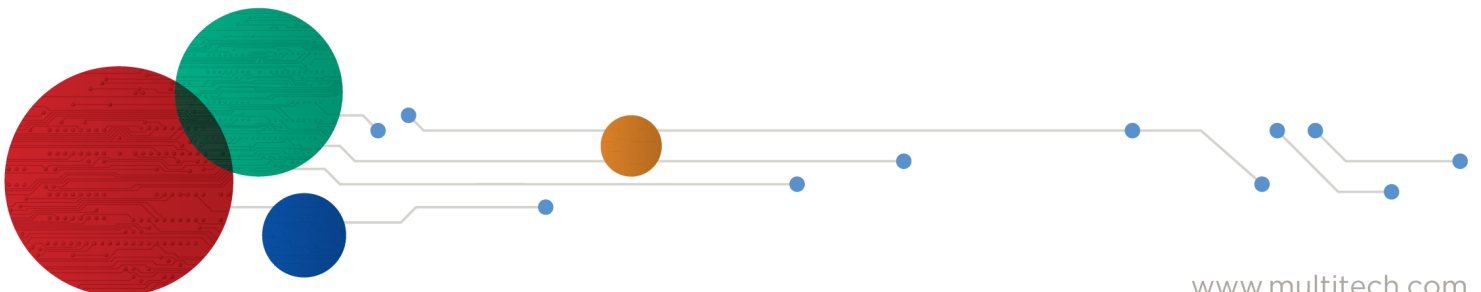


MultiConnect® Conduit™

MTCDT-LAP3 Hardware Guide (AU)



MultiConnect® Conduit™ Hardware Guide

Models: MTCDDT-LAP3-246A-915-AU, MTCDDT-LAP3-246A-AU, MTCDDT-LAP3-247A-915-AU

Part Number: S000718 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.

Product Kit Contents

Your product kit typically includes the following (varies with model):

Device	1 - MTCDDT-Conduit ¹
Power Supply	1 - 100-240V 9V-1.7A power supply with removable blades
	1 - AU 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 ²
Customer Notices	Quick Start
	Registration Card
Feet	4 - Clear Adhesive Feet
Additional	1 - Promotional screwdriver

Note 1: MTCDDT-LAP3-246A-915-AU and MTCDDT-LAP3-246L-915-AU include a LoRa Accessory Card.

Note 2: HEPTA or LTE antennas are not included with MTCDDT-246 or 247A/L (No Radio versions).

Build Options

Product	Description	Region
MTCDDT-LAP3-246A-915-AU	Conduit 4G LTE Cat 1 w/ 3G Fallback mPower Gateway using GNSS w/AU Accessory Kit and LoRa Accessory Card	Australia
MTCDDT-LAP3-246A-AU	Conduit 4G LTE Cat 1 w/ 3G Fallback mPower Gateway using GNSS w/AU Accessory Kit	Australia
MTCDDT-LAP3-247A-915-AU	Conduit 4G LTE Cat 1 w/ 3G Fallback mPower Gateway using GNSS and WiFi/BT w/AU Accessory Kit and LoRa Accessory Card	Australia

Chapter 2 – Specifications

Conduit Specifications

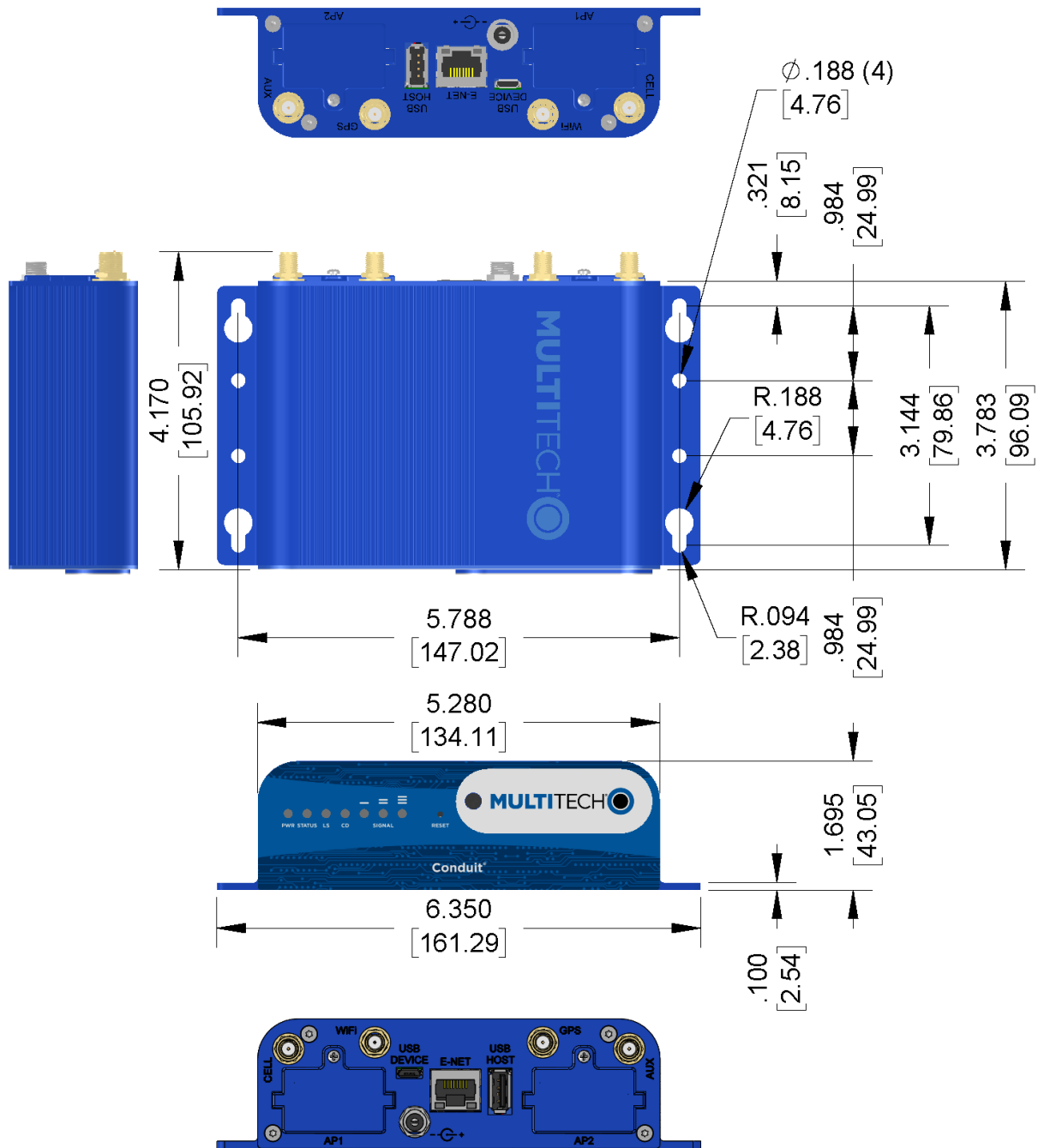
Category	Description
General	
Performance	4G LTE Cat 1 with 3G Fallback Release 9
Frequency Bands (MHz)	4G LTE Cat 1 FDD 2100 (B1), 850 (B5) , 900 (B8), 1800 (B3), and 700 (B28)
	3G WCDMA 2100 (B1), GSM 850 (B5), and EGSM 900 (B8)
Physical Description	
Dimensions	See the Conduit Demensions Drawing
Weight	15.6 oz. (442.25 grams) with no accessory cards installed
Connectors	
Connectors	1 USB device micro Type B debug port (behind nameplate)
	1 RJ-45 Ethernet port
	1 USB micro port
	2 cellular antenna connectors
	1 Wi-Fi/Bluetooth connector
	1 GPS antenna connector
Power Requirements	
Input Voltage	9-32 Volts
Environment	
Operating Environment	-30° to +70° C ¹
Storage Environment	-40° to +85° C
Relative Humidity	20 to 90% non-condensing
Certifications	
Country Approval	RCM (Australia)
Radio & EMC Compliance	EN 55022:2010
	EN 301 489
	FCC Part 15 Class B
	IC Class B
Safety Compliance	UL/cUL 60950-1 2nd Ed.
	IEC 60950-1 2nd Ed. Am. 1 and Am. 2
Telecom Approvals	Telstra

¹UL 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.

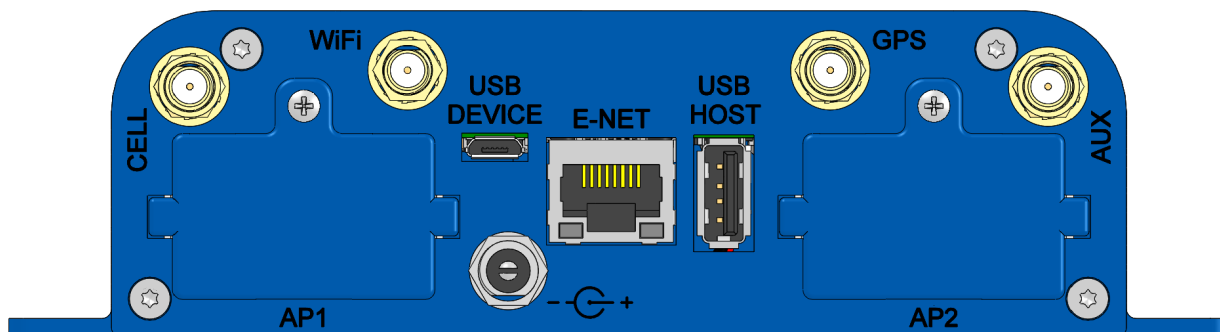
Dimensions



DIMENSIONS IN In [mm]

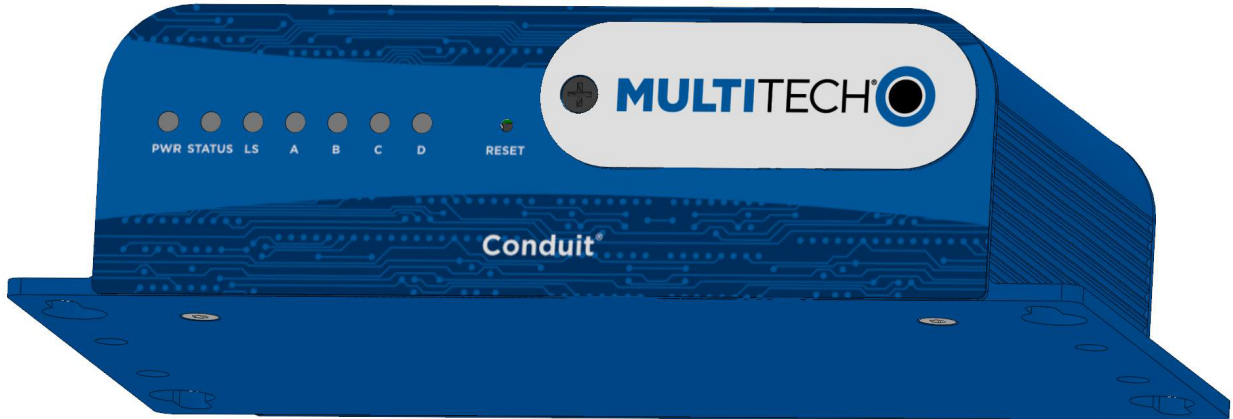
Backpanel Connectors

Label	Description
CELL, AUX	Cellular antenna inputs. <ul style="list-style-type: none"> ■ H5: 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.

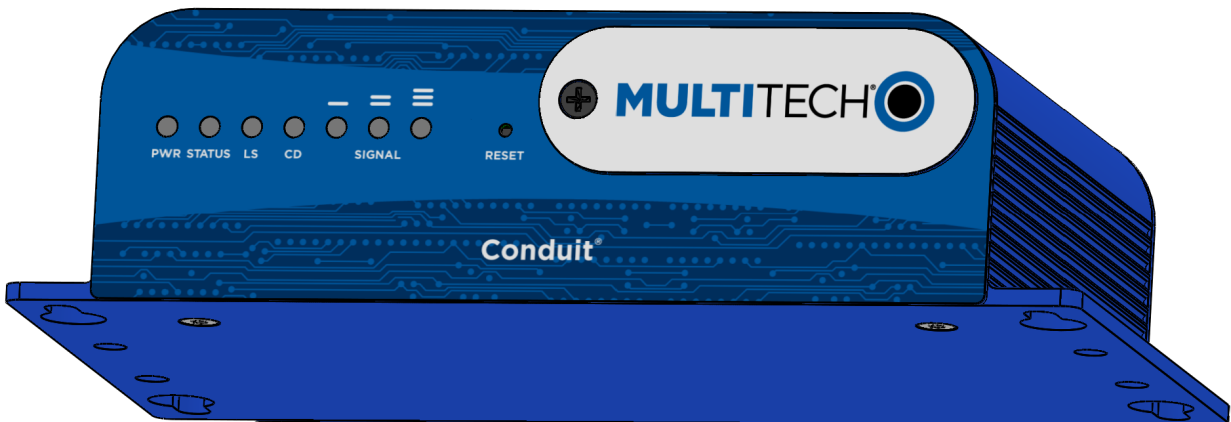


LED Descriptions

Conduit mLinux Model Front Panel



Conduit 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.

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

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.

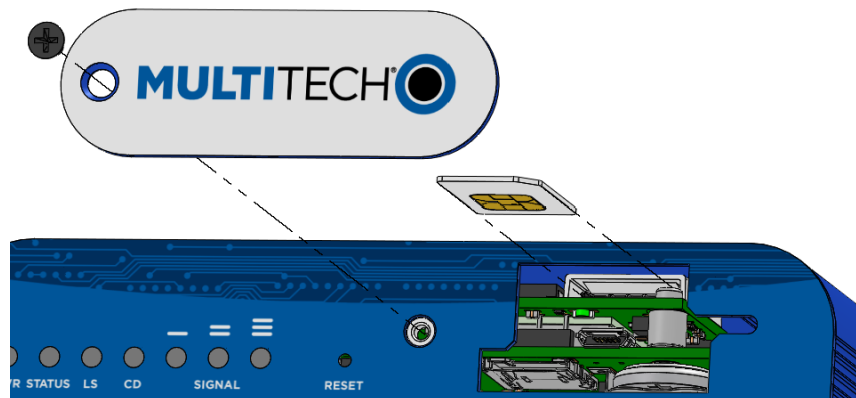
Installing a Mini SIM Card

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.

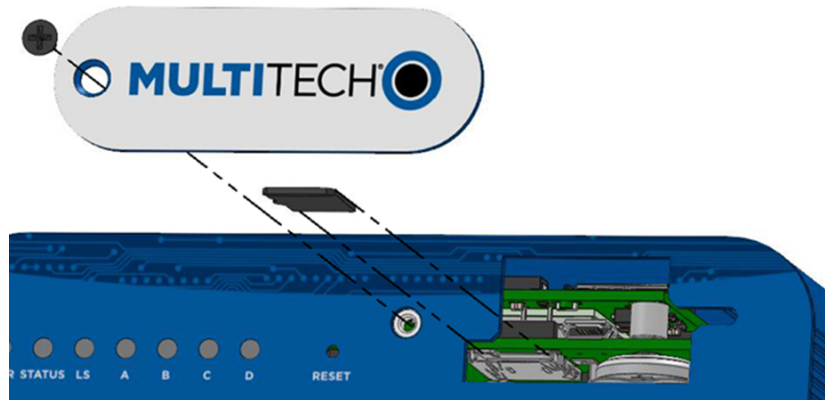
Installing a Micro SD Card

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.

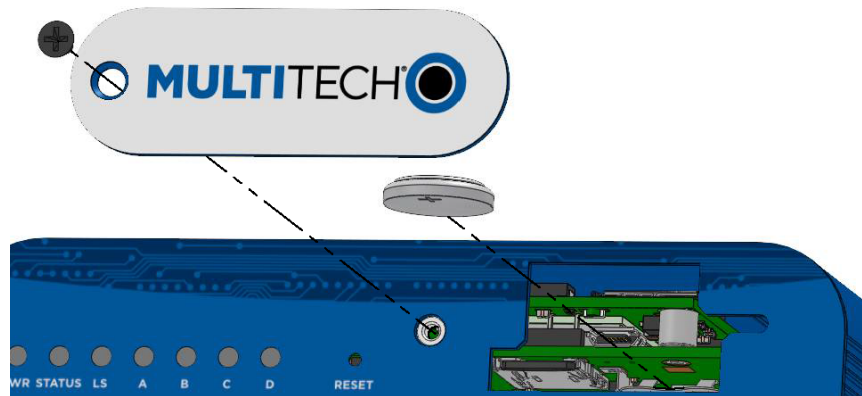
You need:

- 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

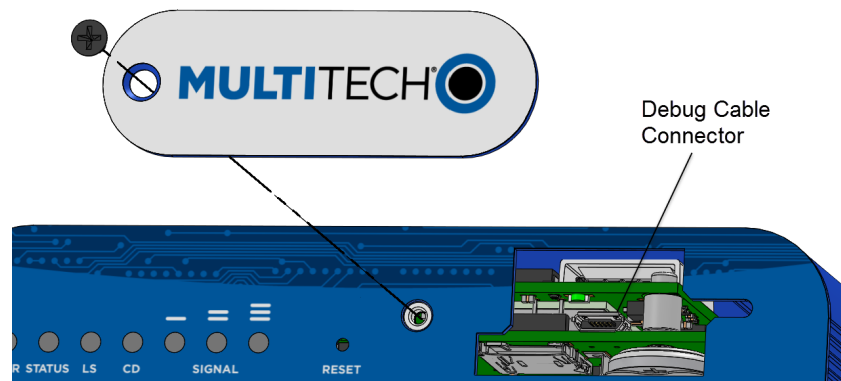
There are two different options for the debug connector: 1) USB Micro B connector or 2) 3-pin connector. Check which debug interface is in your device by using steps 1-3. Once you have the appropriate cable available, proceed with steps 4-7.

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.

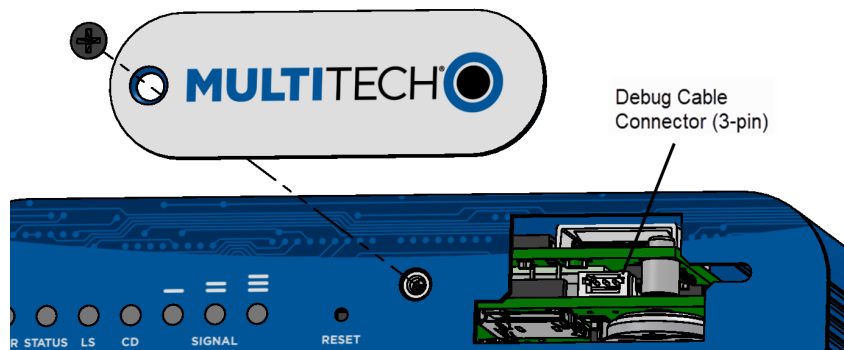
You need:

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

Olimex LTD IS THE DEFAULT			
P/N	Olimex 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: 001	Rev: NONE	Sheet: 1 of 1
	Checked: T. Blair		Rev: B	Part No: 44537340L	Rev: 000	

Olimex cable

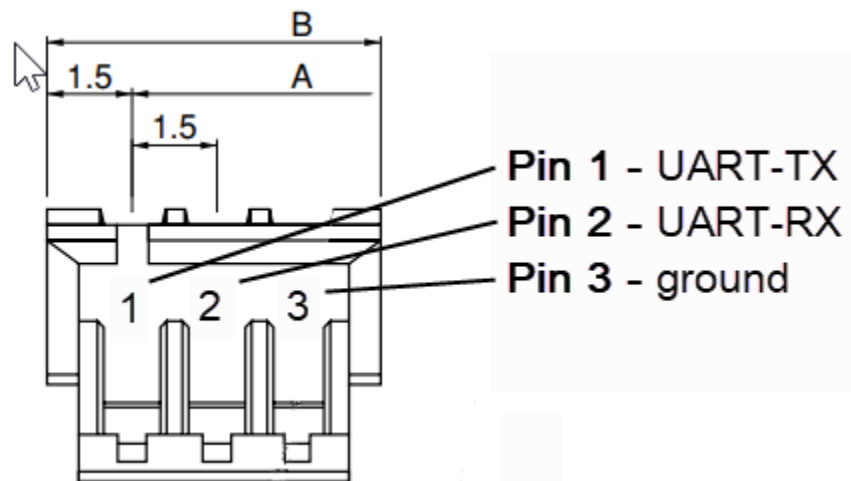


FTDI Cable



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.

Chapter 5 – Regulatory Information

Regulatory Compliance Mark (RCM)



This product complies with the requirements of the Regulatory Compliance Mark (RCM) for Electrical Regulatory Authorities Council (ERAC), Electrical Equipment Safety System (EESS), and the Australian Communications and Media Authority (ACMA) for Electromagnetic Compatibility (EMC).

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>.

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



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.

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。