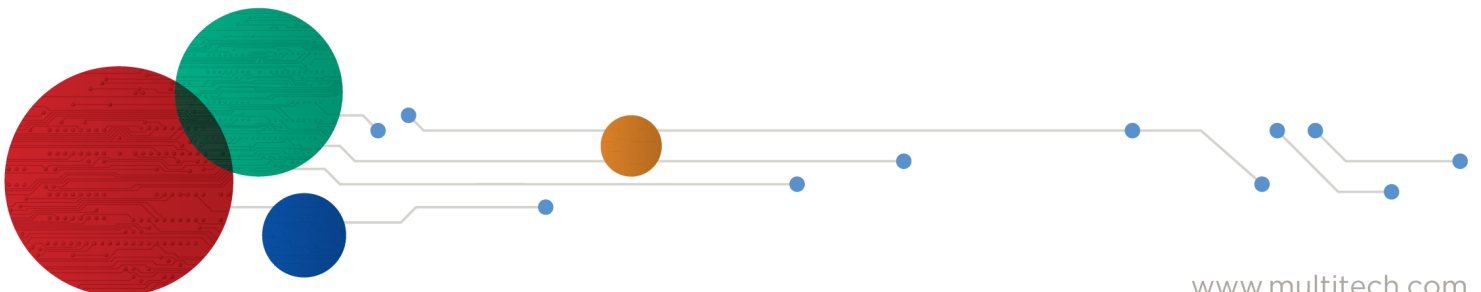


Conduit® Cat 4 for North America

MTCDDT-L4N1 Hardware Guide



Conduit Cat 4 for North America

Model: MTCDT-L4N1

Part Number: S000733 rev. 1.7

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Chapter 1 – Product Overview

Introduction

Conduit® is a programmable gateway that uses an open Linux development environment to enable machine-to-machine (M2M) connectivity using various wireless interfaces. It also provides an online application store for industrial things as a platform for developers to provision and manage their gateway and associated sensors and devices.

Documentation

The following documentation is available at <https://www.multitech.com/brands/multiconnect-conduit>.

Document	Description	Part Number
Hardware Guide	This document provides overview, safety and regulatory information, design considerations, schematics, and general hardware information.	S000733
Software Guide	This document provides instructions and information on how to properly configure your device through its user interface.	S000727
API Developer Guide	You can use the Conduit API to manage configurations, poll statistics, and issue commands. Documentation is available on the MultiTech Developer Resources website at: http://www.multitech.net/developer/software/aep/conduit-aep-api/ .	N/A
Telit LE910C4-NF AT Commands Reference Guide	Lists AT Commands and parameters used to configure your device. (Applies to L4E1 and L4N1 - Cat 4 devices)	80502ST10950A

Product Kit Contents

Your Product Kit includes the following (varies with model):

Device	1 - MTCDT-Conduit
Power Supply	1 - 100-240V 9V-1.7A power supply with removable blades
	Power blades/plugs for your region
Cables	1 - Micro USB Cable
	1 - Ethernet Cable RJ45 6-ft.
Antennas	2 - LTE SMA (for cellular models only)
Customer Notices	Quick Start
	Registration Card
Feet	4 - Clear Adhesive Feet
Additional	1 - Promotional screwdriver

Product Build Options

Product	Description	Region
MTCDDT-L4N1-240A-US	LTE Category 4 mPower Programmable Gateway w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-240L-US	LTE Category 4 mLinux Programmable Gateway w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-246A-915-US	LTE Category 4 mPower Programmable Gateway 8-channel, 915 MHz, GNSS w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-246A-US	LTE Category 4 mPower Programmable Gateway, GNSS w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-246L-915-US	LTE Category 4 mLinux Programmable Gateway 8-channel, 915 MHz, GNSS w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-246L-US	LTE Category 4 mLinux Programmable Gateway, GNSS w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247A	LTE Category 4 mPower Programmable Gateway, GNSS+WiFi/BT (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247A-915-US	LTE Category 4 mPower Programmable Gateway 8-channel, 915 MHz, GNSS+WiFi/BT w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247A-US	LTE Category 4 mPower Programmable Gateway, GNSS+WiFi/BT w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247L-US	LTE Category 4 mLinux Programmable Gateway, GNSS+WiFi/BT w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247L-915-US	LTE Category 4 mLinux Programmable Gateway 8-channel, 915 MHz, GNSS+WiFi/BT w/ US Accessory Kit (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-246A-STARTERKIT-915	LTE Category 4 Conduit IoT Starter Kit for LoRa Technology, 8-channel, 915 MHz w/ GNSS (AT&T/Verizon)	US/Canada
MTCDDT-L4N1-247A-STARTERKIT-915	LTE Category 4 Conduit IoT Starter Kit for LoRa Technology, 8-channel, 915 MHz w/ GNSS+Wi-Fi/BT (AT&T/Verizon)	US/Canada

Note:

The complete product code may end in .Rx. For example, MTCDDT-L4N1.Rx, where R is revision and x is the revision number.

Chapter 2 – Specifications

MTCDT-L4N1 Specifications

Category	Description
General	
Performance	LTE FDD Cat. 4, 3GPP release 10
	HSPA+ with GPRS fallback
Frequency Bands (MHz)	4G LTE: B2, B4, B5, B12, B13, B14, B66, B71
	3G: B2, B4, B5
Cellular radio module	Telit LE910C4-NF
Cellular packet data	Up to 150 Mbps downlink (Theoretical maximum - actual performance may be affected by multiple environmental factors.)
	Up to 50 Mbps uplink (See above note.)
Diversity/MIMO	Rx Diversity and MIMO DL 2x2
SMS over IMS	Point-to-Point messaging, Mobile terminated SMS, Mobile originated SMS
Physical Description	
Dimensions	See the drawing in <i>Dimensions</i> .
Weight	15.6 oz. (442.25 grams) with no accessory cards installed
Connectors	
Connectors	1 USB device micro Type B debug port
	1 RJ-45 Ethernet port
	1 USB 2.0 port
	2 cellular antenna connectors
	1 Wi-Fi/Bluetooth connector
	1 GPS antenna connector
Power Requirements	
Input Voltage	9-32 Volts
Power Draw	See Conduit Power Draw
Environment	
Operating Environment	-30° to +70° C ¹
Storage Environment	-40° to +85° C
Relative Humidity	20 to 90% non-condensing
Certifications	

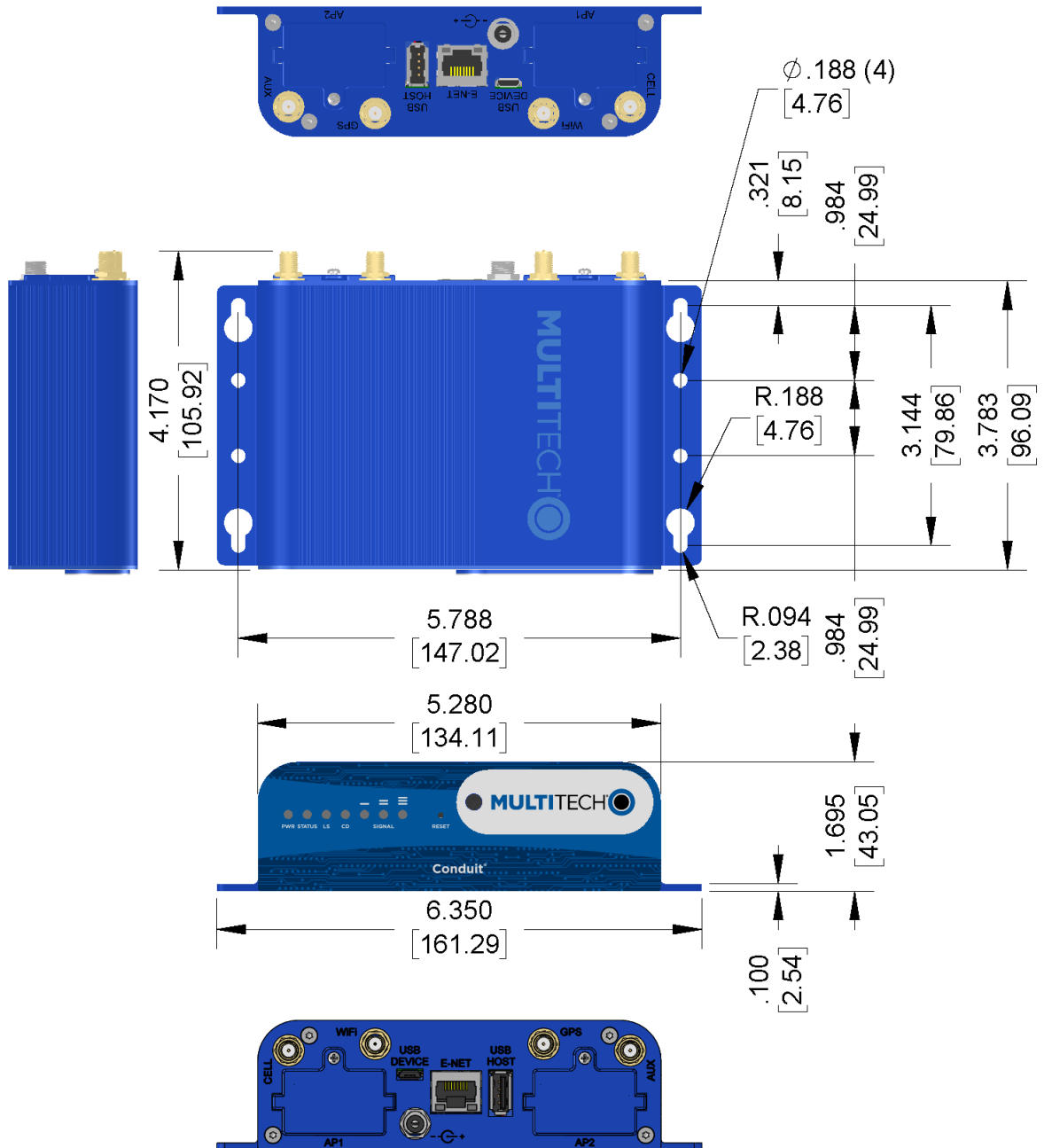
Category	Description
Radio & EMC Compliance	FCC Part 15 Class B/IC Class B
Safety Compliance	UL 60950-1 2nd Ed.
Telecom Approvals	AT&T / Verizon

¹UL Listed @ 40° C, limited by AC power supply. UL Recognized @ 65° C for Conduit LTE devices when used with the fused DC power cable, part number FPC-532-DC.

Installation in outdoor locations or ambient above 70° C has not been evaluated by UL. UL Certification does not apply or extend to use in outdoor applications.


Optional power must be UL Listed ITE power supply marked LPS or Class 2 rated 9 to 32 VDC, 5A. Certification does not apply or extend to Voltages outside certified range, and has not been evaluated by UL for operating voltages beyond tested range.

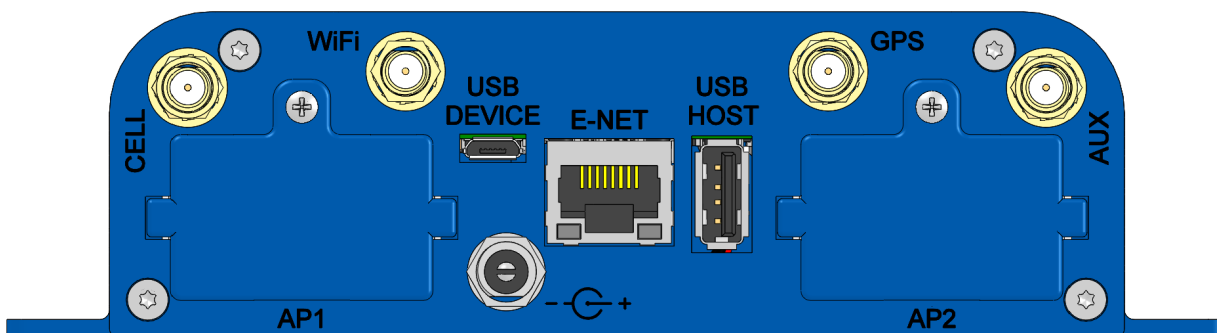
Dimensions



DIMENSIONS IN In [mm]

Backpanel Connectors

Label	Description
CELL, AUX	Cellular antenna inputs. <ul style="list-style-type: none"> ■ CELL - Primary. ■ AUX - Diversity.
AP1, AP2	Slots for MultiTech accessory cards. You can install an accessory card in either slot. Both slots can be occupied at one time. An exception is an SDIO (Secure Digital Input/Output) card, which can be used only in the AP1 slot. Your device may ship with one or more accessory cards pre-installed.
USB DEVICE	User-defined, high-speed 480 Mbps, standard USB 2.0 Micro B connector. Use this port to connect the Conduit to a computer or another device. By default, this port is a serial port terminal interface, but you can program it to act as another device such as a mass storage device or an Ethernet port.
E-NET	RJ-45 receptacle for standard Ethernet 10/100 Base-T. Caution: Ethernet ports and command ports are not designed to be connected to a public telecommunication network or used outside the building or campus.
USB HOST	High-speed, standard USB 2.0 Type A connector. 500mA maximum current draw. You can plug into the Host port a device such as a flash drive, camera, or printer if the Linux kernel has the appropriate driver.
Power	9-32 Vdc power receptacle for provided power cord. 
GPS	GPS antenna input. (Availability based on model.)
WIFI	Wi-Fi antenna input for 2.4/5.0 GHz antenna. (Availability based on model.)

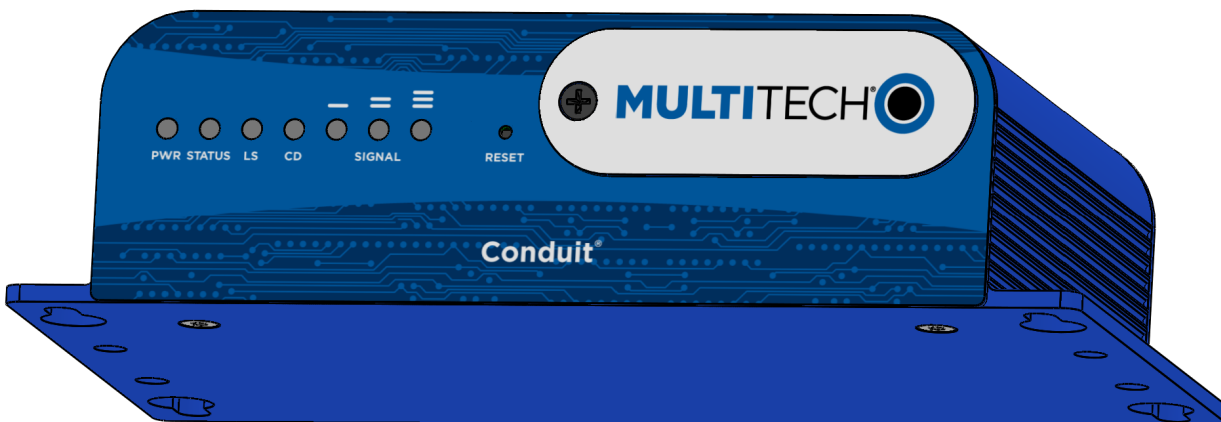


LED Descriptions

Conduit mLinux Model Front Panel



Conduit mPower Model Front Panel



Label	Name	Description
PWR	Power	Solid (constant) green if unit is on indicating that DC power is present.
STATUS	Power Status	Default condition: LED blinks when mLinux is fully loaded.
LS	Link Status	Varies with radio model.
A-B-C-D	--	These 4 LEDs are user-specified. Present on the Conduit mLinux model only.
CD	Carrier Detect	This LED is on when a cellular data connection is made. Present on the Conduit mPower model only.

Label	Name	Description
Signal	Signal Strength	These 3 LEDs display the strength of the cellular signal. Present on the Conduit mPower model only.

If a cellular radio is installed, the typical LS (Link Status) LED behavior is the following:

- OFF - No power to the cellular radio
- Continuously Lit - Not registered
- Slow Blink (-0.2Hz) - Registered or connected

On the back of the Conduit, the RJ-45 Ethernet LEDs (located at the bottom of the connector) are defined as follows:

- Orange LED (lower-left) indicated activity/link. Blinks when there is transmit and receive on the Ethernet link. It shows a steady light when there is a valid Ethernet connection.
- Green LED (lower-right) indicates link speed. Lit when Ethernet is linked at 100Mbps. If not lit, Ethernet is linked at 10 Mbps.

Power Draw

MTCDDT-L4N1 with Modem and No Accessory Cards

Radio Protocol	Sleep Mode Current	Cellular Call Box Connection No Data (mA)	Average Measured Current at Max Power (mA) ¹	TX Pulse (Avg) Amplitude Current	Total Inrush Charge Measured in MilliCoulombs (mC) ²	Total Inrush Charge Duration during Powerup (Inrush Duration)(mS)
9.0 Volts						
WCDMA 1854 Mhz WS46=22	NA	165	635	728	4.87	9.49
LTE freq Band 14 793 Mhz	NA	163	617	704	4.87	9.49
12.0 Volts						
WCDMA 1854 Mhz WS46=22	NA	136	488	572	4.46	8.44
LTE freq Band 14 793 Mhz	NA	136	478	564	4.46	8.44
24.0 volts						
WCDMA 1854 Mhz WS46=22	NA	93	276	356	4.03	17.5
LTE freq Band 14 793 Mhz	NA	90	274	332	4.03	17.5

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

²**Total Inrush Charge:** The total inrush charge at power on expressed in Millicoulombs (mC).

Note:

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

Chapter 3 – Antenna Information

Cellular Antenna

Cellular devices were approved with the following antenna:

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

MultiTech ordering information:

Model	Quantity
ANLTE2-2HRA	1
ANLTE2-10HRA	10
ANLTE2-50HRA	50

Cellular 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

Bluetooth and Wi-Fi Antennas

Manufacturer:	Sinbon
Manufacturer's Model Number:	A9701641-1
Antenna Type:	2.4G / 5.0G Dipole Antenna

Multi-Tech Ordering Information

Model Number	Quantity
ANWF-1HRA	1
ANWF-10HRA	10
ANWF-50HRA	50

Antenna Specifications

Category	Description
Frequency Range	2.4000 to 5.150 GHz
Impedance	50 Ohms
VSWR	VSWR should not exceed 2.0:1 at any point across the bands of operation
Peak Radiated Gain	4.9 dBi for 2.4GHz/ 5.5 dBi for 5 GHz on azimuth plane
Radiation	Omni-directional
Polarization	Linear
Connector	RP-SMA(M)

LoRa Antenna

Manufacturer:	PulseLarsen Antenna
Description:	868-928 MHz RP-SMA Antenna, 8"
Model Number:	W1063

MultiTech ordering information:

Ordering Part Number	Quantity
AN868-915A-1HRA	1
AN868-915A-10HRA	10
AN868-915A-50HRA	50

LoRa Antenna Specifications

Category	Description
Frequency Range	868-928 MHz
Impedance	50 Ohms
VSWR	≤ 2.0
Gain	1.0 dBi
Radiation	Omni
Polarization	Vertical

Chapter 4 – Setting up and Configuring the Device

Installing and Connecting Conduit Hardware

To install and cable the device:

Important: If your device came with a non-fused DC power cable and you want to use it for connecting power, you must do one of the following for installation.

- Connect DC cable to an LPS power supply.
 - Connect DC cable to a Class II power supply.
 - Connect DC cable to a fused circuit. Fuse rating: 32Vdc @ 3 Amps (Fast-Blow)
1. Install a Mini SIM card.
 2. Install a Micro SD card (optional).
 3. Install a battery (optional).
 4. Connect the supplied antenna(s) to the appropriate connector(s) on the back of the device. Connectors may vary with model.
 5. Use the Ethernet connector to connect the Conduit to the device used to administer the Conduit.
 6. Install any mCard accessory cards into a slot at the back of the device. Refer to Installing an mCard Accessory Card for instructions.
 7. Depending on the accessory card type, attach any antennas or cables for use with the card.
 8. Connect the power cord to an outlet or power strip and to the power adapter.
 9. Connect the power adapter to the barrel jack on the back panel of the device. The Power LED comes on immediately after power is applied. Wait for the Status LED to begin blinking.

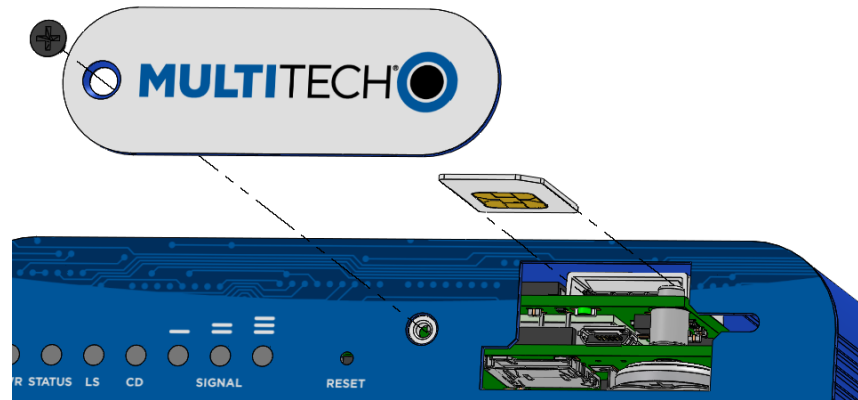
Installing a Mini SIM Card

You need:

- Phillips screwdriver
- Mini SIM card (2FF form factor)

To install or replace the SIM card:

1. Disconnect power to the Conduit, if it is connected.
2. At the front of the Conduit housing, remove the screw that secures the nameplate to the housing and remove the nameplate.
3. Locate the SIM card holder in the upper right corner of the opening. If a SIM card is installed and needs to be removed, slide it out of the SIM card holder.
4. Gently push the new SIM card into SIM card holder face up with the cut corner to the right and the SIM contacts facing toward the Conduit's interior.
5. If not installing a battery or micro SD card, reattach the MultiTech nameplate to the Conduit using the screw removed in Step 2.



Accessory Port (mCard) Interfaces

The accessory card interface on the Conduit base board has the following interface options:

Interface	Description
I2C	<p>Used by all accessory cards. I2C is required for Electronic Identification (EID) support on the accessory card but can be used for other I2C devices. It should supports standard (100 kHz) and/or fast (400 kHz) clock speeds.</p> <p>The I2C interface reserves the full block of EEPROM address space for Electronic ID support, so we recommend that you not attach any other EEPROM devices to the interface. We recommend that you use a 24C04 part, because both address bits of the 24C04 are connected to the AP interface allowing you to identify four separate accessory port (AP) cards in a system.</p>
Serial UART	Serial UART with HW flow control used by Serial interface based Accessory Cards
SDIO interface and/or SPI Interface	AP1 has option for SDIO or SPI interface, based on what Accessory Card is installed. AP2 supports only SPI based Accessory Cards.
GPIO	Additional control pins for certain Accessory Cards.
Interrupts	Software defined interrupts. Can also be used as additional control pins.
PPS	GPS generated Pulse-Per-Second signal used for software timing. Default is 1 pulse/sec.
USB 2.0	A standard USB 2.0 High Speed interface for USB based Accessory Cards.
5 VDC 1 Amp supply	Used by all accessory cards.
3.3 VDC 1 Amp supply	Used by all accessory cards.

For accessory card specifications, regulatory content, and installation information, refer to the appropriate product page: www.multitech.com/brands/multiconnect-mcard.

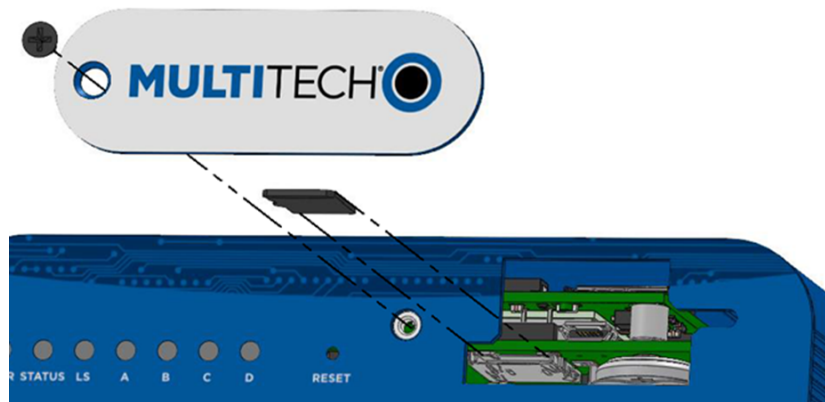
Installing a Micro SD Card

You need:

- Phillips screwdriver
- MicroSD memory card

To install or replace the SD card:

1. Disconnect power to the Conduit, if it is connected.
2. At the front of the Conduit, remove the screw that secures the MultiTech nameplate.
3. Locate the SD card at the left side of the opening on the underside of the PC board.
4. If an SD card is already installed, gently push on the card to release it from its setting and remove it from the housing with your fingers.
5. With the new SD card contacts facing up and toward the interior of the device, gently push the card into the slot to secure it.
6. Reattach the MultiTech nameplate to the housing using the screw removed in step 2.



Installing a Battery

The battery is located in the Conduit housing.

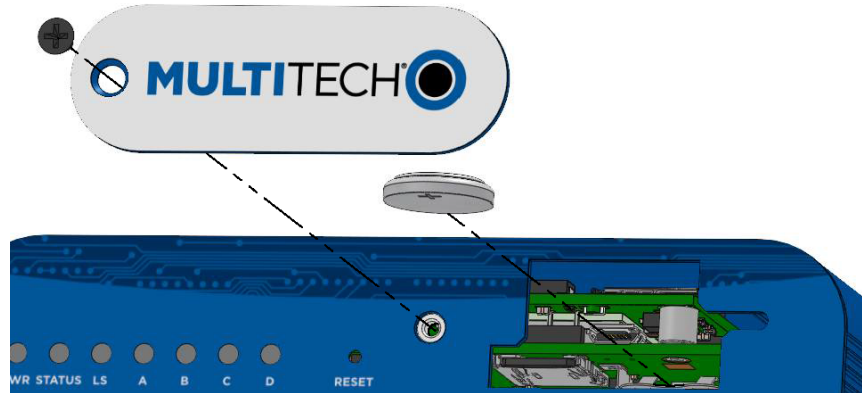
You need:

- Phillips screwdriver
- If replacing a battery, non-metal tweezers or similar object
- CR1632 standard coin lithium battery

To install or replace the battery:

1. If connected, disconnect power to the Conduit.
2. At the front of the Conduit housing, remove the screw that secures the MultiTech nameplate to the housing.

3. The battery holder is located at the right side of the opening on the underside of the PC board. To remove an existing battery, use non-metal tweezers as necessary.
4. Orient the new battery so that the positive (+) pole is facing down. Use your fingers or non-metal tweezers to insert the battery into the holder.
5. Reattach the MultiTech nameplate to the housing using the screw removed in Step 2.



CAUTION: Risk of explosion if this battery is replaced by an incorrect type. Dispose of batteries according to instructions.

Note:

ATTENTION: Risque d'explosion si vous remplacez la batterie par un modèle incompatible. Jetez les piles usagées selon les instructions.

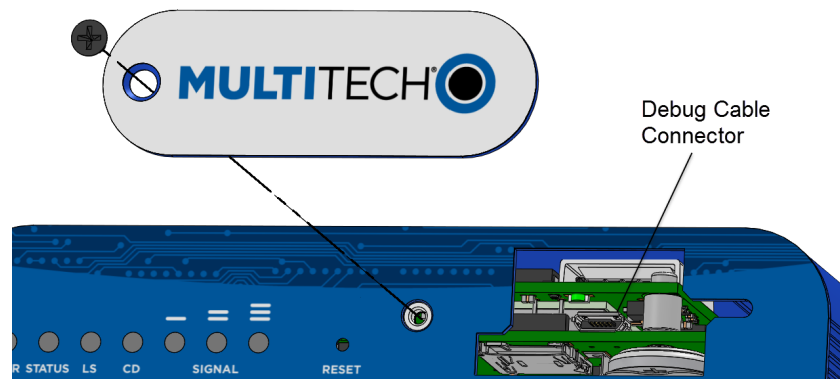
Connecting to the Debug Interface

There are two different options for the debug connector: 1) USB Micro B connector or 2) 3-pin connector. Check which debug interface is in your device by using steps 1-3. Once you have the appropriate cable available, proceed with steps 4-7.

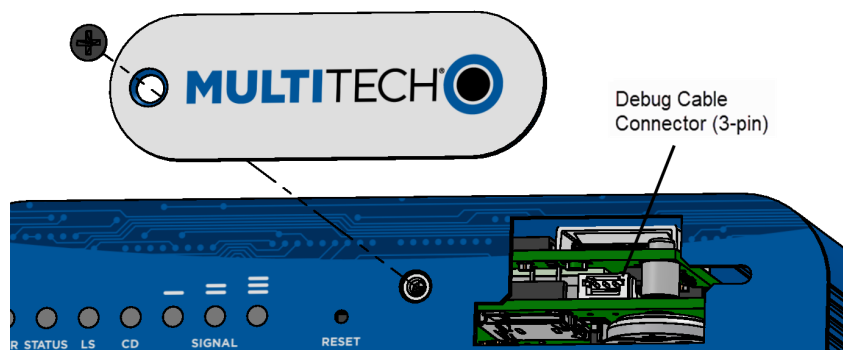
NOTE: If you have a 3-pin connector, you must build a cable specifically for your debug interface. See details on how to build the 3-pin cable following these instructions.

You need:

- Phillips screwdriver
 - Standard USB Micro B cable
1. Disconnect power to the Conduit, if it is connected.
 2. At the front of the Conduit housing, remove the screw that secures the MultiTech nameplate to the housing.
 3. Locate and identify the USB debug cable connector in the center of the opening. Make sure have the appropriate cable available (if you have the 3-pin connector, see cable details below).
 4. Connect the appropriate cable to the debug connector.
 - a. If you have the USB Micro B connector, connect the USB Micro B cable to the debug connector.



- b. If you have the 3-pin connector, connect the 3-pin cable to the debug connector.



5. Connect the Type A end of the USB cable to the host.
6. From the host, use an application such as TeraTerm with a baud rate of 115,200. If the USB driver does not automatically install, do the following:
 - a. Unplug the USB cable.
 - b. Go to the following web site to download and install the appropriate USB driver:
<https://www.maxlinear.com/support/design-tools/software-drivers>
 - c. Plug the USB cable back into the housing.
7. From the host, access the Conduit's USB COM port.

Accessory 3-pin Cable for Debug Interface

The 3-pin Debug Interface cable can be ordered as an accessory from the factory, P/N: 95218134LF, model: CA-MTCDT-DEBUG. Otherwise, you have the option to build it yourself. See details in the following section.

Building the 3-pin Cable

As an alternative to the accessory cable for the 3-pin debug connector, you can build a custom cable to use the debug interface. The resulting cable should have a USB-A connector for the host end and the 3-pin connector on the device end. See tables under the cable and connector information for specific parts and manufacturers that you can use.

You need:

- USB to 3.3V Serial UART cable
- JST-ZHR-3 connector (3-pin connector with crimp-style contacts)
- Custom crimping tool (for use with JST connector only)

1. Purchase a USB to 3.3V Serial UART cable with a USB-A connector for the host end and three leads on the device end. See cable information for details.
2. Purchase a 3-pin connector using crimp-style contacts for the device end of the cable. See connector information for details.
3. Cut the original connectors off the three leads of the device end of the cable.
4. Strip the insulation and crimp the terminals on the wire with a custom crimping tool.
5. Plug the terminals into the connector shell. **Note:** The terminals are very small.

Cable Information

Description	Manufacturer	P/N or Product Number
Olinuxino Serial Console Cable (USB to 3.3V Serial UART cable)	Olímex LTD	USB-SERIAL-F
Debug Cable for Raspberry Pi (USB to 3.3V Serial UART cable)	FTDI	TTL-232R-RPi

Cable Drawing

REVISION HISTORY					BILL OF MATERIALS				
Number	Rev.	EC#	Date	Description	Part Number	Description	Rev.	QTY.	Item No.
44537340L	000	34715	1/14/22	FIRST RELEASE	USB-SERIAL-F/TTL-232R-RPi	Olímex LTD/FTDI		1	1
					01055749L	3POS. SHELL		1	2
					01054956L	CONNECTOR 3PT 5.2H-002T-P0.5		3	3

Olímex LTD IS THE DEFAULT			
P/N	Olímex LTD	FTDI	
1	RED	ORANGE	
2	GREEN	YELLOW	
3	BLUE	BLACK	

1	RED/ORANGE	UART-TX	1
2	GREEN/YELLOW	UART-RX	2
3	BLUE/BLACK	Ground	3

NOTE:
1. ALL MATERIALS MUST BE ROHS COMPLIANT.

MULTITECH	-NOTICE-	CABLE DEBUG CONNECTOR MTCDT	Drawn: Dean Brant	Rev: 0/1122	Rev: NONE	Sheet 1 of 1
	<small> MULTITECH, CONDUIT, CAT 4, AND MTCDT are trademarks of Multitech Systems, Inc. All other trademarks are the property of their respective owners. © 2022 Multitech Systems, Inc. All rights reserved. </small>		Checked: T. Blair	Rev: B	Part No: 44537340L	Rev: 000

Olimex cable

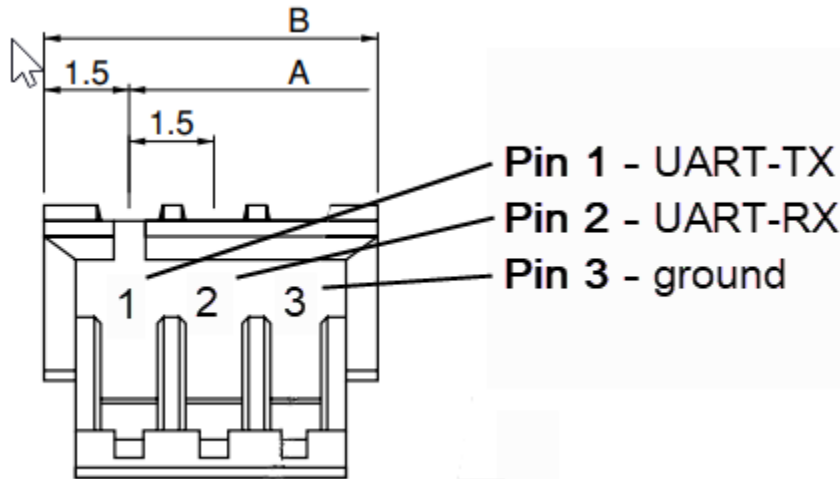


FTDI Cable



Connector Information

Description	Manufacturer	P/N or Product Number	Contacts
3-pin connector with crimp-style contacts (female socket)	JST	JST-ZHR-3	SZH-002T-P0.5



Restoring User Defined Settings

You need:

- A pin, paperclip, or similar thin object that can fit into the reset hole.

To restore user defined settings for an **mPower** device:

1. Locate the hole in the panel labeled RESET. The reset button is recessed into the housing.
2. Use the pin to press in the button for between 3 to 29 seconds, then release the reset button.
 - If you do not press in the button long enough, the device will reset, but the user defined settings will not be restored.
 - If you hold it too long (30 seconds or longer), factory default settings will be restored.

Note: The RESET button is in the same location on all Conduit models.

Resetting the Device

You need:

- A pin, paperclip, or similar thin object that can fit into the reset hole.

The following is the default condition for the RESET button on the Conduit. You can program a change to the behavior of the button if needed.

To reset the device:

1. Find the hole in the front panel labeled RESET. The reset button is recessed into the case.
2. **For mPower models:** Use the pin to press the RESET button for less than 3 seconds, then release. The device reboots.

For mLinux models: Press and hold the RESET button for less than 5 seconds, then release. Holding it beyond 5 seconds resets an mLinux device to factory defaults.

3. The status LED will keep blinking normally for a couple of seconds until the unit resets. Then the status light will stay solid while the device reboots. Once finished, the status will resume blinking normally.

Powering Up the Device

CAUTION: Use only the power cord provided with the device. Using any other power cord voids the warranty and can damage the device.

To power up the device:

1. Install the desired MultiTech accessory card or cards into the slots at the back of the device. Refer to the appropriate installation documentation for the accessory card.
Note: Some models already have MTAC cards installed.
2. Connect the power cord to an outlet or power strip and to the power adapter.
3. Connect the power adapter to the barrel jack on the back panel of the device.
4. Verify power.
 - The Power LED comes on immediately after power is applied.
 - The device takes a short time to boot up when you apply power.
5. Connect the device to the controlling device through the Ethernet connector or the USB connector on the back panel.

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. The device is configured for Verizon 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: This AT Command reboots the system.

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`).

Chapter 5 – Regulatory & Safety 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 Notice

The MultiTech Conduit is an open embedded development product. Configurations of this product may optionally contain a sub GHz radio technology which MultiTech has certified for compliance with US and Foreign compliance bodies including FCC, R&TTE and others. (e.g. FCC 15.247:2015 & IC RSS-210:2010).

MultiTech provides software code meant to operate the radio to a level that maintains compliance with the operating modes under which these radio devices were certified. To ensure this level of compliance, the software code is provided in binary form only. Users are prohibited from making any changes that affect the operation of the radio performance. Accessing or controlling the radio through any means other than the provided binary software will require the user to obtain their own intentional radiator license from the certification body governing their locality, as all pre-certification provided with Conduit IP67 Series 200 Base Station. Conduit mDot will have been made invalid.

MTSMC-L4N1 and MTSMC-L4N1-U

FCC Parts 22H, 24E, 27, and 90

FCC Identifier:	RI7LE910CXNF
Equipment Class:	PCS Licensed Transmitter
Notes:	WCDMA and LTE Wireless Module

FCC Rule Parts:	22H, 24E, 27, 90
------------------------	------------------

FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designators
24E	1850.0 - 1910.0	0.297852	1.0 PM	4M14G7W
27	1710.0 - 1755.0	0.323594	1.0 PM	4M14G7W
22H	824.0 - 849.0	0.326588	1.0 PM	4M14G7W
24E	1850.7 - 1909.3	0.27353	1.0 PM	1M10G7D
24E	1851.5 - 1908.5	0.28642	1.0 PM	2M69G7D
24E	1852.5 - 1907.5	0.28576	1.0 PM	4M48G7D
24E	1855.0 - 1905.0	0.27669	1.0 PM	8M93G7D
24E	1857.5 - 1902.5	0.23496	1.0 PM	13M4G7D
24E	1860.0 - 1900.0	0.26182	1.0 PM	17M8G7D
22H	824.7 - 848.3	0.30339	1.0 PM	1M09G7D
22H	825.5 - 847.5	0.30269	1.0 PM	2M69G7D
22H	826.5 - 846.5	0.23388	1.0 PM	4M48D7W
22H	829.0 - 844.0	0.32359	1.0 PM	8M94G7D
27	699.7 - 715.3	0.29785	1.0 PM	1M09G7D
27	700.5 - 714.5	0.27479	1.0 PM	2M68G7D
27	701.5 - 713.5	0.29309	1.0 PM	4M48G7D
27	704.0 - 711.0	0.25882	1.0 PM	8M94G7D
27	779.5 - 784.5	0.31333	1.0 PM	4M46G7D
27	782.0 - 782.0	0.2851	1.0 PM	8M90G7D
90	790.5 - 795.5	0.27416	1.0 PM	4M47G7D
90	793.0 - 793.0	0.27416	1.0 PM	8M90G7D
27	665.5 - 695.5	0.25119	1.0 PM	4M46G7D
27	668.0 - 693.0	0.24774	1.0 PM	8M90G7D
27	670.5 - 690.5	0.24889	1.0 PM	13M3G7D
27	673.5 - 688.0	0.23442	1.0 PM	17M7G7D

Notes

Output power listed is conducted.

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

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

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

The maximum antenna gain including cable loss for compliance with radiated power limits, RF exposure requirements and the categorical exclusion requirements of 2.1091 is 5.63 dBi for 600 MHz bands, 5.94 dBi for the 700 MHz bands, 6.12 dBi for the 800 MHz bands, 5.00 dBi for the 1700 MHz bands and 8.01 dBi for 1800 MHzband.

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

Compliance of this device in all final product configurations is the responsibility of the Grantee.

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

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

Industry Canada Class B Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.

This device complies with Industry Canada license-exempt RSS standard(s). The operation is permitted for the following two conditions:

1. the device may not cause interference, and
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Lithium Battery

- A lithium battery (3V, coin cell, CR1632) located within the product provides backup power for the timekeeping. If the device is left powered off, the battery lasts approximately 90 days.
- When this battery starts to weaken, the date and time may be incorrect.
- Battery is not user replaceable. If the battery fails, the device must be sent back to MultiTech Systems for battery replacement.

- Lithium cells and batteries are subject to the Provisions for International Transportation. Multi-Tech Systems, Inc. confirms that the Lithium batteries used in the MultiTech product(s) referenced in this manual comply with Special Provision 188 of the UN Model Regulations, Special Provision A45 of the ICAO-TI/IATA-DGR (Air), Special Provision 310 of the IMDG Code, and Special Provision 188 of the ADR and RID (Road and Rail Europe).

CAUTION: Risk of explosion if this battery is replaced by an incorrect type. Dispose of batteries according to instructions.

Attention: Risque d'explosion si vous remplacez la batterie par un modèle incompatible. Jetez les piles usagées selon les instructions.

User Responsibility

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

Power Supply Caution

CAUTION: Do not replace the power supply with one designed for another product; doing so can damage the modem and void your warranty. Adapter shall be installed near the equipment and shall be easily accessible.

CAUTION: Pour garantir une protection continue contre les risques d'incendie, remplacez les fusibles uniquement par des fusibles du même type et du même calibre. L'adaptateur doit être installé à proximité de l'appareil et doit être facilement accessible.

Device Maintenance

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

When maintaining your device:

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

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

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.

Notice regarding Compliance with FCC, EU, and Industry Canada Requirements for RF Exposure

The antenna intended for use with this unit meets the requirements for mobile operating configurations and for fixed mounted operations, as defined in 2.1091 of the FCC rules for satisfying RF exposure compliance. This device also meets the European RF exposure requirements of EN 62311. If an alternate antenna is used, consult user documentation for required antenna specifications.

Compliance of the device with the FCC, EU and IC rules regarding RF Exposure was established and is given with the maximum antenna gain as specified above for a minimum distance of 20 cm between the devices radiating structures (the antenna) and the body of users. Qualification for distances closer than 20 cm (portable operation) would require re-certification.

Wireless devices could generate radiation. Other nearby electronic devices, like microwave ovens, may also generate additional radiation to the user causing a higher level of RF exposure.

Radio Frequency (RF) Safety

Due to the possibility of radio frequency (RF) interference, it is important that you follow any special regulations regarding the use of radio equipment. Follow the safety advice given below.

- Operating your device close to other electronic equipment may cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.
- Different industries and businesses restrict the use of cellular devices. Respect restrictions on the use of radio equipment in fuel depots, chemical plants, or where blasting operations are in process. Follow restrictions for any environment where you operate the device.
- Do not place the antenna outdoors.
- Switch OFF your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and is illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.
- Switch OFF your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your wireless device in hospitals and any other place where medical equipment may be in use.

Sécurité relative aux appareils à radiofréquence (RF)

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

- Utiliser l'appareil à proximité d'autres équipements électroniques peut causer des interférences si les équipements ne sont pas bien protégés. Respectez tous les panneaux d'avertissement et les recommandations du fabricant.
- Certains secteurs industriels et certaines entreprises limitent l'utilisation des appareils cellulaires. Respectez ces restrictions relatives aux équipements radio dans les dépôts de carburant, dans les usines de produits chimiques, ou dans les zones où des dynamitages sont en cours. Suivez les restrictions relatives à chaque type d'environnement où vous utiliserez l'appareil.
- Ne placez pas l'antenne en extérieur.
- Éteignez votre appareil sans fil dans les avions. L'utilisation d'appareils électroniques portables en avion est illégale: elle peut fortement perturber le fonctionnement de l'appareil et désactiver le réseau cellulaires. S'il ne respecte pas cette consigne, le responsable peut voir son accès aux services cellulaires suspendu ou interdit, peut être poursuivi en justice, ou les deux.
- Éteignez votre appareil sans fil à proximité des pompes à essence ou de diesel avant de remplir le réservoir de votre véhicule de carburant.
- Éteignez votre appareil sans fil dans les hôpitaux ou dans toutes les zones où des appareils médicaux sont susceptibles d'être utilisés.

Interference with Pacemakers and Other Medical Devices

Potential interference

Radio frequency energy (RF) from cellular devices can interact with some electronic devices. This is electromagnetic interference (EMI). The FDA helped develop a detailed test method to measure EMI of implanted cardiac pacemakers and defibrillators from cellular devices. This test method is part of the Association for the Advancement of Medical Instrumentation (AAMI) standard. This standard allows manufacturers to ensure that cardiac pacemakers and defibrillators are safe from cellular device EMI.

The FDA continues to monitor cellular devices for interactions with other medical devices. If harmful interference occurs, the FDA will assess the interference and work to resolve the problem.

Precautions for pacemaker wearers

If EMI occurs, it could affect a pacemaker in one of three ways:

- Stop the pacemaker from delivering the stimulating pulses that regulate the heart's rhythm.
- Cause the pacemaker to deliver the pulses irregularly.
- Cause the pacemaker to ignore the heart's own rhythm and deliver pulses at a fixed rate.

Based on current research, cellular devices do not pose a significant health problem for most pacemaker wearers. However, people with pacemakers may want to take simple precautions to be sure that their device doesn't cause a problem.

- Keep the device on the opposite side of the body from the pacemaker to add extra distance between the pacemaker and the device.
- Avoid placing a turned-on device next to the pacemaker (for example, don't carry the device in a shirt or jacket pocket directly over the pacemaker).

Chapter 6 – Environmental Notices

Waste Electrical and Electronic Equipment Statement

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

WEEE Directive

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

Instructions for Disposal of WEEE by Users in the European Union

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

July, 2005



Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc.

Certificate of Compliance

2015/863

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

These MultiTech products do not contain the following banned 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

REACH-SVHC Statement

Registration of Substances

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

For the current REACH-SVHC statement, refer to additional regulatory documents at:

<https://www.multitech.com/support/support>

Refer to the following for the most current candidate list of substances: <https://echa.europa.eu/candidate-list-table>.

Information on HS/TS Substances According to Chinese Standards (in Chinese)

依照中国标准的有毒有害物质信息

根据中华人民共和国信息产业部 (MII) 制定的电子信息产品 (EIP) 标准—中华人民共和国《电子信息产品污染控制管理办法》(第 39 号), 也称作中国 RoHS, 下表列出了 Multi-Tech Systems, Inc. 产品中可能含有的有毒物质 (TS) 或有害物质 (HS) 的名称及含量水平方面的信息。

有害/有毒物质/元素

成分名称	铅 (PB)	汞 (Hg)	镉 (CD)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板	O	O	O	O	O	O
电阻器	X	O	O	O	O	O
电容器	X	O	O	O	O	O
铁氧体磁环	O	O	O	O	O	O
继电器/光学部件	O	O	O	O	O	O
ICs	O	O	O	O	O	O
二极管/晶体管	O	O	O	O	O	O
振荡器和晶振	X	O	O	O	O	O
调节器	O	O	O	O	O	O
电压传感器	O	O	O	O	O	O
变压器	O	O	O	O	O	O
扬声器	O	O	O	O	O	O
连接器	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
螺丝、螺母以及其它五金件	X	O	O	O	O	O
交流-直流电源	O	O	O	O	O	O
软件/文档 CD	O	O	O	O	O	O
手册和纸页	O	O	O	O	O	O
底盘	O	O	O	O	O	O

X 表示所有使用类似材料的设备中有害/有毒物质的含量水平高于 SJ/Txxx-2006 限量要求。

O 表示不含该物质或者该物质的含量水平在上述限量要求之内。

Information on HS/TS Substances According to Chinese Standards

In accordance with China's Administrative Measures on the Control of Pollution Caused by Electronic Information Products (EIP) # 39, also known as China RoHS, the following information is provided regarding the names and concentration levels of Toxic Substances (TS) or Hazardous Substances (HS) which may be contained in Multi-Tech Systems Inc. products relative to the EIP standards set by China's Ministry of Information Industry (MII).

Hazardous/Toxic Substance/Elements

Name of the Component	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Printed Circuit Boards	O	O	O	O	O	O
Resistors	X	O	O	O	O	O
Capacitors	X	O	O	O	O	O
Ferrite Beads	O	O	O	O	O	O
Relays/Opticals	O	O	O	O	O	O
ICs	O	O	O	O	O	O
Diodes/ Transistors	O	O	O	O	O	O
Oscillators and Crystals	X	O	O	O	O	O
Regulator	O	O	O	O	O	O
Voltage Sensor	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
Speaker	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
Screws, Nuts, and other Hardware	X	O	O	O	O	O
AC-DC Power Supplies	O	O	O	O	O	O
Software /Documentation CDs	O	O	O	O	O	O
Booklets and Paperwork	O	O	O	O	O	O
Chassis	O	O	O	O	O	O

X Represents that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/Txxx-2006 Requirements for Concentration Limits.

O Represents that no such substances are used or that the concentration is within the aforementioned limits.