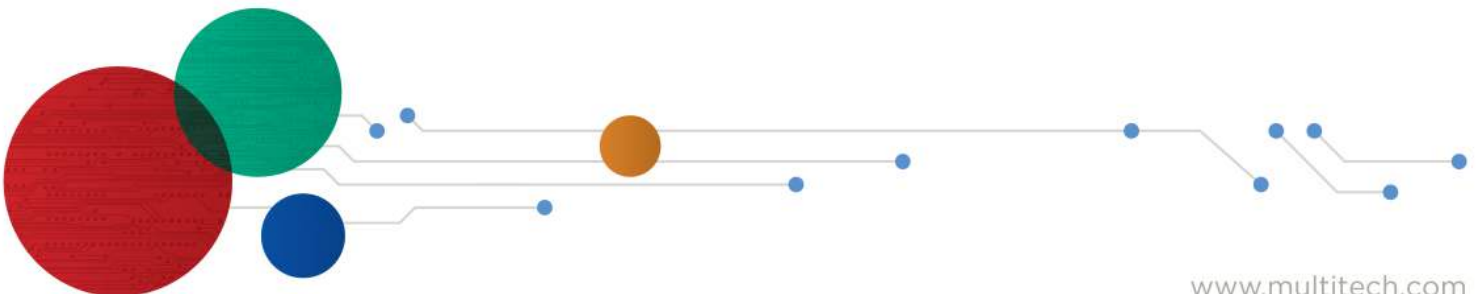




MultiConnect[®] Dragonfly[™]

MTQ-MNA1-B01 Device Guide



MultiConnect Dragonfly Device Guide Cat M1

Models: MTQ-MNA1-B01

Part Number: S000682, Version 1.1

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Chapter 1 – Product Overview

Overview

The Dragonfly™ (MTQ) cellular system-on-module (SoM) is a ready-to-integrate processing and communications device that offers developers the functionality of a SoM with the convenience of an onboard cellular radio all in one compact design. Models with the integrated ARM® Cortex®-M4 processor allow developers to host their application and have access to a full suite of interfaces for connecting sensors or other remote assets. Dragonfly features an ARM mbed™ compatible software library for faster development. All Dragonfly software is Open Source.

Documentation

The following documentation is available at

<http://www.multitech.com><https://www.multitech.com/brands/multiconnect-dragonfly>.

Document	Description	Part Number
Device Guide	This document. Provides model specifications and developer information.	S000682
Universal Developer Kit 2.0 Developer Guide	Provides information on using the developer board with the MTQ.	S000610
USB Driver Installation Guide	Provides steps for installing USB drivers on Linux and Windows Systems.	S000616
Telit ME910C1 AT Commands Reference Guide	Lists AT commands and parameters used to configure your device.	80529ST10815A Rev 2

Note: Additional documentation is available on the mbed site and at www.multitech.net. See [Getting Started with MTQ-MAT1-B01](#) for details.

Product Build Options

Product	Description	Region
MTQ-MNA1-B01	LTE Cat M1 SoM with GNSS	North America
Developer Kit		
MTUDK2-ST-CELL	Developer Kit for Dragonfly devices.	Global

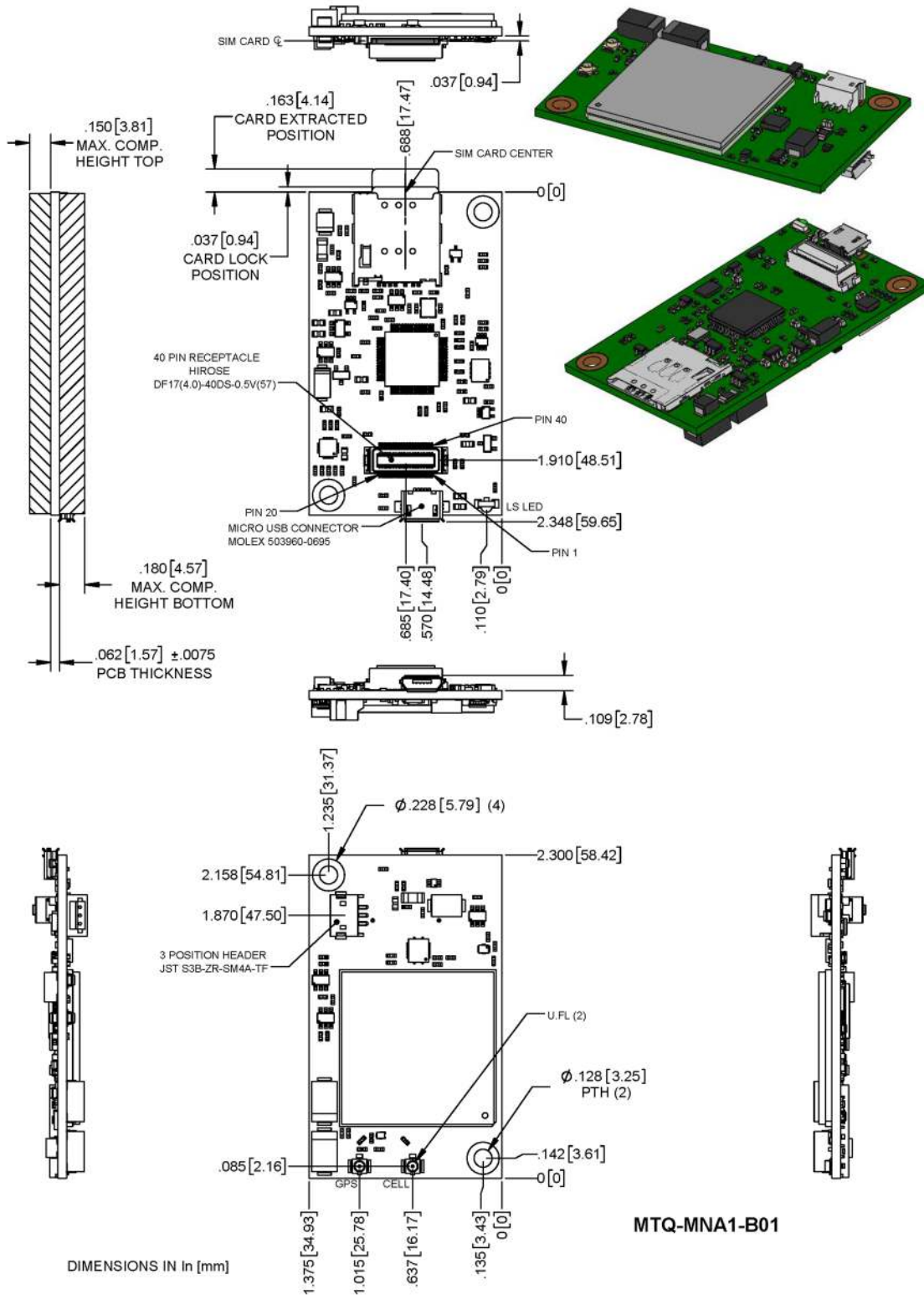
Note:

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, MTQ-MNA1-B01.Rx, where R is revision and x is the revision number.

All builds can be ordered individually or in 50-packs.

Chapter 2 – MTQ-MNA1 Mechanical Drawing



Chapter 3 – Hardware and Specifications

Specifications

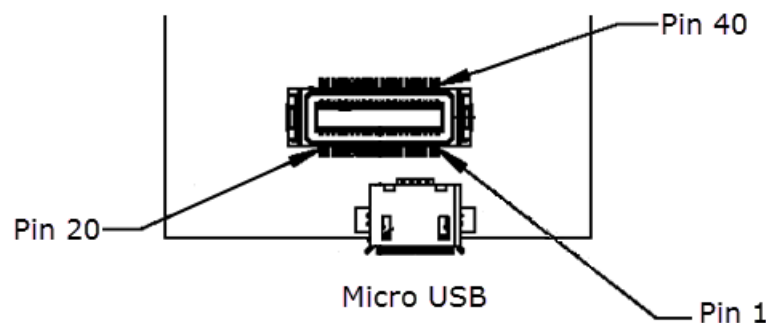
Category	Description	
General		
Standards	LTE UE Category M1, 3GPP release 13 compliant	
	USB Interface is CDC-ACM compliant	
Frequency Bands	AT&T	Verizon
	4G: 1900 (B2) / 700 (B12) /AWS 1700 (B4)	4G: 700 (B13)
LED	One, link status	
Speed		
Data Speed	LTE Cat M1: Up to 375 Kbps uplink / Up to 300 Kbps downlink	
Interface		
USB Interface	Micro 3FF USB 2.0 high speed	
UART	B01 models: Full UART to processor, then RX, TX, RTS, CTS only between the processor and radio	
Serial Modem Interface	Up to 921.6 Kbps	
Storage		
Serial Flash	SPI bus compatible serial 16Mb flash memory	
Physical Description		
Weight	0.6 oz (17g)	
Dimensions	Refer to Mechanical Drawings for details.	
Connectors		
Antenna	2 surface mount U.FL: cellular, auxiliary	
SIM Holder	1.8 V and 3 V micro	
Pin header	40-pin female for USB or UART	
Environment		
Operating Temperature ³	-40° C to +85° C	
Storage Temperature	-40° C to +85° C	
Humidity	20%-90% RH, non-condensing	

Category	Description
Certifications and Compliance	
EMC and Radio Compliance	FCC Part 15 Class B
	FCC Part 22
	FCC Part 24
Safety Compliance	UL/cUL 60950-1 2nd Edition
Carrier	AT&T/PTCRB/Verizon

Note:

- Mbed has limited USB support for the processor. Software controls routing to processor or directly to radio.
- The battery management circuit is designed for single cell Li-Ion/Li-Poly technology. Acceptability of the battery charge circuit for charging specific batteries/cells is to be determined in the end product.
- Acceptability of the battery charge circuit for charging specific batteries/cells is to be determined in the end product.
- Radio performance may be affected by temperature extremes. This is normal.
- Device has been tested up to +85° C. UL Recognized @ 85° C.

40-Pin Connector Definitions



MTQ-xx-B01

Pin	Signal Name	Logic Level Voltage ¹	In/Out	Description
1	DBX_TX	3V	O	ST Micro UART debug Tx output
2	SWCLK	3V	I	See ST Microcontroller Guide
3	CHARGE_MON	0 - VCC-IN	O	Open-drain charging status indication output
4	PWR_GOOD	0 - VCC-IN	O	Open-drain power good status indication output
5	GND	GND	GND	Ground

Pin	Signal Name	Logic Level Voltage ¹	In/Out	Description
6	USB-DATA+	0 - 3V ²		
7	USB-DATA-			
8	VCC-IN	4.35 - 5.25	Power Input	Main Power
9	IO_00	I = 0 - 7V, O = 0 - 3V	I/O	General Purpose I/O from ST Microcontroller (STM 32F411)
10	IO_01			
11	IO_02			
12	IO_03			
13	GND			
14	IO_04	I = 0 - 7V, O = 0 - 3V	I/O	General Purpose I/O from ST Microcontroller (STM 32F411)
15	IO_05			
16	IO_06			
17	IO_07			
18	IO_08			
19	IO_09			
20	IO_10			
21	IO_11			
22	IO_12			
23	IO_13			
24	IO_14			
25	IO_15			
26	IO_16			
27	IO_17			
28	GND	GND	GND	Ground
29	IO_18	I = 0 - 7V, O = 0 - 3V	I/O	General Purpose I/O from ST Microcontroller (STM 32F411)
30	IO_19			
31	IO_20			
32	IO_21			
33	VCC-IN	4.35 - 5.25	Power Input	Main Power
34	LINK_STATUS	3V	O	Radio link status LED
35	RESET	0 - 3V	I	NRST pin of ST micro
36	GND	GND	GND	Ground
37	GND			
38	SWO	3V	O	See ST Microcontroller Guide

Pin	Signal Name	Logic Level Voltage ¹	In/Out	Description
39	SWDIO	3V	I	
40	DBG_RX	3V	I	ST Micro UART debug Tx input

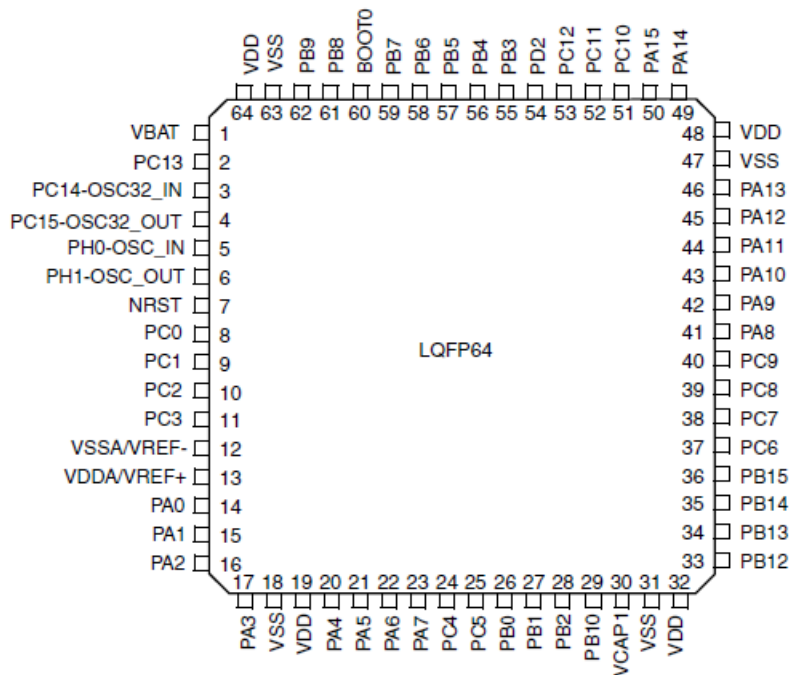
¹ A hyphen (-) indicates a range of acceptable logic levels.

²USB D+D-: 5V tolerant inputs / 3V drive-level output

40-Pin Connector

Manufacturer: Hirose Electric Co LTD
 Description: Plug
 Model Number: DF17(2.0)-40DP-0.5V(57)

Processor Pin Information (B01 models only)



Note: Diagram from the STMicro 32F411 datasheet.

The following table lists the processor pins and how the MTQ uses them.

Net Name	Number	Pin Name	Details
VDD3_3	1	VBAT	Power
3G_ONOFF	2	PC13	Enable line to the Radio
32K_XTAL_	3	PC14	RTC Clock
32K_XTAL	4	PC15	RTC Clock
26MHZ_CLK_IN	5	PH0-OSC_IN	Main Clock

Net Name	Number	Pin Name	Details
26MHZ_CLK_DRIVE	6	PH1-OSC_OUT	Main Clock
N_RESET	7	NRST	External Reset in
IO_10	8	PC0	GPIO/Analog capable pin
IO_11	9	PC1	GPIO/Analog capable pin
IO_8	10	PC2	GPIO
RADIO_PWR	11	PC3	Voltage enable for Telit
GND	12	VSSA	Power
VDD3_3	13	VDDA	Power
IO_18/RTS	14	PA0	GPIO/Analog capable pin/USART2_CTS
IO_03/CTS	15	PA1	GPIO/Analog capable pin/USART2_RTS
IO_00/RXD	16	PA2	GPIO/USART2_TX
IO_21/TXD	17	PA3	GPIO/USART2_RX
GND	18	VSS_4	Power
VDD3_3	19	VDD_4	Power
SPI-SS1	20	PA4	SPI1 Select
IO_05/SCK	21	PA5	SPI1 Clock/GPIO
IO_16/MISO/SDIO_CMD	22	PA6	SPI1 MISO/SDIO_CMD /GPIO
IO_01/DCD	23	PA7	GPIO
IO_12	24	PC4	GPIO/Analog capable pin
VDD1_8_MON	25	PC5	Power
IO_9	26	PB0	GPIO/Analog capable pin
IO_02/RI	27	PB1	GPIO
BOOT1/BC_NCE	28	PB2	Battery charge enabled. Pulled down by default.
RADIO_RTS	29	PB10	Serial comm with the radio
VCAP	30	PB11/VCAP_1	Power
N16612690	31	VCAP_1/VSS	Power
VDD3_3	32	VDD_1	Power
RADIO_CTS	33	PB12	Serial comm with the radio
IO_13	34	PB13	GPIO
SPI-SS2	35	PB14	GPIO for use with external SPI
IO_7	36	PB15	GPIO/SDIO_CK
RADIO_TXD	37	PC6	Serial comm with the radio

Net Name	Number	Pin Name	Details
RADIO_RXD	38	PC7	Serial comm with the radio
IO_17/SS2/SDIO_D0	39	PC8	GPIO/SDIO_D0
IO_14/SDIO_D1	40	PC9	GPIO/SDIO_D1
IO_20/DTR	41	PA8	GPIO
IO_19/DSR	42	PA9	GPIO/SDIO_D2
USB_DIR/VBUS	43	A10	USB Switch control, 0=Telit, 1=STM
FS_DM	44	PA11	USB
FS_DP	45	PA12	USB
J_TMS /SWDIO	46	PA13	JTAG
	47	VCAP_2/VSS	Power
VDD3_3	48	VDD_2	Power
J_TCK/SWCLK	49	PA14	JTAG
J_TDI/C_MON	50	PA15	JTAG
SPI-SCK	51	PC10	EPROM/SPI3_SCK
SPI-MISO	52	PC11	EPROM/SPI3_MISO
SPI-MOSI	53	PC12	EPROM/SPI3_MOSI
SPI-SRDY	54	PD2	EPROM/SPI3_SRDY
J_TDO/SWO	55	PB3	JTAG
J_RST/P_GOOD	56	PB4	JTAG
IO_4/MOSI/SDIO_D3	57	PB5	GPIO/SPI1_MOSI/SDIO_D3
DBG_TX	58	PB6	JTAG
DBG_RX	59	PB7	JTAG
BOOT	60	BOOT0	Reserved.
IO_6/SCL/SS1	61	B8	GPIO/I2C1_SCL
IO_15/SDA/SRDY	62	PB9	GPIO/I2C1_SDA
GND	63	VSS_3	Power
VDD3_3	64	VDD_3	Power

Serial Flash Embedded Memory

The M25P16 is a 16Mb (2Mb x 8) serial flash memory device with write protection mechanisms accessed by a SPI-compatible bus.

The serial flash is accessible via the processor pinout on B01 devices. Features include:

- 75 MHz clock frequency (maximum)
- Page program (up to 256 bytes) in 0.64ms (TYP)

- Erase capability
 - Sector erase: 512Kb in 0.6 s (TYP)
 - Bulk erase: 16Mb in 13 s (TYP)
- Write protection
 - Hardware write protection (protected area size defined by non-volatile bits BP0, BP1, BP2)
- Deep power down: 1 μ A (TYP)
- Electronic signature
 - JEDEC standard 2-byte signature (2015h)
 - Unique ID code (UID) and 16 bytes of read-only data available upon customer request
 - RES command, one-byte signature (14h) for backward compatibility
- More than 100,000 write cycles per sector
- More than 20 years of data retention

Electrical Characteristics

Operating Conditions

Parameter	Minimum Volts	Maximum Volts
Supply Range - Vcc	4.35	5

Absolute Maximum Rating

Parameter	Minimum Volts	Maximum Volts
Voltage at any signal pin	-0.3	5.5

DC Electrical Characteristics

Parameter	Conditions	Minimum Volts	Maximum Volts
Digital signal input low level	CMOS port $I_{IO}=+8$ mA	-0.3	0.9
Digital signal input high level	CMOS port $I_{IO}=+8$ mA	2.1	5.5
Output low level voltage for an I/O pin	CMOS port	-	0.4
Output high level voltage for an I/O pin	$I_{IO}=+8$ mA	$V_{DD}-0.4$	-
Output low level voltage for an I/O pin	TTL port	-	0.4
Output high level voltage for an I/O pin	$I_{IO}=+8$ mA	2.4	-
Output low level voltage for an I/O pin	$I_{IO}=+20$ mA	-	1.3 ⁽¹⁾
Output high level voltage for an I/O pin		$V_{DD}-1.3$ ⁽¹⁾	-
Output low level voltage for an I/O pin	$I_{IO}=+6$ mA	-	0.4 ⁽¹⁾
Output high level voltage for an I/O pin		$V_{DD}-0.4$ ⁽¹⁾	-

Parameter	Conditions	Minimum Volts	Maximum Volts
Output low level voltage for an I/O pin	$I_{IO}=+4$ mA	-	0.4 ⁽²⁾
Output high level voltage for an I/O pin		$V_{DD}-0.4$ ⁽²⁾	-
RESET (low active) input low	CMOS port $I_{IO}=+8$ mA	-	0.99
RESET (low active) input high	CMOS port $I_{IO}=+8$ mA	2.31	-

(1) Guaranteed by characterization results, not tested in production.

(2) Guaranteed by design, not tested in production.

Note:

See the ST Microcontroller data sheet (STM 32F411REF) and the Pin Connector Definitions table in Chapter 3 of this guide.

Use $V_{DD} = 3.0V$ when referencing the STM 32F411REF data sheet.

Input/Output Current Ratings

Output current draw PWR_GOOD, CHG_MON	5 mA
Output current draw all other output pins	25 mA

MTQ-MNA1-B01 Power Draw

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

Radio Protocol	Sleep Mode	Cellular Connection Idle (No Data)	(AVG) Measured Current at Max Power ¹	TX Pulse ² (AVG) Amplitude Current for Peak Current for LTE	Total Inrush Charge ³ Measured in Millicoulombs	Total Inrush Charge Duration during Powerup
5 Volts USB only, no developer card						
LTE	3.6 mA	57 mA	195 mA	420 mA	5.11 mC	40.9 mS
5 Volts with Unit in Developer Card						
LTE	3.6 mA	54 mA	191 mA	412 mA	3.72 mC	40.1 mS

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 an LTE connection.

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

Chapter 4 – Antennas

Requirements for Cellular Antennas with regard to FCC/IC Compliance

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

External Antenna Option

Wieson Antenna

Devices were approved with the following antenna:

Manufacturer:	Wieson
Description:	LTE GY115HT467-017
Model Number:	11320Y11194A1

MultiTech ordering information:

Model	Quantity
ANLTE2-1HRA	1
ANLTE2-10HRA	10
ANLTE2-50HRA	50

Antenna Specifications

Category	Description
Frequency Range	.069~0.96GHz, 1.71~2.17GHz, 2.3GHz~2.69GHz
Impedance	50 Ohms
VSWR	VSWR should not exceed 3:1 at any point across the bands of operation
Peak Gain	3.8 dBi
Radiation	Omni-directional
Polarization	Linear Vertical

SMA to U.FL Cables

The developer kit includes three 4.5" SMA to U.FL cables which are preinstalled on the developer board. Consult the mechanical drawings for your device to determine which antenna to connect to which U.FL connector on the device.



Connecting an Antenna through the Developer Board Connectors

To connect an antenna to the device through the developer board:

1. Determine which SMA connector you want to use for the antenna.
2. Finger tighten the antenna to the SMA connector.
3. Attach the U.FL connector from the cable to the connector on the device.

G = GPS

M = Main



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.

Note: Only use antennas approved respectively as listed for the unlicensed radios (Bluetooth/Wi-Fi)

Host Labeling

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

This device contains FCC ID: {Add the FCC ID of the specific device}

This device contains equipment certified under IC ID: {Add the IC ID of the specific device}

For additional labeling requirements, see the product's Labeling Requirements. For the FCC and IC IDs, see specific certificate information in the Regulatory Statement chapter.

Chapter 5 – Safety Information

Handling Precautions

To avoid damage due to the accumulation of static charge, use proper precautions when handling any cellular device. Although input protection circuitry has been incorporated into the devices to minimize the effect of static build-up, use proper precautions 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 cellulaire. S'il ne respecte pas cette consigne, le responsable peut voir son accès aux services cellulaires suspendu ou interdit, peut être poursuivi en justice, ou les deux.
- Éteignez votre appareil sans fil à proximité des pompes à essence ou de diesel avant de remplir le réservoir de votre véhicule de carburant.

- Éteignez votre appareil sans fil dans les hôpitaux ou dans toutes les zones où des appareils médicaux sont susceptibles d'être utilisés.

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

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.

Device Maintenance

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

When maintaining your device:

- Do not misuse the device. Follow instructions on proper operation and only use as intended. Misuse could make the device inoperable, damage the device and/or other equipment, or harm users.
- Do not apply excessive pressure or place unnecessary weight on the device. This could result in damage to the device or harm to users.
- Do not use this device in explosive or hazardous environments unless the model is specifically approved for such use. The device may cause sparks. Sparks in explosive areas could cause explosion or fire and may result in property damage, severe injury, and/or death.
- Do not expose your device to any extreme environment where the temperature or humidity is high. Such exposure could result in damage to the device or fire. Refer to the device specifications regarding recommended operating temperature and humidity.
- Do not expose the device to water, rain, or spilled beverages. Unless the device is IP67 rated, it is not waterproof. Exposure to liquids could result in damage to the device.
- Do not place the device alongside computer discs, credit or travel cards, or other magnetic media. The information contained on discs or cards may be affected by the device.
- Using accessories, such as antennas, that MultiTech has not authorized or that are not compliant with MultiTech's accessory specifications may invalidate the warranty.

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

User Responsibility

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

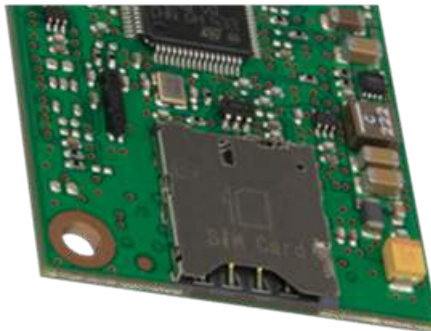
Chapter 6 – Getting Started

Installing a SIM Card on a DragonFly

Note: When using the Dragonfly with a developer board, install the SIM card before mounting the Dragonfly on the developer board.

To install the SIM card:

- With the contact side facing down, align the notched edge as shown on the Dragonfly's SIM holder and slide the SIM card completely into the SIM holder.



Device Drivers

Note: Install drivers on your computer before connecting the device.

Driver installation instructions for both Windows and Linux are included the <https://www.multitech.com/documents/publications/manuals/s000616.pdf> (S000616) available on your prod.

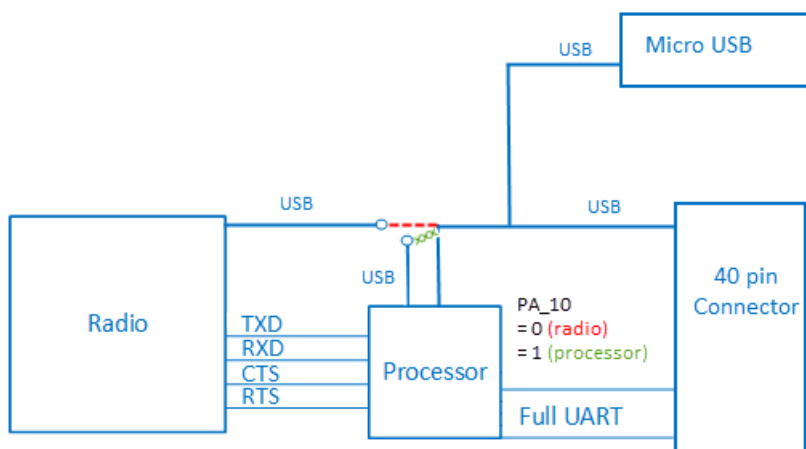
USB Cable Recommendations

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.

Communications Flow

Processor Model (B01)



Note:

- The device has a UART subset as well as GPIO (4 pin UART (tx/rx/rts/cts))
- If needed, use the GPIOs for additional UART signaling.
- The USB port can switch between a connection to the radio (red dotted line) or a connection to the processor (green x line). The USB selection is controlled via programming on the processor. There is no USB between the radio and the processor.

Communicating with the Device

Following are three options for communicating with the device.

- Install USB drivers and plug into the micro USB connector. No need for a host board.
- Access the device's USB interface via pins 6 and 7 of the 40-pin connector. Data pins 6 and 7 are in parallel with the micro USB connector on the device. There is no connection to pins 6 and 7 on the developer board.
- Establish serial communication using Multitech developer board MTUDK2. See the *Universal Developer Kit 2.0 Developer Guide* (PN S000610) for more information.

Dual Carrier Firmware for Cellular Radio

This device uses a cellular radio with dual carrier firmware meaning that it can be used on different carrier networks (not simultaneously). The device can be used on either the Verizon or AT&T/other networks. The device is configured for AT&T/others by default.

To check that your device is configured for the desired 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.

To switch carrier networks:

From AT&T to Verizon:

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

From Verizon to AT&T:

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

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`).

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, do one of the following options:

Option 1:

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 AND the `ONOFF` line is high, the radio restarts after 60 seconds.

Option 2:

1. Hold signal `ONOFF` (processor pin PC13) low.
2. Monitor signal `VDD1_8_MON` (processor pin PC5). When it goes low, the radio is powered off and it is safe to remove power.

Device Reset (NRESET Pin 35)

NRESET pin 35 of the 40 pin connector is routed directly to NRST on the STM32F411RE processor.

There are two components to reset:

1. Processor Reset

Multiple reset methods are available. Refer to STM32F411 documentation for details.

2. Radio Reset

The STM32F411RE processor pin `PC_13` is routed to a tiny9 supervisory processor that controls the radio.

- If `PC_13` is driven low for $>50\text{ms}$ and $<1\text{s}$, the radio is reset.
- If `PC_13` is driven low for $>1\text{s}$, the radio is powered down.

Processor

- To reset the processor, the minimum recommended reset pulse is 200 μ s. The maximum reset pulse is less than 1 second.
- Refer to STM32F411 documentation for additional reset options available within the on-board microcontroller.
 - Reset is controlled via PC13 on the on-board microcontroller.
 - Refer to 3G_ONOFF Signal for instructions on managing radio module reset.

Sleep Mode

Control radio sleep mode with the GPIO pin PC13 (3G_ONOFF) on the onboard processor. See also *3G_ONOFF Signal*.

- Setting PC13 to Low and holding it low turns the radio off, causing it to draw minimal power.
- Setting PC13 to High resets and wakes up the device.
- Refer to +CFUN in the *AT Command Reference Guide* for other sleep options.

Note: If using +CFUN commands, then reset the device via the PC13 (3G_ONOFF) toggle low to high to bring the radio out of +CFUN sleep mode.

Developing with an MTQ in Mbed

Build applications written for the MTQ are built on top of the Arm®Mbed™ library and can include the MTSAS library for easy cellular radio use.

The MTQ ships with AT pass-through firmware, which directly connects the cellular radio to the external serial port 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.

MTSCellularInterface Library

The MTSCellularInterface software library on mbed provides a consistent interface to the cellular radio on each MTQ module. The interface includes:

- TCP sockets.
- UDP sockets.
- HTTP/HTTPS requests.
- SMS messaging.
- GPS if supported by the radio.
- Access to common radio information like signal strength, registration, etc.

The library provides an easy-to-use API for interacting with the cellular radio. It identifies the radio and uses proper AT commands for that radio type, which allows the same application to run on multiple MTQ models with no software changes. The library and example programs are available at:

<https://developer.mbed.org/platforms/MTS-Dragonfly/>

Mbed™ Documentation

Arm Mbed is a free, open-source platform and operating system for embedded devices using the Arm Cortex-M microcontrollers. The Mbed website provides free software libraries, hardware designs, and online tools for rapid prototyping of products. 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 MTQ Microcontroller

With the MTQ 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 MTQ.

All MTQ software is open source.

Mbed Links

- Explore Mbed: <http://developer.mbed.org/explore>
- Getting Started with Mbed: <http://developer.mbed.org/getting-started>
- Mbed Handbook: <http://developer.mbed.org/handbook/Homepage>
- Serial Flash Datasheet: <https://www.micron.com/~media/documents/products/data-sheet/nor-flash/serial-nor/m25p/m25p16.pdf>
- Additional Information: <http://www.multitech.net/developer/products/multiconnect-dragonfly/>

MTQ Platform

The MTQ Mbed page includes the **MTSCellularInterface** library and example programs.

<https://developer.mbed.org/platforms/MTS-Dragonfly>

ST Microelectronics STM32F411xC/E

For information on the STM32F411xC/E microcontroller, refer to:

- **Reference Manual:** http://www.st.com/st-web-ui/static/active/en/resource/technical/document/reference_manual/DM00119316.pdf
- **Datasheet:** <http://www.st.com/web/en/resource/technical/document/datasheet/DM00115249.pdf>

Chapter 7 – Verizon FOTA Information

Firmware Over the Air (FOTA) Script

Verizon Requirement: Firmware Over The Air (FOTA) - Scripting

Products: MultiTech MTC-MVW1, MTC-MNA1, MTC-LNA4, MTSMC-MVW1, MTSMC-MNA1, MTSMC-LNA4, MTCM-LNA3, and MTCAP-LNA3 Series

Cellular Radio Modules:

- For MVW1 (Cat M1): ME910C1-NV
- For MNA1 (Cat M1): ME910C1-NA
- For LNA4 (Cat 4): LE910-NA V2
- For LNA3 (Cat 1): LE910-NA1

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).

MultiTech LTE Category M1, Cat 1, and Cat 4 devices for Verizon will allow the customer to initiate a FOTA update from a remote server (push FOTA) as required and communicated by Verizon.

If your device does not include local processing capabilities, you will be required to upgrade when that release becomes available.

Below is an example of a FOTA process for an LTE cellular module (the same steps would work for other LTE devices just using different file names) you could implement in your host system. You may implement the process below or implement your own FOTA solution.

In the example below, your host system application periodically accesses a file placed on an FTP server of your choosing and reads file contents to determine if a firmware update is required. Contact MultiTech at support.multitech.com for test delta files and to review your process prior to deployment.

Cellular Module FOTA Script Example Process

1. Set up an FTP server to contain a folder for future module firmware files.
2. Assign a unique username/password to access the FTP server.
3. Create and place a file on your FTP server named `firmwarecheck.csv` to be downloaded and read by your cellular radio module FTP client host application. Include the following types of information in the file. You can include additional information as needed.
 - a. The firmware version and build your LTE device should currently be using.
 - b. Path on current FTP server where firmware update file resides.
 - c. The date/time interval at which the host application should next perform a FOTA check in.
 - d. FTP server IP address which the host application should access during next FOTA check in.
 - e. Credentials for the FTP server where host application should next perform a FOTA check in.

4. Before deploying devices with your Telit cellular radio module, create code in the host system code to perform the following sequence at a defined interval (nightly, weekly, daily, monthly).
 - a. Issue following command to your cellular radio module to configure socket connection settings:
`AT#SCFG=1,3,300,90,600,50`
 - b. If data APN has not previously been programmed, issue the following command:
`AT+CGDCONT=3,"IPV4V6","CorrectAPNForAccount"`
If the data APN has been previously programmed, go to Step 4.c.
 - c. Issue the following command to check for signal presence:
`AT+CSQ`
 - d. Issue the following command to check for registration presence:
`AT+CEREG?`
 - e. If signal and registration are present, issue the following command to establish data connection:
`AT#SGACT=3,1`
If signal and registration are not present, check antenna for proper connection and SIM for correct orientation.
 - f. Issue following command to create FTP session:
`AT#FTPOPEN="204.26.122.49","username","password",1,3`
 - g. Have the host application issue the following command to download the `firmwarecheck.csv` file, read its contents, and take actions based on those contents:
`AT#FTPGET="firmwarecheck.csv"`
 - h. Have host system issue the following command to Telit radio module to determine current firmware file version and firmware build:
`AT+GMR`
`AT#CFVR`
 - i. If version/build indicated in responses are the same as indicated in `firmwarecheck.csv`: **Go to Step 4.s.**
 - j. If current firmware version is older than version indicated in `firmwarecheck.csv`: **Continue to next step.**
 - k. Issue the following command to Telit radio module to download the file indicated in the `firmwarecheck.csv` file and wait for OK response (which indicates the file has been downloaded):
`AT#FTPGETOTA="Name-Of-Firmware-File-Here.bin",0`
 - l. After file is downloaded issue following command to close FTP session:
`AT#FTPCLOSE`
 - m. After closing FTP, issue following command to disconnect data session:
`AT#SGACT=3,0`
 - n. After closing data session, issue following command to apply downloaded file:
`AT#OTAUP=0`
 - o. Before continuing, wait for your cellular radio to reset a total of three times and/or wait a fixed period of time to ensure module has enough time to apply downloaded firmware. The time needed varies depending on the size of your firmware file.
 - p. Issue the following command to determine current firmware version.
`AT+GMR`
 - q. If version matches value indicated in `firmwarecheck.csv`: **Go to Step 4.t.**

If version does not match value indicated in firmwarecheck.csv issue, appropriate commands listed earlier as needed in order to attempt to download and process the firmware file again.

- r. Issue following command to close FTP session:

```
AT#FTPCLOSE
```

- s. Issue following command to close data session:

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

- t. End Process

Note:

- Before deploying the device, thoroughly test your chosen FOTA implementation for functionality.
- Before performing any module firmware update to devices in the field, first thoroughly test the new module firmware to ensure compatibility with your existing application.
- In the above example you might consider placing on the FTP server one file for every IMEI you deploy. Then have host application read module IMEI to determine which IMEI file on the FTP server to read. This would allow you to control which specific IMEIs you want to update by changing the contents of the file on server for the device IMEI.

FOTA Client Example Session Log

Example of updated from firmware version 30.00.001-B026 to version 30.00.001-B026_FOTA

```
[Tue Jan 09 13:18:18.344 2018] AT+GMM
[Tue Jan 09 13:18:18.437 2018] ME910C1-NA
[Tue Jan 09 13:18:18.437 2018]
[Tue Jan 09 13:18:18.437 2018] OK
[Tue Jan 09 13:18:18.952 2018] AT+GMR
[Tue Jan 09 13:18:19.046 2018] 30.00.001-B026
[Tue Jan 09 13:18:19.046 2018]
[Tue Jan 09 13:18:19.046 2018] OK
[Tue Jan 09 13:18:19.560 2018] AT#SCFG=1,3,300,90,600,50
[Tue Jan 09 13:18:19.950 2018] OK
[Tue Jan 09 13:18:20.465 2018] AT+CGDCONT=3,"IPV4V6","VZWINTERNET"
[Tue Jan 09 13:18:21.120 2018] OK
[Tue Jan 09 13:18:21.635 2018] AT+CSQ
[Tue Jan 09 13:18:21.729 2018] +CSQ: 25,3
[Tue Jan 09 13:18:21.729 2018]
[Tue Jan 09 13:18:21.729 2018] OK
[Tue Jan 09 13:18:22.243 2018] AT+CEREG?
[Tue Jan 09 13:18:22.384 2018] +CEREG: 0,1
[Tue Jan 09 13:18:22.384 2018]
[Tue Jan 09 13:18:22.384 2018] OK
[Tue Jan 09 13:18:22.899 2018] AT#SGACT=3,1
[Tue Jan 09 13:18:23.101 2018] #SGACT:
100.82.36.41,38.0.16.20.176.102.243.25.0.0.0.2.116.124.129.1
[Tue Jan 09 13:18:23.101 2018]
[Tue Jan 09 13:18:23.101 2018] OK
[Tue Jan 09 13:18:23.616 2018]
AT#FTPOPEN="204.26.122.49","USERNAME","PASSWORD",1,3
[Tue Jan 09 13:18:24.942 2018] OK
[Tue Jan 09 13:18:25.457 2018] AT#FTPGET="firmwarecheck.csv"
```

```

[Tue Jan 09 13:18:26.159 2018] CONNECT
[Tue Jan 09 13:18:26.237 2018] 30.00.001-B026_FOTA,30.00.001-
B026_FOTA.bin,2017-01-31,204.26.122.49,USERNAME,PASSWORD
[Tue Jan 09 13:18:26.253 2018] NO CARRIER
[Tue Jan 09 13:18:26.767 2018] AT+GMR
[Tue Jan 09 13:18:26.861 2018] 30.00.001-B026
[Tue Jan 09 13:18:26.861 2018]
[Tue Jan 09 13:18:26.861 2018] OK
[Tue Jan 09 13:18:27.742 2018] AT#CFVR
[Tue Jan 09 13:18:27.750 2018] #CFVR: 1
[Tue Jan 09 13:18:27.750 2018]
[Tue Jan 09 13:18:27.750 2018] OK
[Tue Jan 09 13:18:32.430 2018] AT#FTPGETOTA="30.00.001-B026_to_B026-
FOTA.bin",0
[Tue Jan 09 13:18:37.001 2018] OK
[Tue Jan 09 13:18:37.516 2018] AT#FTPCLOSE
[Tue Jan 09 13:18:37.843 2018] OK
[Tue Jan 09 13:18:38.358 2018] AT#SGACT=3,0
[Tue Jan 09 13:18:38.545 2018] OK
[Tue Jan 09 13:18:39.060 2018] AT#OTAUP=0
[Tue Jan 09 13:18:39.388 2018] OK
[Tue Jan 09 13:21:23.977 2018] AT+GMR
[Tue Jan 09 13:21:27.456 2018] 30.00.001-B026_FOTA
[Tue Jan 09 13:21:27.456 2018]

```

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. The antenna system must be the same type with similar in-band and out-of-band radiation patterns and maintain the same specifications. Refer to the FCC grant information for details.
- **Model Identification:** The MultiTech model identification allows the carrier to verify the modem as one of its approved models. This information is located on the modem's label below the bar code.

Example Labels

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

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

The label shown is not the actual size.

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



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 Information

FCC Identifier:	RI7ME910C1NA
Equipment Class:	PCS Licensed Transmitter
Notes:	ME910C1-NA LTE Module CAT M
Approval:	Single Modular

FCC Rule Part	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
27	699 - 716	0.22751	1.0 PM	1M17G7D
27	699 - 716	0.27861	1.0 PM	1M14W7D
27	1710 - 1755	0.22803	1.0 PM	1M29G7D
27	1710 - 1755	0.22594	1.0 PM	1M03W7D
24E	1850 - 1910	0.22803	1.0 PM	1M20G7D
24E	1850 - 1910	0.22439	1.0 PM	1M06W7D

Output power is conducted.

This device is approved for mobile and fixed use with respect to RF exposure compliance. The antenna of this transmitter must provide a separation distance of at least 20 cm from all persons. Installers and end users must be provided with antenna installation instructions and antenna operating conditions and instructions for satisfying RF exposure compliance. The final product operating this transmitter must include operating instructions and antenna installation instructions for end users and installers to satisfy RF exposure compliance requirements. Multi-transmitter, supporting simultaneous transmission configurations, have not been evaluated and shall be evaluated according to KDB Publication 447498 and §15.31 (h) and §15.31 (k) and §2.1 end product terms and concepts. Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, emissions and host/module authentication, or new application if appropriate.

The maximum antenna gain including cable loss for compliance with radiated power limits, RF exposure requirements, and the categorical exclusion requirements of 2.1091 is 6.18 dBi for the 700 MHz frequency band, 6.00 dBi for 1700 MHz band, and 9.01 dBi for the 1900 MHz frequency band.

Chapter 10 – 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



REACH Statement

Registration of Substances

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

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

Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc.

Certificate of Compliance

2015/863

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

These MultiTech products do not contain the following banned chemicals¹:

- Lead, [Pb] < 1000 PPM
- Mercury, [Hg] < 100 PPM
- Cadmium, [Cd] < 100 PPM
- Hexavalent Chromium, [Cr+6] < 1000 PPM
- Polybrominated Biphenyl, [PBB] < 1000 PPM
- Polybrominated Diphenyl Ethers, [PBDE] < 1000 PPM
- Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm
- Benzyl butyl phthalate (BBP): < 1000 ppm
- Dibutyl phthalate (DBP): < 1000 ppm
- Diisobutyl phthalate (DIBP): < 1000 ppm

Environmental considerations:

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

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

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

Chapter 11 – Using Connection Manager

Use Connection Manager to:

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

Note:

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

Installing Connection Manager

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

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

To install Connection Manager and the device drivers:

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

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

Note: This page appears only on Windows 10.

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

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

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

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

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

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

Note:

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

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

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

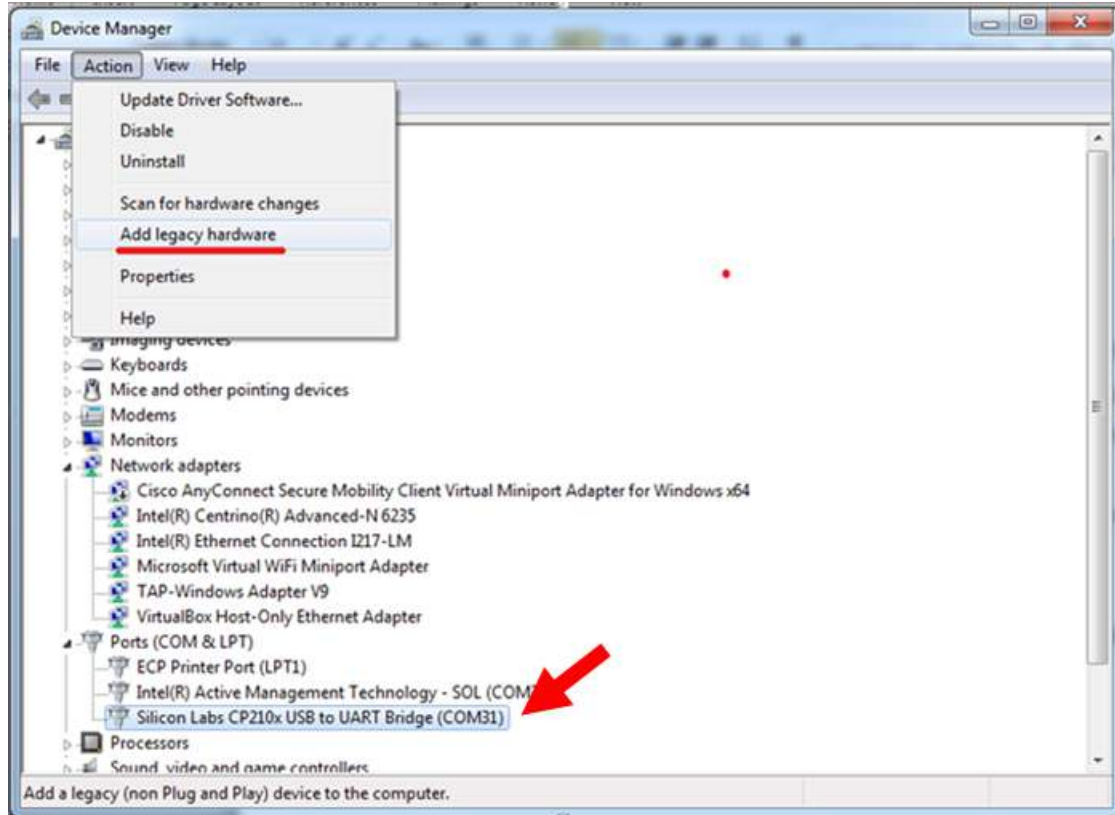
Setting Up a Serial Device in Windows Device Manager

To set up the device in Windows Device Manager:

1. Make sure that your desired COM port for the serial device is available.
2. Connect the serial device to the PC.
3. Go to **Control Panel > Device Manager**. Make a note of the COM port number for the connected device (in **COM Ports**).

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

4. Go to **Action > Add legacy hardware**.



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

- a. Click **Next**.
- b. Select **Install the hardware that I manually select from a list**, then click **Next**.
- c. Select **Modems**, then click **Next**.
- d. Check **Don't detect my modem; I will select it from a list**, then click **Next**.
- e. Select **Standard Modem Types**, then select **Standard 33600 bps Modem** on the right.

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

- f. Select your COM port, then click **Next**.
- g. Click **Finish**.
- h. Go to **Device Manager > Modems** and confirm that the device is added.

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

- a. Go to **Device Manager > Modems**, right-click **Standard 33600 bps Modem**, and select **Properties**.
- b. On the **Diagnostics** tab, click **Query Modem**.

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

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

To connect the device to your carrier's network, refer to [Connecting a Device](#).

Connecting a Device

Before You Begin

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

To connect your device to the carrier's network:

1. Open Connection Manager.

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

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

You may need to ask the carrier for these settings.

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

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

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

Note:

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

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

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

3. On the **Settings** tab, select **USB Modem** or **Serial Modem** depending on whether you are connecting a USB or serial device.
4. If you are connecting a serial device, provide the serial settings on the **Settings** tab:
 - a. In the **Modem type** list, select the appropriate modem type.
 - b. For the other settings, provide the values that match the serial-port settings for the device in Device Manager.

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

Note:

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

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

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

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

Note:

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

Uninstalling Connection Manager

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

Before You Begin

Make sure that Connection Manager is not running.

To uninstall Connection Manager:

1. In Windows, go to **Control Panel > Programs > Programs and Features**.
2. Right-click **MultiTech Connection Manager** and select **Uninstall**.
3. Click **Yes** to confirm that you want to uninstall Connection Manager.
The native Windows WWAN AutoConfig service is automatically enabled.
4. When the message "Are you sure you want to uninstall this product?" appears, click **Yes**.

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

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

Connection Manager User Interface

Connection Manager consists of the following tabs:

- Main
- Settings

- Connection
- Details
- Terminal
- Charts

MultiTech Connection Manager 1.0.6.77

MULTITECH

Main Settings Connector Details Terminal Charts

Statistics

Download:	0 B/s
Upload:	847 B/s
Sent:	37.39 Kb
Received:	24.39 Kb

Connected

58%

Keep-alive check: Success
Last ping response: 879 ms

Disconnect

Main tab

The **Main** tab displays the following:

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

Note: The signal strength is displayed for a serial device only when the device is not connected to the carrier's network.
- Connection statistics: download and upload speeds, amount of traffic sent and received (only when connection to the carrier's network is established)
- The keep-alive check status and when the last ping response was received if **Enable keep-alive check** is checked on the **Connection** tab.

Settings tab

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

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

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

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

Connection tab

The **Connection** tab displays the following:

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

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

Details tab

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

Terminal tab

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

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

Charts tab

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

Troubleshooting

Serial COM port is not available in the Serial Modem Settings

Close Connection Manager and reopen it.

Device is not detected ("No Device")

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

Try the following steps:

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

MultiConnect Cell USB Modem is not detected

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

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

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

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

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

This error has the following causes and solutions.

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

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