	IO_06/SCL/SS1	16	D15	GPIO, 4.7K pull up
K10	PB15	FT	IO_07/MOSI2	17	D2	GPIO / MOSI output from MTQN
J3	PC2	FT_a	IO_08/MISO2	18	A0	GPIO / MISO input to MTQN
D2	PE6	FT	IO_09	19	A3	GPIO
C1	PC13	FT	IO_10	20	A1	GPIO
L4	PA6	FT_a	IO_11	21	A4	GPIO
K5	PC4	FT_a	IO_12	22	A2	GPIO
L10	PB10	FT_f	IO_13/SCK2	23	D9	GPIO
J6	PG8	FT_fs	IO_14	24	A5	GPIO

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
B3	PB9	FT_f	IO_15/SDA/SRDY	25	D14	GPIO, 4.7K pull up
F9	PG3	FT_s	IO_16/MISO1	26	D12	GPIO / MISO input to MTQN
E10	PC8	FT	IO_17/SS2	27	D10	GPIO
L2	PA0	FT_a	IO_18/CTS	29	D3	Serial Comm output from MTQN
D10	PA9	FT	IO_19/DSR	30	D5	Serial Comm output from MTQN
H4	PG7	FT_fs	IO_20/DTR	31	D7	Serial Comm input to MTQN
L3	PA3	TT	IO_21/TXD	32	D0	Serial Comm input to MTQN
			LS	34		Link status output from Cell radio, 47K pull up
A8	PB3	FT_a	J_TDO/SWO	38		JTAG
A11	PA13_SWDIO	FT	J_TMS/SWDIO	39		JTAG
B4	PB7	FT_fa	DBG_RX	40		Programming , Input to MTQN
A4	BOOT0	B	3V3 or GND			Boot option, tied low
	GND					
H2	NRST	Reset	N_RESET			Reset Input, 47K pull up, active low
	NRST_IN			35		Reset input from 40-Pin, connected to NRST by 47K resistor
	NRST_IN					

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
L12	PB12	FT	VCC-IN_MEAS_EN			Control for enabling power measurement, pulled low with 100K resistor
H1	PC0	FT_fa	VCC-IN_MEAS			Ananlog power measurement
B11	PC10	FT	FLASH_SCK			FLASH_SCK, 47K pull down
C10	PC11	FT	FLASH_MISO			FLASH_MISO
B10	PC12	FT	FLASH_MOSI			FLASH_MOSI
D1	PC14_OSC32 IN	FT	32K Clock			32K Clock
E1	PC15_OSC32 OUT	FT	32K Clock			32K Clock
K2	PC3	FT_a	RADIO_PWR			RADIO_PWR, enable for cell regulator, 47K pull down
L5	PC5	FT_a	1V8_MON			Radio Control Feedback, 100K pull down
E12	PC6	FT	BUF_EN			Buffer Power Control, 100K pull up, active low
J12	PD10	FT	RADIO_RI			Serial for Radio
J11	PD11	FT	RADIO_CTS			Serial for Radio
J10	PD12	FT	RADIO_RTS			Serial for Radio
H12	PD13	FT	RADIO_DTR			Serial for Radio

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
H11	PD14	FT	RADIO_DCD			Serial for Radio
H10	PD15	FT	RADIO_DSR			Serial for Radio
K9	PD8	FT	RADIO_TXD			Serial for Radio
K8	PD9	FT	RADIO_RXD			Serial for Radio
A2	PE1	FT	VMEM_EN			Power control for Flash, 100K pull up, active low
M9	PE11	FT	CELL_GPIO5			GPIO to RADIO
M10	PE13	FT	CELL_GPIO2			GPIO to RADIO
M11	PE14	FT	CELL_GPIO3			GPIO to RADIO
M12	PE15	FT	CELL_GPIO4			GPIO to RADIO
A1	PE3	FT	VUSB_DET			USB Select, Active low for Serial mode, 100K pull down
B1	PE4	FT	RADIO_ONOFF			Radio power control, 100K pull down
E4	PF3	FT_a	RADIO_RESET			RADIO_RESET control, 100K pull down
D7	PG12	FT_s	FLASH_NSS			FLASH_NSS, active low
E2	VBAT		VRTC			VRTC
G2	VDD1		3V3			3V3
H3	VDD2		3V3			3V3
G6	VDD3		3V3			3V3

Processor Pin Number	Processor Pin Name	IO Type	Net name	40 Pin	UDK2 pin /Arduino	Primary Function
G12	VDD4		3V3			3V3
C11	VDD5		3V3			3V3
G11	VDD6		3V3			3V3
C4	VDD7		3V3			3V3
M1	VDDA		3V3			3V3
G7	VDDIO2		3V3			3V3
L1	VREF+		3V3			3V3

Data taken from STM32L471QG processor datasheet.

Key for IO type values:

FT 5V tolerant IO

TT 3.6V tolerant IO

B Dedicated Boot pin

RST Reset pin

_f IO, Fm+ capable

_a IO, with Analog supplied by VDDA

_s IO, supplied by VDDIO2

Software Pinout Information

The names in this table are defined in the PinNames.h file in mbed-os at the following path: mbed-os\targets\target_stm\target_stm32l4\target_mts_dragonfly_l471qg

Pin	UDK2	Primary	Alternate names
PA_0	D3	UART2_CTS	TIM5_1, ADC1_IN13, ADC2_IN13, SERIAL_CTS, IO_18, WAKEUP, LED1, LED2, LED3, LED4
PA_1	D6	UART2_RTS	TIM5_2, ADC1_IN6, ADC2_IN6, SERIAL_RTS, IO_03
PA_13		J_TMS	
PA_14		J_TCK	
PA_15		J_TDI	TIM2_1
PA_2	D1	UART2_TX	TIM2_3, TIM5_3, ADC1_IN7, ADC2_IN7, SERIAL_TX , IO_00

Pin	UDK2	Primary	Alternate names
PA_3	D0	UART2_RX	ADC1_IN8, ADC2_IN8, SERIAL_RX , IO_21
PA_6	A4	IO_11	ADC1_IN11, ADC2_IN11
PA_7	D4	UART2_DCD	TIM3_2, TIM7_1, ADC1_IN12, ADC2_IN12, SERIAL_DCD, IO_01
PA_9	D5	UART2_DSR	SERIAL_DSR, IO_19
PB_0	D8	SERIAL_RI	TIM3_3, ADC1_IN15, ADC2_IN15, IO_02
PB_10	D9	SPI2_SCK	IO_13
PB_12		VCC_IN_MEAS_EN	
PB_15	D2	SPI2_MOSI	IO_07
PB_3		J_TDO	TIM2_2
PB_4		J_RST	TIM3_1
PB_5	D11	SPI1_MOSI	IO_04
PB_6		UART1_TX	USBTX
PB_7		UART1_RX	USBRX
PB_8	D15	I2C1_SCL	TIM4_3, CAN1_RX, IO_06
PB_9	D14	I2C1_SDA	CAN1_TX, IO_15
PC_0		VCC_IN_MEAS	
PC_10		SPI3_SCK	
PC_11		SPI3_MISO	
PC_12		SPI3_MOSI	
PC_13	A1	IO_10	
PC_14		32K	
PC_15		32K	
PC_2	A0	SPI2_MISO	ADC1_IN3, ADC2_IN3, ADC3_IN3, IO_08, ADC1_IN1, ADC2_IN1, ADC3_IN1
PC_3		RADIO_PWR	
PC_4	A2	IO_12	ADC1_IN13, ADC2_IN13
PC_5		MON_1V8	
PC_6		BUF_EN	
PC_8	D10	IO_17	TIM8_3

Pin	UDK2	Primary	Alternate names
PD_10		RADIO_RI	MDMRI
PD_11		RADIO_CTS	MDMCTS, UART3_CTS
PD_12		RADIO_RTS	MDMRTS, UART3_RTS
PD_13		RADIO_DTR	MDMDTR
PD_14		RADIO_DCD	MDMDCD
PD_15		RADIO_DSR	MDMDSR
PD_8		RADIO_TX	MDMTXD
PD_9		RADIO_RX	MDMRXD , UART3_RX
PE_1		VMEM_EN	
PE_11		CELL_GPIO5	
PE_13		CELL_GPIO2	
PE_14		CELL_GPIO3	
PE_15		CELL_GPIO4	
PE_3		VUSB_DET	
PE_4		RADIO_ONOFF	MDMPWRON
PE_6	A3	IO_09	
PF_3		RADIO_RESET	MDMRST
PG_12		SPI3_SSEL	
PG_2	D13	SPI1_SCK	IO_05
PG_3	D12	SPI1_MISO	IO_16
PG_7	D7	UART2_DTR	I2C3_SCL, SERIAL_DTR, IO_20
PG_8	A5	IO_14	I2C3_SDA

40-Pin Connector

Manufacturer	Hirose Electric Co LTD
Description	.5MM 40 PN B>B RECEPTACLE
Model Number	DF17(4.0)-40DP-0.5V(57)

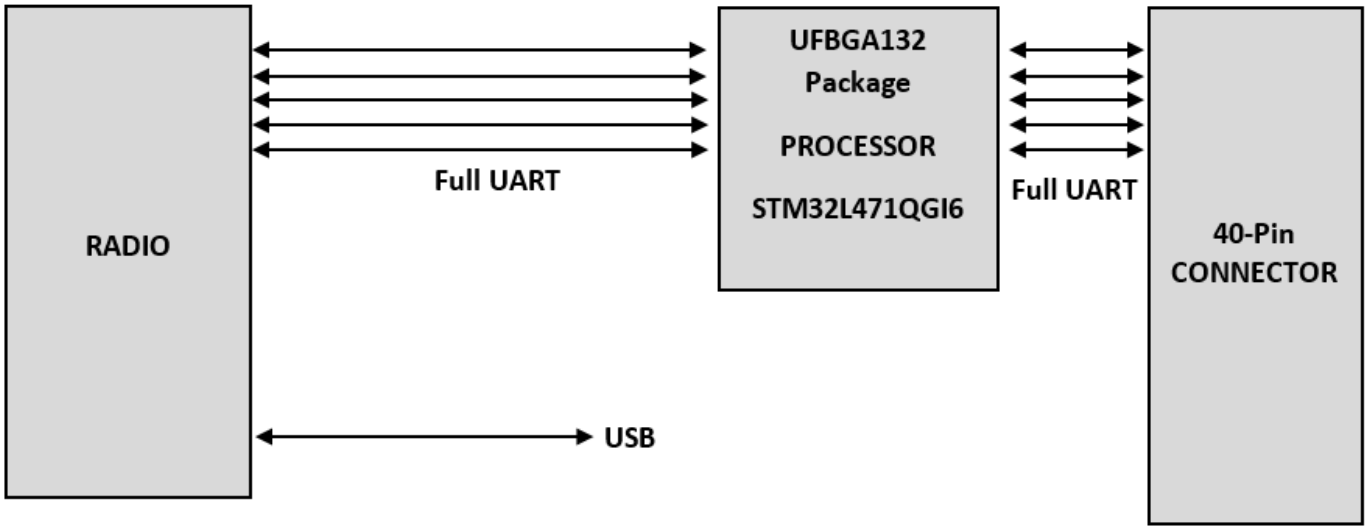
Use with:

Manufacturer	Hirose Electric Co LTD
Description	.5mm 40 pin B.B header PLUG
Model Number	DF17(2.0)-40DP-0.5V(57)

Communications Flow

MTQN-MNG1-B01

The MTQN-MNG1-B01 provides full UART from the cellular radio to the processor as well as the user application. Model B01 provides a direct USB interface connection to the radio, but not through the 40-pin connector.



Switching between the USB interface and serial port requires a reset. The cellular radio checks for a USB connection upon reset. If USB is not present, it only uses the serial port. If USB is present upon reset, it only uses USB.

Electrical Characteristics

Operating Conditions

Parameter	Minimum Volts	Maximum Volts
Supply Range - Vcc	3.3 VDC +/- 5%	5.0 VDC +/- 5%

Absolute Maximum Ratings

Symbol	Description	Conditions	Min.	Max.	Unit
SIM	SIM interface	Input DC voltage at SIM digital interfaces pins	-0.3	3.9	V
P_ANT	Antenna power	Input RF power at ANT pin		-22	dbM
Rho_ANT	Antenna ruggedness	Output RF load mismatch ruggedness at ANT pins		10.1	VSWR
tstg	Storage Temperature		-40	85	°C
V_P	Voltage at any pin	Voltage at any signal pin	-0.3	4	V

Symbol	Description	Conditions	Min.	Max.	Unit
V_{DDX} - V_{SS}	External voltage	V_{DDX} , V_{DDA},V_{DDIO2}, V_{BAT}[1]	-0.3	4	V
V_{IN}[2]	Input Voltage	Input voltage on FT_xxx pins	V_{SS}-0.3	min (V_{DD}, V_{DDA},V_{DDIO2}) + 4.0[3 & 4]	V
		Input voltage on TT_xx pins	V_{SS}-0.3	4.0	V
		Input voltage on BOOT0 pin	V_{SS}	9.0	V
		Input voltage on any other pins	V_{SS}-0.3	4.0	V
$\|\Delta V_{DDx}\|$	Variations between power pins	Variations between different V_{DDX} power pins of the same domain	N/A	50	mV
$\|V_{SSx}-V_{SS}\|$	Variations between ground pins	Variations between all the different ground pins[5]	N/A	50	mV

Data taken from STM32L471QG processor datasheet.

(1) All main power (V_{DD}, V_{DDA}, V_{DDIO2}, V_{BAT}) and ground (V_{SS}, V_{SSA}) pins must always be connected to the external power

(2) V_{IN} maximum must always be respected. Refer to Nominal Ratings for the maximum allowed injected current values.

(3) This formula has to be applied only on the power supplies related to the IO structure described in the pin definition table.

(4) To sustain a voltage higher than 4 V the internal pull-up/pull-down resistors must be disabled.

(5) Include VREF- pin.

Nominal Ratings

Symbol	Ratings	Max Voltage (mA)
ΣIV_{DD}	Total current into sum of all VDD power lines (source)[1]	150
ΣIV_{SS}	Total current out of sum of all VSS ground lines (sink)[1]	150
$IV_{DD(PIN)}$	Maximum current into each VDD power pin (source)[1]	100
$IV_{SS(PIN)}$	Maximum current out of each VSS ground pin (sink)[1]	100
$I_{IO(PIN)}$	Output current sunk by any I/O and control pin except FT_f	20
	Output current sunk by any FT_f pin	20
	Output current sourced by any I/O and control pin	20

Symbol	Ratings	Max Voltage (mA)
$\Sigma I_{IO(PIN)}$	Total output current sunk by sum of all I/Os and control pins$_2$	100
	Total output current sourced by sum of all I/Os and control pins$_2$	100
$I_{INJ(PIN)}$[3]	Injected current on FT_xxx, TT_xx, RST and B pins, except PA4, PA5	-5/+0[4]
	Injected current on PA4, PA5	
$\Sigma\|I_{INJ(PIN)}\|$	Total injected current (sum of all I/Os and control pins)[5]	-5/0
		25

Data taken from STM32L471QG processor datasheet.

(1) All main power (V_{DD}, V_{DDA}, V_{DDIO2}, V_{BAT}) and ground (V_{SS}, V_{SSA}) pins must always be connected to the external power, in permitted range.

(2) This current consumption must be correctly distributed over all I/Os and control pins. The total output current must not be sunk/sourced between two consecutive power supply pins referring to high pin count QFP packages.

(3) Positive injection (when $V_{IN} > V_{DDIOx}$) is not possible on these I/Os and does not occur for input voltages lower than the specified maximum value.

(4) A negative injection is induced by $V_{IN} < V_{SS.\ IINJ(PIN)}$ must never be exceeded. Refer to the Absolute Maximum Ratings table for the minimum allowed input voltage values.

(5) When several inputs are submitted to a current injection, the maximum $\Sigma|I_{INJ(PIN)}|$ is the absolute sum of the negative injected currents (instantaneous values).

Power Draw

Voltage	Radio Protocol	Sleep Mode Current	Power Saving Mode	(AVG) Measured Current at Max Power[1]	TX Pulse [2](AVG) Amplitude Current for Peak Current	Total Inrush Charge[3] in MilliCoulombs (mC)
3.8 VDC	LTE	21.943 µA				
5.0 VDC	LTE		4.702 µA	155.421 mA	315.532 mA	0.00792

[1]**Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power.

[2]**Tx Pulse:** The average peak current during a GSM 850 transmission burst period or LTE connection. The transmission burst duration for GSM 850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).

[3]**Inrush Charge:** The total inrush charge at power on.

USB Cable Recommendations

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

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

Chapter 4 Antennas

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 Safety Instructions

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.

General Safety

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

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

Attention: Maintenir une distance d'au moins 20 cm (8 po) entre l'antenne du récepteur et le corps de l'utilisateur ou à proximité de personnes. Le modem n'est pas conçu pour, ou destinés à être utilisés dans les applications portables, moins de 20 cm du corps de l'utilisateur.

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 6 Getting Started

Developing with an MTQN in Mbed

The MTQN ships with AT pass-through firmware, which directly connects the cellular radio to a serial port made available via micro USB connector J6 on the MTUDK2-ST-CELL developer board. The firmware:

- Runs at 115200 baud by default to match with the cellular radio's default baud rate.
- Prints debug messages from the debug port at 115200 baud.
- Allows users to increase or decrease the application's baud rate by entering a plus (+) or minus (-) character on the USB debug port. Issuing a plus or minus character on the USB debug port changes the external serial port speed as well as the speed of the link between the processor and the radio. The speed of the USB debug port on reset is always 115200 to match the radio's default regardless of the baud rate used at the time of reset.
- Uses RTS/CTS flow control on the serial connection to the radio and on the external serial connection. Enables RTS/CTS flow control on terminal emulators used with the AT pass-through firmware.

About Mbed

ARM Mbed is a free, open-source platform and operating system for embedded devices using the ARM Cortex-M microcontrollers. The platform includes a standards-based C/C++ SDK, a microcontroller HDK, and supported development boards, an online compiler and online developer collaboration tools.

Programming the MTQN Microcontroller

With the MTQN and the MTUDK2-ST-CELL developer board, use the ARM Mbed ecosystem to program the microcontroller. Compile in the cloud or locally, copy the resulting binary file to the Mbed USB drive, and reset the MTQN-MNG1.

MTQN software is open source.

Useful Links

Description	Link
MTUDK2-ST-CELL developer guides (see Manuals for different versions)	https://www.multitech.com/models/94557065LF
Serial Flash Datasheet (pdf):	http://www.micron.com (refer to P/N M25P16)
Additional Information:	https://multitech.com/all-products/cellular/embedded-modems/multitech-socketmodem-mtqn

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).

ST Microcontroller STM32L471QG

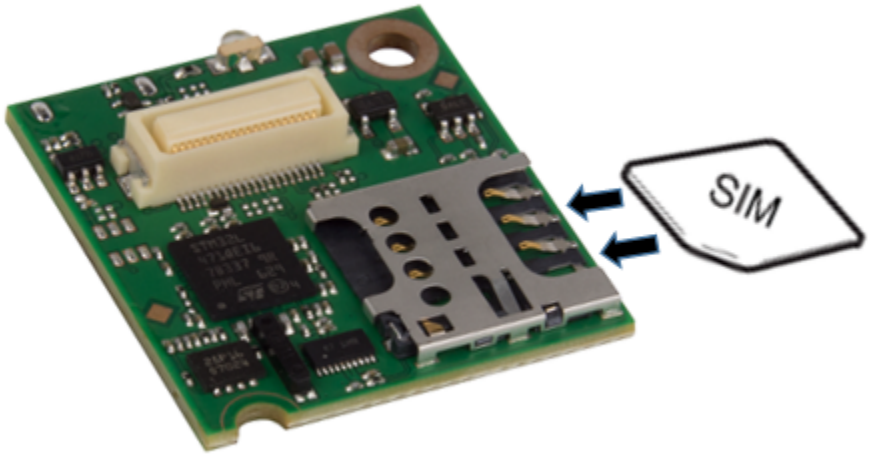
For the ST microcontroller STM32L471QG reference manual and datasheet, refer to the product page at https://www.st.com/en/microcontrollers/stm32l471qg.html.

Installing a SIM Card

Note: All SocketModem MTQN models require the use of a Micro SIM (3FF) card.

To install the SIM card:

- Refer to the image below.
- Slide the SIM card completely into the SIM holder.



Configuring u-blox Cellular Radio

This MNG1 device uses a cellular radio that can operate on different carrier networks (not simultaneously).

You must configure your module based on your carrier network and application. This includes setting the applicable MNO profile (based on carrier), RAT (type of technology you wish to use such as Cat M1), and

LTE bands intended for the application device and within regulatory compliance. The module is not intended be used in the factory-default setting.

Depending on your MNO profile, certain elements may or may not be available. Refer to the table for details.

Updates to MNO profile version:

- Updates to MNO profile version:

MNO	Version	System Selection	LTE Bands	PSM [1]	eDRX [2]	URAT [3]	UBANDMASK [4]
AT&T	v 7.1	M1 only	2, 4, 5, 12	yes	no	no	no
China Telecom	v 7.0	M1->NB1	3, 5, 8	no	no	yes	yes
Deutsche Telekom	v 7.0	M1->NB1	3, 8, 20	yes	yes	yes	yes
Sprint	v 7.0	M1 only	2, 4, 12, 25	no	no	yes	yes
Standard Europe	v 7.0	M1->NB1	3, 8, 20	yes	yes	yes	yes
Telstra	v 7.0	M1 only	3, 5, 8, 28	no	no	no	no
T-Mobile USA	v 7.0	NB1 only	2, 4, 5,12	no	no	yes	yes
TELUS	v 7.0	M1 only	2, 4, 5, 12	yes	no	no	no
Verizon	v 7.0	M1 only	13	no	no	no	no
Vodafone	v 7.0	NB1->M1	3, 8, 20	yes	no	yes	yes
SW default	N/A	M1->NB1	2, 3, 4, 5, 8, 12, 13, 18, 19, 20, and 25 as M1-only	no	no	no	no

  - Note 1: +CPSMS
  - Note 2: +CEDRXS
  - Note 3: +URAT
  - Note 4: +UBANDMASK

If your carrier network is not on the supported list of MNOs, you must set to Cat M1 mode and follow the instructions per that scenario below.

The MNG1 model has regulatory approval on both Verizon or AT&T networks. We continue to work for approval on other networks. Refer to the Sara-R4/N4 series AT Commands Manual for more details.

Note: If your device is on +UMNOPROF: 0 (SW default), there is no network and you must set one.

To set or switch carrier networks:

1. Deregister the module from the network or perform an AT+CFUN=0 cycle:

   ```
   AT+CFUN=0
   ```

2. Set the carrier network (refer to the list of +UMNOPROF values):
   To AT&T:

   ```
   AT+UMNOPROF=2
   ```

To Verizon:

```
AT+UMNOPROF=3
```

3. Reboot the module in order to apply the new configuration:

```
AT+CFUN=15
```

If the APN is known and will not change: We recommend hard-coding the MNO and setting the PDP context manually. The following example of an AT command sequence is for AT&T.

```
AT+CFUN=0

AT+UMNOPROF=2

AT+CGDCONT=1, "IPV4V6", "phone"

AT+CFUN=15
```

If the MNO is not listed: the following command sequence is recommended.

NOTE: We recommend changing +UMNOPROF separately before +UBANDMASK.

```
AT+CFUN=0

AT+UMNOPROF=0

AT+CFUN=15

AT+CFUN=0

AT+CGDCONT=..

AT+UBANDMASK=..

AT+CFUN=15
```

To configure the supported radio bands: Use the +UBANDMASK command if your MNO is not listed by the +UMNOPROF command. Refer to your specific carrier regarding available bands.

USB Driver Installation

For the Windows USB driver, refer to the SARA-R4 USB Driver Installation Guide on the product page of the Multitech website. The driver is located under the Downloads section of the product page.

For the Linux USB driver, if your Linux OS does not automatically detect your device, you may need to execute a script. This script adds the MTQN vendor ID and product ID to the USB serial driver. Download the zip file which contains this script and readme file under Downloads on the product page of the website.

Chapter 7 AT Commands

Powering Down the Cellular Radio

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

To properly power down the cellular radio, use one of the following methods:

1. Issue command AT+CPWROFF then either wait 40s or until 1.8v from the cellular radio goes low. Processor pin PC5 (Mbed pin name MON_1V8) has 1.8v from the radio connected to it.
2. Hold pin processor PE_4 (Mbed pin name RADIO_ONOFF or MDMPWRON) low for at least 1.5s. 1.8v from the radio should go low.
3. If neither of the above two options are successful, an emergency power down can be performed by holding processor pin PF_3 (Mbed pin name RADIO_RESET) low for 10s. As always, power down is confirmed by monitoring 1.8v from the radio.

Device Reset

MTQN-MNG1-B01

There are two components to reset.

1. Processor reset: Several reset methods are available and all are documented in the STM32L471QG reference guide.
2. Radio reset: The processor controls the RESET_N and PWR_ON pins to the radio. The functionality of those pins is described in the ublox SARA_R4 data sheet.

Note:

N_RESET of the 40 pin connector is directly connected to NRST of the STM32L471QG processor. The processor controls the PWR_ON(RADIO_ONOFF/PE_4) and RESET_N(RADIO_RESET/PF_3) pins to the radio.

Low Power Modes

To achieve lowest power consumption, we recommend powering down the radio then configuring RADIO_PWR, VMEM_EN and BUF_EN as analog inputs with no pull resistor. The last step is to place the processor in a low power mode of your choosing.

WARNING: If your application is using the on board flash memory part, make sure any flash accesses are complete before removing power or the memory may be corrupted.

Cellular Radio Low Power

Note: Refer to the U-blox AT command guide for details on AT commands.

1. Powering Down - See Powering Down The Cellular Radio section

2. PSM mode- AT+CPSMS command
3. eDRX- AT+CEDRXS command
4. Device functionality- AT+CEDRXS command

Power to Cellular Radio

After power down, RADIO_PWR can be configured as an analog input with no pull resistor to disable the power supply regulator that powers the radio. There is an on board resistor that sets the RADIO_PWR signal level so that the regulator is disabled.

On Board Flash Memory

After power down, RADIO_PWR can be configured as an analog input with no pull resistor to disable the power supply regulator that powers the radio. There is an on board resistor that sets the RADIO_PWR signal level so that the regulator is disabled.

Level translator

BUF_EN can be configured as an analog input with no pull resistor to disable the level shifter. There is an on board resistor that sets the BUF_EN signal level so power is removed.

STM32L471QG processor

See the STM32L471QG data sheet for low power modes.

Chapter 8 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.
- **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

The label shown is not the actual size.

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.

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.

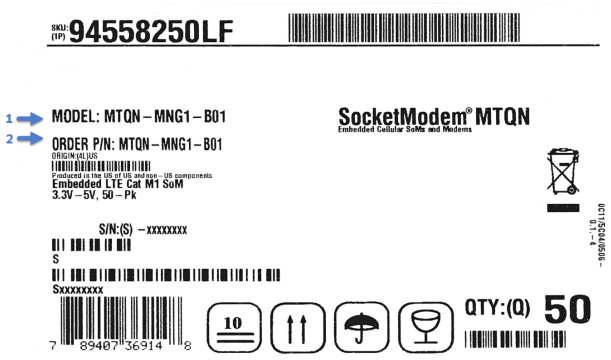
The label shown is not the actual size.

1 - MultiTech Model Identification
2 - MultiTech Ordering Part Number
3 - IMEI

Device Label



Package Label



Chapter 9 Regulatory Information

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

FCC Grant Part 22, 24, and 27

The u-blox AG: SARA-R4 cellular module has been issued an equipment authorization by the FCC.

Category	Description
FCC Identifier	XPY2AGQN4NNN (for SARA-R410M-02B)
Equipment Class	PCS Licensed Transmitter
Notes	Cellular Module
FCC Rule Parts	22H, 24E, 27
Approval	Single Modular

Component	Description
SARA-R410M-02B	LTE module for North America (AT&T/Verizon); Cat M1

The device operates within approved frequencies overlapping with the following cellular bands:

- LTE 2, 1900 PCS UP
- LTE 25, 1900+ UP
- LTE 35, TD PCS Lower DOWN
- UMTS CH 2 UP
- UMTS CH 25 UP
- UMTS CH 35 DOWN

The following table provides the certified radio frequency data for this device:

FCC Rule Parts	Frequency Range	Output Watts (mW)	Frequency Tolerance	Emission Designator
27	699 - 716 MHz	0.316	1.0 PM	1M11G7D
27	699 - 716 MHz	0.316	1.0 PM	1M11W7D
22H	824 - 849 MHz	0.316	1.0 PM	1M11G7D
22H	824 - 849 MHz	0.316	1.0 PM	1M11W7D
27	1.71 - 1.755 GHz	0.316	1.0 PM	1M24G7D
27	1.71 - 1.755 GHz	0.316	1.0 PM	1M13W7D
24E	1.85 - 1.91 GHz	0.316	1.0 PM	1M12G7D
24E	1.85 - 1.91 GHz	0.316	1.0 PM	1M12W7D

Single Modular Approval. Power output listed is conducted. This device is approved for mobile and fixed use with respect to RF exposure compliance, and may only be marketed to OEM installers. The antenna(s) used for this transmitter, as described in this filing, must be installed to provide a separation distance of at least 20 cm from all persons. Installers and end-users must be provided with operating conditions for satisfying RF exposure compliance.

Maximum permitted antenna gain/cable:

- 3.67 dbi for 700 MHz
- 4.10 dBi for 850 MHz
- 6.74 dBi for 1700 MHz
- 7.12 dBi for 1900 MHz

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. 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, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.

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

Chapter 10 Environmental Notices

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 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/.

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/.

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.

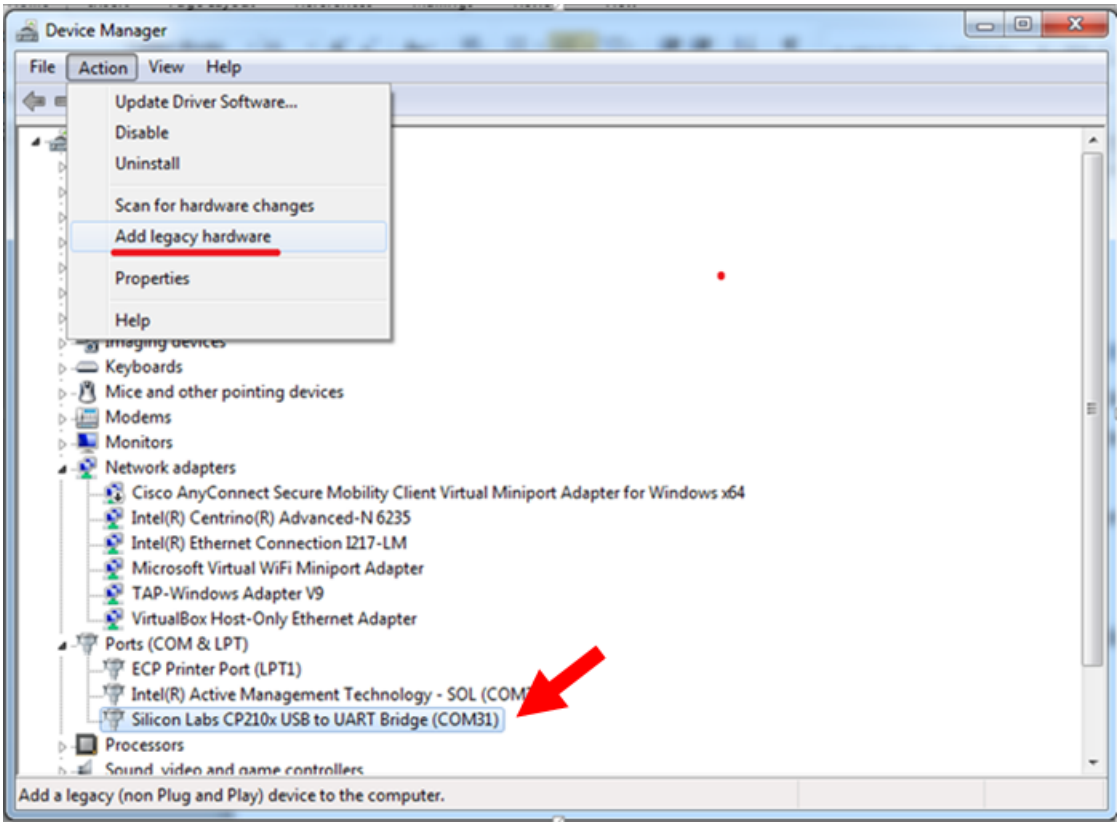
Setting Up a Serial Device in Windows Device Manager

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 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**.

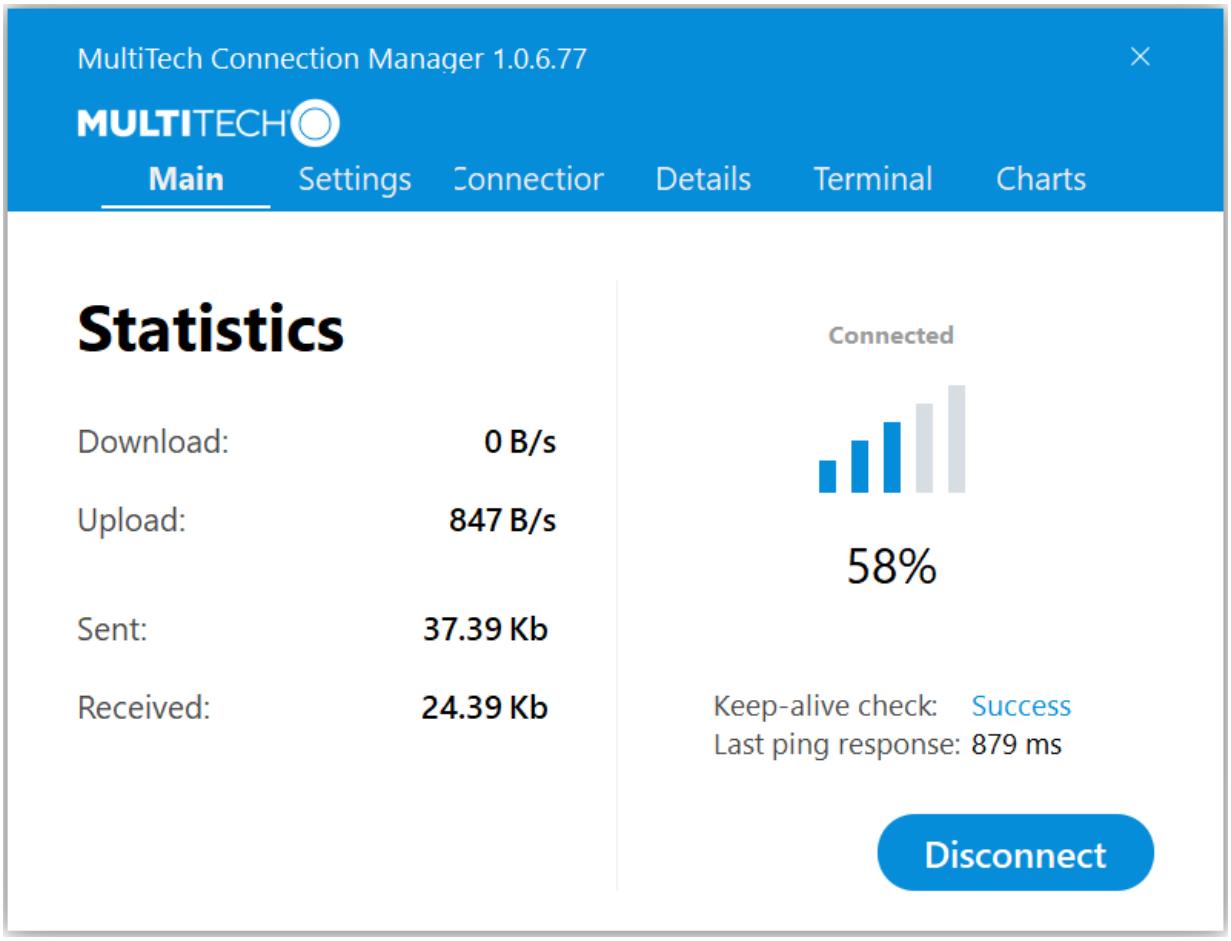
Connection Manager and the installed drivers are removed from the computer.

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

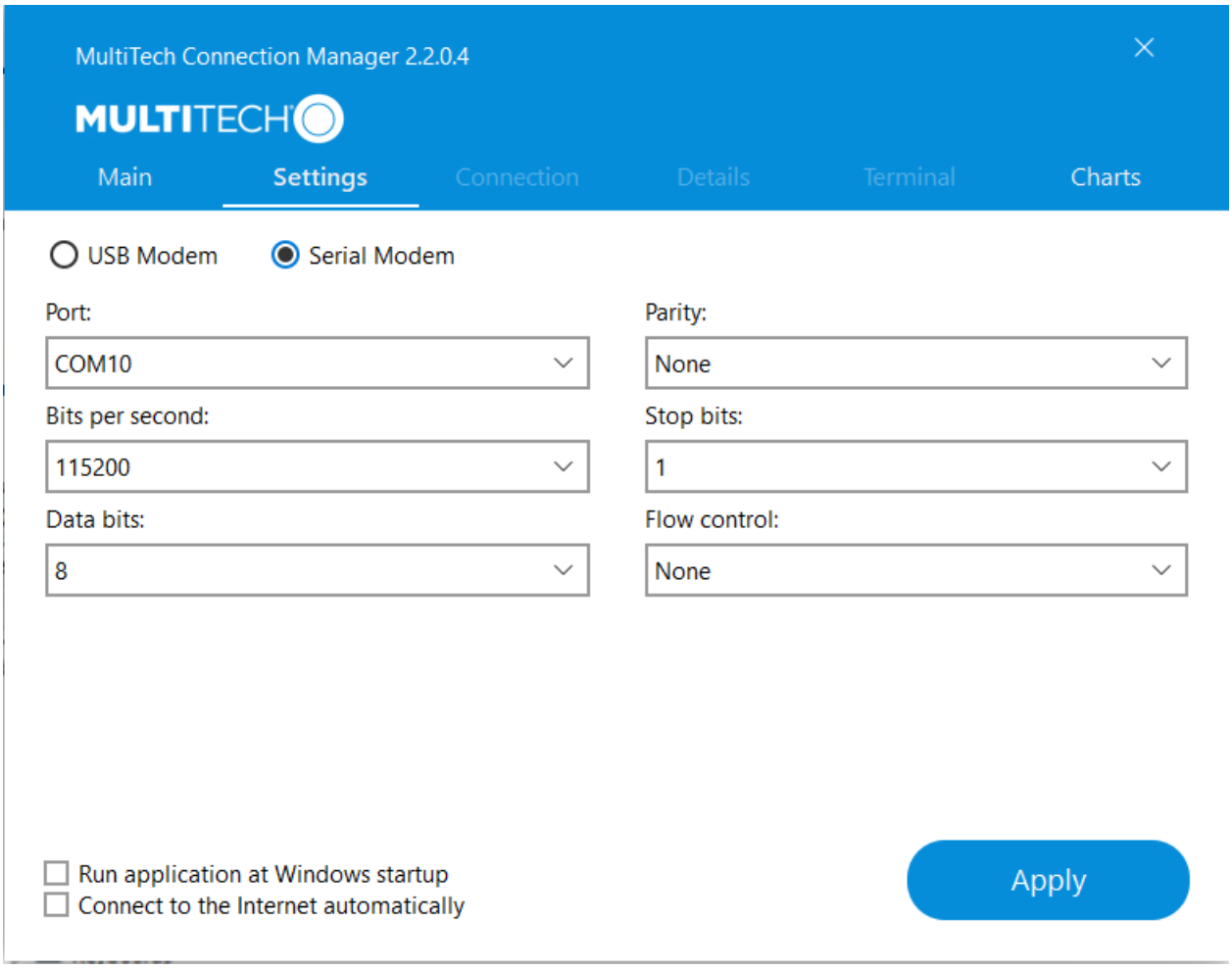
This error has the following causes and solutions.

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 **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.

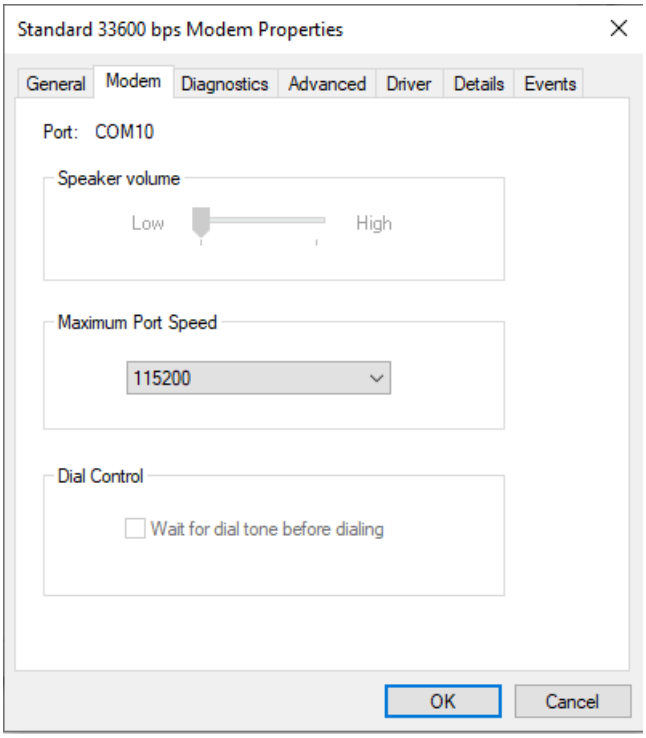
In **Connection Manager**, click the **Settings** tab.



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

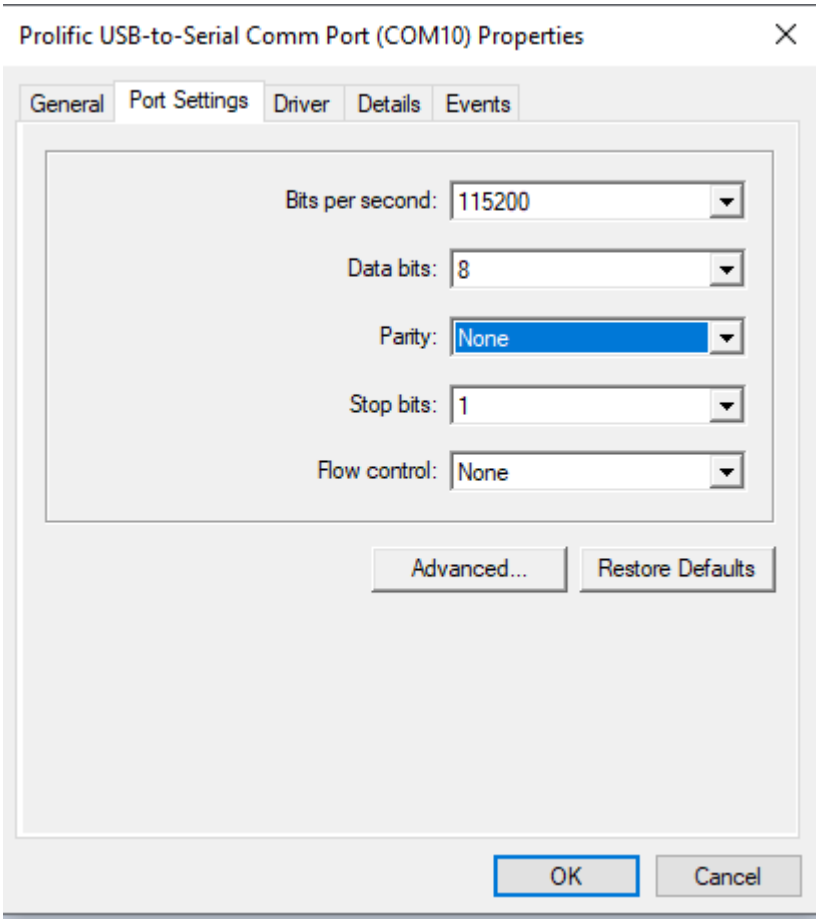
Note: If Modems and Ports don't appear in Device Manager, open the **View** Menu and select **Show hidden devices**.

Click 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, 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

Warranty

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

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Revision History

Revision Number	Description	Revision Date
1.8	Updated marketing branding.	January 2025
1.7	Clarified input voltages.	November 2024
1.6	Updated Mounting Hardware section.	December 2021
1.5	Added Connection Manager.	October 2019
1.4	Added Mounting Hardware.	August 2019
1.3	Added MNO profiles.	June 2019
1.2	Minor updates.	June 2019
1.1	Minor updates.	January 2019
1.0	Original publication.	September 2018