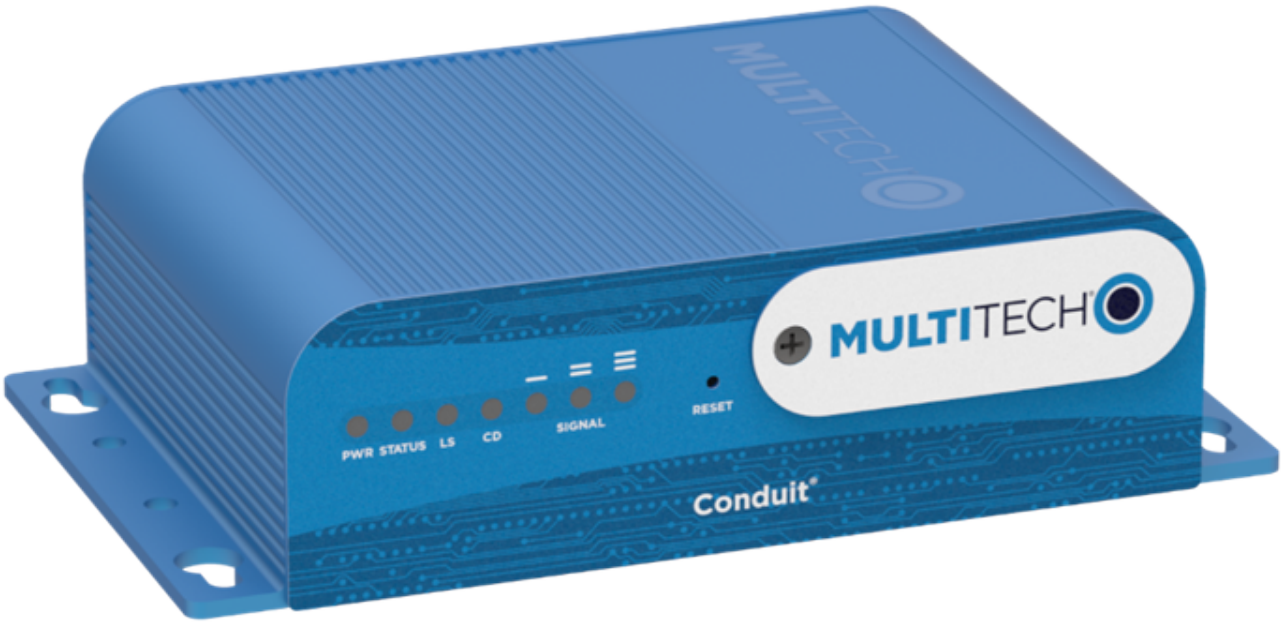
MULTITECH®



Conduit® Cat 4 for EU/UK

MTCDT-L4E1 Hardware Guide

Conduit® Hardware Guide

Model: MTCDT-L4E1

Part Number: S000731

Copyright

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Knowledge Base

The Knowledge Base provides immediate access to support information and resolutions for all MultiTech products. Visit http://www.multitech.com/kb.go.

Support Portal

To create an account and submit a support case directly to our technical support team, visit: https://support.multitech.com.

Support

Business Hours: M-F, 8am to 5pm CT

Country	By Email	By Phone
Europe, Middle East, Africa:	support@multitech.co.uk	+(44) 118 959 7774
U.S., Canada, all others:	support@multitech.com	(800) 972-2439 or (763) 717-5863

Warranty

To read the warranty statement for your product, visit www.multitech.com/warranty.go. For other warranty options, visit www.multitech.com/es.go.

World Headquarters

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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.	S000731
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-EU 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
	1 - NAM blade/plug
	1 - EURO blade/plug
	1 - UK blade/plug
Cables	1 - Micro USB Cable
	1 - Ethernet Cable RJ45 6-ft.
Antennas*	1 - Hepta Band SMA (for non-LTE devices) or 2 - LTE SMA (for Conduit LTE only), 1 - GPS antenna, and 1 - Wi-Fi/Bluetooth antenna
Customer Notices	Quick Start*
	Registration Card
Feet	4 - Clear Adhesive Feet
Additional	1 - Promotional screwdriver

Note: *HEPTA or LTE antennas are not included with MTCDT-246 or 247A/L (No Radio versions).

Product Build Options

Product	Description	Region
MTCDT-L4E1-247A-868-EU-GB	LTE Cat 4 AEP Programmable Gateway 8-channel, 868 MHz, w/ GNSS, MTAC-LORA-H-868 mCard, Wi-Fi/Bluetooth, and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-246A-868-EU-GB	LTE Cat 4 AEP Programmable Gateway 8-channel, 868 MHz, w/ GNSS, MTAC-LORA-H-868 mCard, and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-247A-EU-GB	LTE Cat 4 AEP Programmable Gateway, w/ GNSS, Wi-Fi/Bluetooth, and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-246A-EU-GB	LTE Cat 4 AEP Programmable Gateway w/ GNSS and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-240A-EU-GB	LTE Category 4 AEP Programmable Gateway w/ US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-247L-868-EU-GB	LTE Category 4 mLinux Programmable Gateway 8-channel, 868 MHz w/ GNSS, MTAC-LORA-H-868 mCard, Wi-Fi/Bluetooth, and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-246L-868-EU-GB	LTE Category 4 mLinux Programmable Gateway 8-channel, 868 MHz w/ GNSS, MTAC-LORA-H-868 mCard, and US/EU/UK Accessory Kit	EU/UK

Product	Description	Region
MTCDT-L4E1-247L-EU-GB	LTE Category 4 mLinux Programmable Gateway w/ GNSS, WiFi/BT, and EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-246L-EU-GB	LTE Category 4 mLinux Programmable Gateway, w/ GNSS and US/EU/UK Accessory Kit	EU/UK
MTCDT-L4E1-240L-EU-GB	LTE Category 4 mLinux Programmable Gateway w/ US/EU/UK Accessory Kit	EU/UK

Note:

The complete product code may end in .Rx. For example, MTCDT-L4E1.Rx, where R is revision and x is the revision number.

Chapter 2 – Specifications

MTCDT-L4E1 Specifications

Category	Description
General	
Performance	LTE FDD Cat. 4, 3GPP release 10
	HSPA+ with GPRS fallback
Frequency Bands (MHz)	4G LTE: B3(1800), B7(2600), B20(800), B1(2100), B8(900), B28A (700)
	3G: B1(2100), B3(1800), B8(900)
	2G: B3(1800), B8(900)
Cellular radio module	Telit LE910C4-EU
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 Conduit Demensions Drawing
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

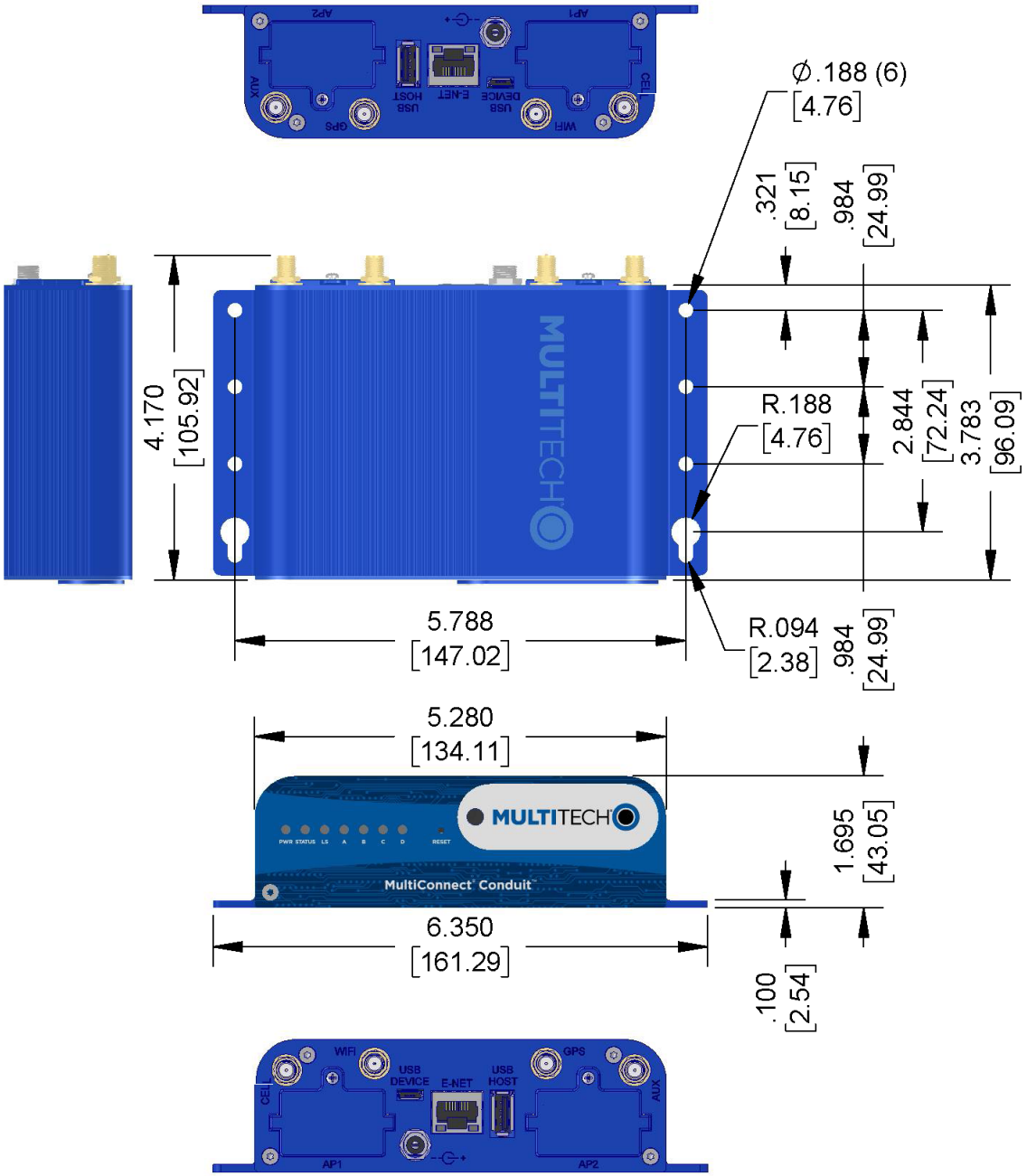
Category	Description
Certifications	
Radio & EMC Compliance	CE Mark, RED (EU)
Safety Compliance	IEC60950-1(EU)
Telecom Approvals	EU carriers

[1]UL Listed @ 40° C, limited by AC power supply. UL Recognized @ 65° C for Conduit LTE devices within IP67 enclosure or 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 12 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.

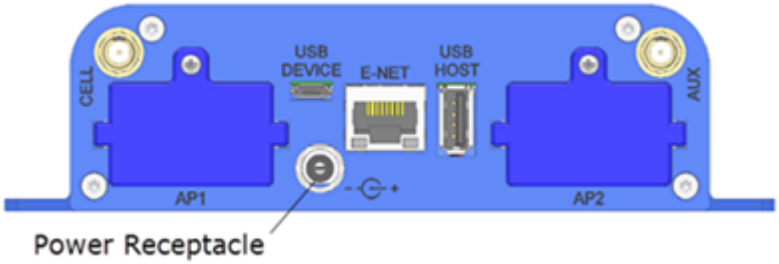
Mechanical Drawing



DIMENSIONS IN In [mm]

Backpanel Connectors

Label	Description
CELL, AUX	Cellular antenna inputs. ■ 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.
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.



LED Descriptions

Conduit mLinux Model Front Panel

Conduit Application 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 Application model only.
Signal	Signal Strength	These 3 LEDs display the strength of the cellular signal. Present on the Conduit Application 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.

Chapter 3 – Power Draw

Power Draw

MTCDT-L4E1-247A with Modem and No Accessory Cards

Radio Protocol	Cellular Connection no data (mA)	Measured Current at Max Power (mA)	TX Pulse (AVG) Amplitude Current for GSM850 or Peak Current (mA)[1]	Total Inrush Charge (mC)[2]
9.0 Volts				
eGSM 900 MHz	163	423	1,650	5.25
WCDMA	162	617	728	5.25
LTE	236	602	688	5.25
12.0 Volts				
eGSM 900 MHz	154	326	1,210	4.68
WCDMA	141	489	584	4.68
LTE	175	465	556	5.68
24.0 volts				
eGSM 900 MHz	104	191	635	3.63
WCDMA	95	282	360	3.63
LTE	115	265	316	3.63

[1]**Tx Pulse**: The average peak current during a GSM850 transmission burst period. The transmission burst duration for GSM850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).

[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 4 – Antenna Information

Wieson Antenna

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

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

Chapter 5 – Frequency Information

Frequency Bands for Conduit

Cellular Radio	Frequencies
LE910C4-EU L4E1	2G: B3(1800), B8(900), 3G: B1(2100), B3(1800), B8(900), 4G: B3(1800), B7(2600), B20(800), B1(2100), B8(900), B28A(700)

Frequency and Power Information for WiFi/Bluetooth

Operating Frequency	RF Output Power
802.11b: 2400 MHz – 2483.5 MHz	19.1 dBm
802.11g: 2400 MHz – 2483.5 MHz	19.9 dBm
802.11n: 2400 MHz – 2483.5 MHz	19.9 dBm
802.11a: 5150 MHz – 5350 MHz, 5470 MHz – 5725 MHz	13.5 dBm
802.11n: 5150 MHz – 5350 MHz, 5470 MHz – 5725 MHz	13.6 dBm
BT/BLE: 2400 MHz – 2483.5 MHz	10.1 dBm

Frequency and Power Information for LoRa

Operating Frequency	RF Output Power
FCC Part 15C: 923.3 MHz – 927.5 MHz (USA)	25.1 dBm
EN 300 220-2: 863.1 MHz – 869.9 MHz (Europe)	14 dBm

Transmission Output Power

For Telit LE910C4-EU (L4E1)

Band	Power Class
2G: LB	1 (33dBm)
2G: HB	4 (30dBm)
3G: TD-SCDMA - All bands	Class 3 (24dBm)
4G: LTE FDD & TDD - All bands	Class 3 (23dBm @1RB)

Chapter 6 – Setting up and Configuring the Device

Install and Connect Conduit Hardware

To install and cable the device:

1. Install a Mini SIM card.
2. Install a Micro SD card (optional).
3. Install a battery (optional).
4. Connect the supplied antenna to the **CELL** connector on the back of the device.
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.

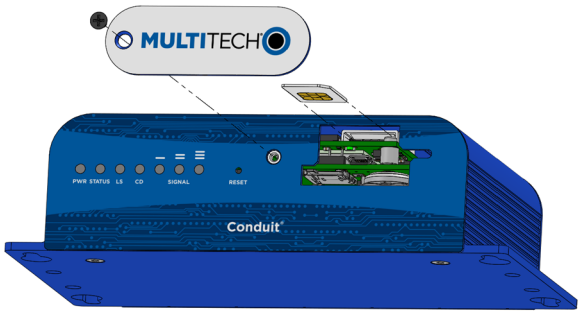
Installing a Mini SIM Card

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	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.
	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.
Serial UART	Serial UART with HW flow control used by Serial inteface 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, see the Accessory Card information.

Installing a Micro SD Card

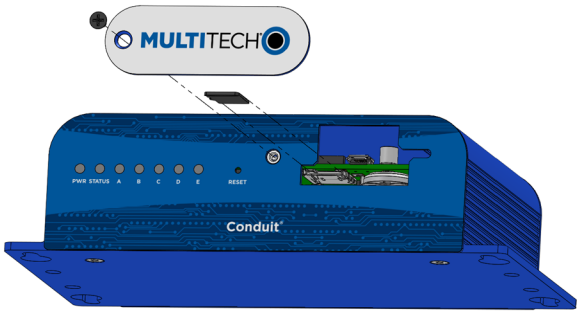
You need:

- 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

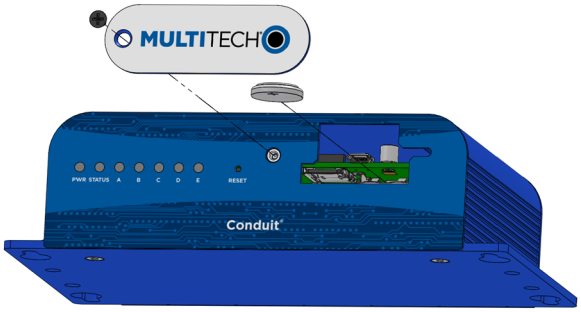
The battery is located in the Conduit housing.

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.

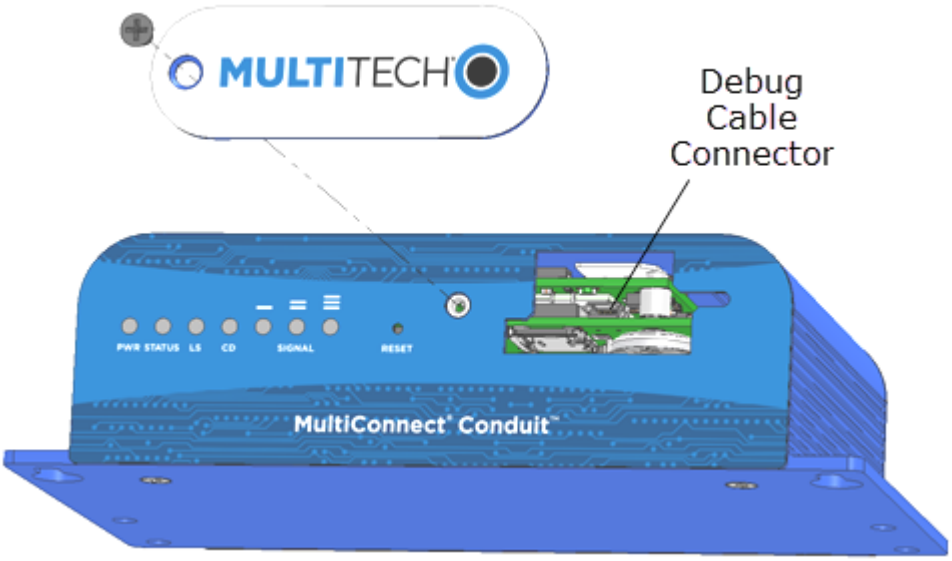
Connecting to the Debug Interface

You need:

- Phillips screwdriver
- Standard USB Micro B cable

To connect the debug 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 the USB debug cable connector in the center of the opening.
4. Connect the USB Micro B 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.



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 **AEP 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 AEP**: Use the pin to press the RESET button for less than 3 seconds, then release. The device reboots.

   For mLinux: 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.
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.

Chapter 7 – Regulatory & Safety Information

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

CE

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

> Council Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment;
> and
> Council Directive 2014/53/EU on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

MultiTech declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be requested at https://support.multitech.com.

Lithium Battery

- A lithium battery (3V, coin cell, CR1632) located within the product provides backup power for the timekeeping. This battery has an estimated life expectancy of ten years.
- 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. 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.

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 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.

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 8 – 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).

These MultiTech products do not contain the following banned chemicals[1]:

- Lead, [Pb] < 1000 PPM
- Mercury, [Hg] < 100 PPM
- Cadmium, [Cd] < 100 PPM
- Hexavalent Chromium, [Cr+6] < 1000 PPM
- Polybrominated Biphenyl, [PBB] < 1000 PPM

- Polybrominated Diphenyl Ethers, [PBDE] < 1000 PPM
- Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm
- Benzyl butyl phthalate (BBP): < 1000 ppm
- Dibutyl phthalate (DBP): < 1000 ppm
- Diisobutyl phthalate (DIBP): < 1000 ppm

Environmental considerations:

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

[1]Lead 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.

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.

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.